IMPACT AND PROCESS EVALUATION OF NORTHWESTERN ENERGY 2007–2011 DEMAND SIDE MANAGEMENT PROGRAMS

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EXECUTIVE SUMMARY

This report presents the methodology, findings and recommendations based on an impact and process evaluation of the NorthWestern Energy (NWE) Demand Side Management (DSM) portfolio. The evaluation covers the operation of 24 energy efficiency and renewable energy programs during the period July 1, 2006 through December 31, 2011.

Evaluation of Impacts and Cost-Effectiveness

The table below shows the net savings and cost effectiveness findings for NWE's natural gas and electric programs funded with Universal System Benefits Charges (USBC) or through natural gas and electric supply rates. We base these findings on data collection and analysis of participant and non-participant samples representative of each program in the portfolio. As part of this evaluation, we completed file reviews for 1,181 participants. Our field staff also completed site visits, and site-specific energy savings estimates for 638 participants and, as part of that effort, we installed 220 light loggers at 75 homes to measure hours of lighting operation. Our team completed telephone surveys with 922 participants to assess free ridership and they assessed spillover for 508 participants. In addition, we interviewed 40 Compact Fluorescent Lamp (CFL) retailers to determine what portion of the Upstream Buy-Down CFLs (and related Northwest Energy Efficiency Alliance (NEEA) Initiatives were purchased by businesses.

The energy impact and cost-effectiveness results from our evaluation are summarized in Table 1. As shown in the table we found that NWE's DSM portfolio achieved 87 percent of reported electric savings and 66 percent of report gas savings over the five year period covered by this evaluation. The table also shows our findings regarding the benefits and costs of the portfolio during this period. Benefits exceeded costs (Benefit/Cost ratio greater than 1) for both electric and gas savings.

Table 1: Portfolio Impact and Cost-Effectiveness for All Calendar Years

Funding	Program	Units	Reported Energy Savings	Net Savings Adjustment Rate	Adjusted Savings	Benefit/Cost Ratios			
						Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric									
	All Programs Electric	kWh	309,335,688	0.87	270,564,139	1.41	2.49	1.46	1.56
Natural Gas									
	All Programs Natural Gas	dkt	874,310	0.66	577,245	1.28	1.60	1.20	1.41

A large majority of the portfolio savings were due to the installation of CFLs in homes or businesses. The residential CFL operating hours study we performed determined daily hours of use, averaged over a year, for a typical CFL in a NWE program participant residence. We recruited a sample of 76 participants in the residential CFL direct and owner install program residences, and metered 220 CFLs at these residences (about three per home). We then explored means to annualize the metered data first by applying linear regression techniques to individual meter and aggregate data, then ultimately by applying monthly usage profiles from other lighting metering studies. Extrapolated results showed average use of 2.02 hours/day in 2012, 45% less than the 3.7 hours/day used by NorthWestern Energy from the 2007 Nexant Program Evaluation.

The persistence study we performed assessed claimed measures for programs and measures of particular interest. We inspected a sample of such measures from the 2007–2008 program years to determine whether the measures were still operational and yielding substantial savings. For measures where onsite inspections were unlikely to yield useful information--such as a boiler tune-up, for example--we instead performed literature reviews. We then analyzed both the onsite inspection and literature review data qualitatively and developed recommendations for maintaining or adjusting the portfolio measure lives. For the programs and measures we studied, we generally found the applicable EULs to be reasonable. We did, however, find some areas worthy of additional scrutiny and possible adjustment for future program years.

Based on the impact evaluation findings, NWE should consider the following portfolio-wide opportunities:

- Increase marketing efforts to further awareness of the efficiency opportunities that NWE offers.
- Compile customer e-mail addresses in the tracking database.
- Maintain consistent names for each program across evaluation cycles.
- Update UES values regularly, and apply by building type when applicable.

Additionally, some of the more significant program-specific opportunities to consider include:

- Improve audit report clarity and follow-up.
- Improve CFL hours of use estimation, as well as appropriate light levels and documentation.
- Work with NEEA to use NWE service territory-specific sales data, improve savings analysis transparency, and reassess treatment of CFL retirement.
- Restructure or drop programs with poor participation, such as new construction, motor rewind, and Vending Miser.

Process Evaluation

NWE offers a large portfolio of residential and non-residential programs, including audits, prescriptive rebates, custom incentives, and education and training. It offers this portfolio with an extremely low staff to budget ratio, as compared with program administrators around the country. NWE's efforts are firmly grounded in efficiency program best practices. It follows over 50 best practices in program planning and design, management and administration, marketing and outreach, quality control, tracking and reporting, and evaluation. NWE clearly adopted recommendations offered in the process evaluation conducted for the 2004–2006 program cycle.

We identified that NWE's program practices adheres to over 50 established best practices, as shown in the following table. Yet the best practices are ideals; in practice, there is always room for improvement and we identify opportunities for NWE to further enhance its strong programs.

Table 2: Executive Summary NWE Efficiency Programs Adhere to Over 50 Best Practices

1	Develop a sound program plan
2	Understand local market conditions
3	Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)
4	Maintain program design flexibility to respond to changes in market and other factors
5	Maintain program funding throughout the year
6	Clearly articulate program changes to trade allies and customers
7	Develop written process plan
8	Keep participation simple
9	Offer assistance in preparing and submitting program applications
10	Use internet to facilitate participation
11	Provide quick, timely feedback to applicants
12	Maintain accurate contact lists
13	Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks
14	Maintain clear lines of communication
15	Capture and retain "program memory" in-house
16	Offer a single point of contact for customers of audit and non-residential programs
17	Use electronic processing
18	Use well-qualified engineering staff for technical programs
19	Communicate with customers through multiple media
20	Use the program's website to broadly inform the market and attract participation
21	Use Energy Star products and logo for leverage and to instill consumer confidence
22	Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations
23	Promote all benefits of energy efficient measures
24	Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects
25	Conduct cross-program marketing
26	Conduct sample-based post-installation inspections

27	Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)
28	Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions
29	Assess customer satisfaction
30	Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market
31	Implement a contractor QC process, such as training, screening or certification
32	Identify data requirements needed for success metrics and periodic program evaluation (especially pertinent to tracking performance of new or substantially revised programs)
33	Carefully document the tracking system and provide manuals for all users
34	Build in rigorous quality control screens for data entry
35	Use Internet to facilitate data entry and reporting; develop electronic application processes and, as relevant, web-based communications, to the extent the benefits warrant the costs
36	Link databases to dynamically exchange information
37	Integrate all program data, including measure-level data, into a single database
38	Develop accurate algorithms and assumptions on which to base savings estimates
39	Use Internet to facilitate data entry and reporting
40	Include audit recommendations and savings potential in program tracking database
41	Track vendor activity (number of jobs, measure types, savings)
42	Track incentives committed
43	Collect pre-existing wattage data
44	If use proactive marketing, track prospects early and drive program intervention around major equipment-related events
45	Periodically review and update market-level information about measures, including construction practices, EE market share and measure adoption; conduct periodic baseline studies
46	Conduct detailed ex post, impact evaluations -- including measure verification -- routinely, though not necessarily annually; review and update algorithms for calculating project savings; estimate free ridership and spillover
47	Use regular process evaluation activities to provide timely and fresh data providing feedback supporting program rationale and design
48	Create a culture whereby evaluation findings are valued and integrated into program management
49	Support program review & assessment at the most comprehensive level possible
50	Select an evaluator who has a detailed understanding of the market context in which a program operates
51	Clearly explain evaluation roles and responsibilities to participants in advance

NWE has opportunities to build on its successes by considering additional best practices and adopting those that appear to have value for them and their customers. We emphasize that responding to opportunities requires additional work for NWE and may not be cost-effective. No program administrator is in full conformance with all best practices. NWE should adopt those practices whose benefits seem likely to outweigh their implementation costs.

NWE should consider the following opportunities:

- Formalize the outcome of its planning efforts with written program plans

- Reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
- Systematically update customers about program changes
- Write down process plans (that is, detailed implementation activities, including roles and responsibilities)
- Include in trade ally program communications a means to provide program feedback to NWE; contractors can be a good source of market intelligence and suggestions for program improvement
- Increase the use of internet tools in facilitating program applications
- Provide participants with more information about efficiency opportunities through mail
- Notify participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities – the information NWE currently provides the members of its Lighting Trade Ally Network
- Recruit additional trade allies as preferred contractors from among the contractors serving "self-installed" participants
- Incorporate additional non-energy benefits and marketing messages, such as waste reduction and community benefit
- Consider project inspection costs when setting ongoing inspection rates; NWE may be over-inspecting in some programs
- Adopt a fast-feedback evaluation approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free-ridership information
- Monitor product markets and conduct market saturation studies to assess the extent of market transformation; exit transformed markets
- Conduct more frequent, smaller-scope evaluations

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1. Introduction

1.1. Key Terms

The following are definitions of key terms used throughout this report.

Term	Definition
Choice Customers	In NWE's Montana service territory, legislation was enacted in the late 1990s to allow customers to arrange for electricity and/or natural gas supply in competitive markets. Customers who have moved to competitive supply are Choice Customers. NWE Montana provides its Choice Customers with transmission and distribution services only.
Custom Measures	Measures implemented under NWE efficiency programs that are assigned customized, measure-specific incentives and savings estimates.
Desk Top Review	An analysis of savings that includes engineering review of program documentation but does not involve on-site inspection or metering.
DSM (Demand Side Management)	Describes NWE Montana's entire programmatic efforts for energy efficiency and renewable energy funded through electric and natural gas supply rates as well as with USB funds.
E+ Program Contractors	Entities selected by and contracted with NWE to provide products and services to NWE Montana customers through the E+ Commercial Programs (electric and gas). These contractors are paid based upon the energy savings generated by the E+ Program projects customers undertake.
E+ Programs	DSM programs marketed as Efficiency Plus (E+) Programs includes offerings for all classes of electric and natural gas customers in the NWE Montana service territory.
Firmographic	A term coined to describe for the non-residential sector; a concept analogous to the adjective "demographic" for the residential sector. Firmographic data describes the characteristics of the firms in the population or sample.
Free Rider	Someone who would have installed an energy efficiency measure or followed an energy efficiency recommendation without a financial incentive from NWE but received a financial incentive or rebate anyway.
Free Ridership Estimate	Energy savings likely to have occurred in the program's absence.
Gross Savings	Annual energy savings determined either by NWE or this evaluation. Gross savings do not account for free ridership, leakage or spillover, which are included in estimating net savings.
Implementation Contractors	Entities selected by and contracted with NWE Montana to implement the E+ Programs, including providing products and services to NWE Montana customers.

Term	Definition
Indirect Measures	Non-rebated measures or activities implemented during the program years being evaluated as a result of audits, education and training activities funded by NWE efficiency programs.
Install Date	Date that the implementation of a program measure or project was completed by the customer or project implementer.
Leakage	Movement of rebated or directly installed efficiency measures outside of NWE Montana's service territory.
NEEA (Northwest Energy Efficiency Alliance)	NEEA works in collaboration with its funders and other strategic market partners to accelerate the innovation and adoption of energy-efficient products, services, and practices.
Net Savings	Gross savings adjusted for free ridership, leakage, and spillover.
Net to Gross Ratio	The ratio of net savings to gross savings.
Participant	Customer who receives information, education, training, services, rebates or incentives through the NWE efficiency programs.
Preferred Contractors	Insulation and equipment contractors approved by NWE Montana for higher incentives through the E+ Residential Electric Savings and E+ Residential Gas Rebates programs.
Prescriptive Measures	Measures implemented under NWE efficiency programs that are assigned unitized incentives and unitized (or very simplified) energy savings.
Program	Includes both electric and natural gas energy conservation and renewable programs within the NWE Montana service territory for both residential and non-residential customer segments.
Program Staff	The employees of NWE Montana that design, manage, and implement the E+ and other efficiency programs.
Realization Rate	A decimal fraction that is computed by dividing the evaluation savings estimate by NWE's savings estimate for a sampled measure or project.
Rebate Date	Date that NWE paid the program rebate or incentive to the customer or implementer.
RTF (Regional Technical Forum)	An advisory committee established in 1999 to develop standards to verify and evaluate conservation savings. Its voting members are appointed by the Northwest Power and Conservation Council.
Spillover	Energy savings induced by, but not subsidized by, the program.
Spillover Estimate	An estimate of spillover savings expressed as a proportion of gross savings.
UES (Unit Energy Savings)	The energy savings estimate applied to each unit of a given energy efficiency measure (such as a 13 watt CFL in residential use).
USB (Universal System Benefits)	A funding source established by the Montana legislature for programs that provide benefits to the broad public through such activities as local conservation, market transformation, renewable generation, research and development, and low income activities.

1.2. Portfolio Summary

This report presents the methodology, findings and recommendations based on an impact evaluation of the NWE DSM portfolio. The evaluation covers the operation of 24 energy efficiency and renewable energy programs during the period July 1, 2006 through December 31, 2011.

Following is a brief summary of the programs that comprise the portfolio:

- **E+ Audit Home or Business** – This program has three components; Home Electric Survey, Home On-site Audit, and Small Business Electric Appraisal. The Home Electric Survey is a mail-in survey. The Home On-site Audit and Small Business Electric Appraisal are on-site surveys. The on-site audits may include free installation of hot water efficiency measures. All components include custom reports to customers which recommend efficiency improvements.
- **E+ Building Blocks Pilot** – This former pilot program offered free high-quality investment-grade audits within a concentrated area of downtown Bozeman with the goal of increasing participation in NWE electric rebate, gas rebate, and/or custom incentive programs. Participating customers received a report with recommendations for energy efficiency measures and improvements to operation and maintenance practices.
- **E+ Business Partners** - This custom incentive program serves eligible electric and gas customers in the commercial, industrial, institutional, multifamily, and agricultural sectors. The program includes both retrofit and new construction projects. Any measure that achieves energy savings may be proposed for funding, provided it is not offered through prescriptive rebate programs. Customers may develop projects on their own; however, third party consultants and contractors are involved in the majority of program projects.
- **E+ Irrigation** – This custom incentive program serves eligible customers in the agricultural sector. The program includes both new and existing irrigation equipment. Any irrigation measure achieving energy savings may be proposed for funding, provided it is not offered through the commercial electric rebate programs. Customers may develop projects on their own; however, third parties are involved in the majority of program projects.
- **DEQ Appliance** - The Montana Department of Environmental Quality (DEQ) operated this appliance rebate program with American Recovery and Reinvestment Act (ARRA) funding. NWE provided program support through advertising. Montana residential customers received DEQ rebates for specified Energy Star appliances on a first come, first served basis until the funding was depleted. The program is no longer offered.
- **E+ Commercial Existing Electric Rebate** - This non-residential electric prescriptive rebate program offers incentives to eligible non-residential customers who install prescriptive electric efficiency measures. The program covers all non-residential electric rebate measures with the exception of lighting and motors. General measure areas include heating, ventilation, and air conditioning (HVAC), irrigation, appliances, refrigeration, weatherization, and electric water heating.

- **E+ Commercial Existing Gas Rebate** - This non-residential gas prescriptive rebate program offers incentives to eligible non-residential customers who install prescriptive gas efficiency measures. The program covers measures for high efficiency HVAC, service water heating, and refrigeration heat recovery.
- **E+ Commercial Lighting** – This program has two components; Commercial Lighting Rebate and Commercial compact fluorescent lamp (CFL) Direct Install. The E+ Commercial Lighting component targets NWE's commercial, industrial, and institutional customers. The program provides prescriptive rebates for customers replacing obsolete lighting equipment with more efficient technologies and the installation of lighting controls. The CFL Direct Install component is implemented during the Small Business Electric Appraisal audit.
- **E+ Commercial New Electric Rebate** – This program for new construction is a prescriptive rebate program that offers prescriptive electric measures for commercial new construction projects.
- **E+ Commercial New Gas Rebate** – This program for new construction is a prescriptive rebate program that offers measures for high efficiency HVAC, service water heating, and refrigeration heat recovery to eligible gas customers.
- **E+ Electric Motor/Rewind Rebate** – This program has two components; Premium Efficiency Motor Rebates and Motor Rewind Rebates. The program serves the commercial, industrial, institutional, and agricultural sectors. The Motor Rewind component offers rebates to eligible customers that participated through a rewind shop certified as a Green Motors Practice Member. The Premium Efficiency Motor Rebate component offered rebates to eligible customers that purchased new National Electrical Manufacturers Association (NEMA) Premium efficiency motors. The motor rebate program is no longer offered.
- **E+ Free Weatherization/Fuel Switch** – This program provides weatherization and conversions from electric heat to natural gas heat to qualified low income NWE customer households. The program is a partnership between NWE and Montana's Department of Public Health and Human Services (DPHHS).
- **E+ New Homes** – This legacy rebate program offered prescriptive incentives to new homeowners for efficiency improvements to new residences through 2008. From 2009 through the end of 2011, the program provided training, verification, marketing, and advertising.
- **E+ Residential Existing Electric Rebate** – This residential electric prescriptive rebate program offers incentives to eligible residential customers who install prescriptive electric efficiency measures. Measure eligibility varies depending on whether the home uses electricity for space and/or service water heating.
- **E+ Residential Existing Gas Rebate** – This program has two components; Residential Existing Gas Rebate and Residential Existing Gas Free Kits. All NWE residential gas supply customers are eligible to participate in the program. The Residential Existing Gas Rebate component offers prescriptive rebates measures such as insulation, high-efficiency gas space-heating and water-heating equipment. The Residential Existing Gas Free Kits offers

free weatherization kits through distribution events or at the time of a home energy audit. There are four types of kits; weatherization, hot water, windows and programmable thermostats.

- **E+ Residential Lighting** – This program has six components which involve the distribution of energy efficient CFLs to residential customers. The components include;
  - in-store coupons redeemed by customers at local retailers
  - trade show give-aways
  - mail-in rebates mailed to customers after submittal of an application and product documentation
  - mail-out CFL bulbs sent to Home Electric Survey participants along with their audit report
  - direct install bulbs installed by NWE during the Home On-site Audit
  - upstream buy-down bulbs distributed through local retailers
- **E+ Residential New Electric Rebate** - This prescriptive rebate program offers rebates on a whole-house basis for manufactured homes meeting the Northwest (NW) Energy Star certification standard and for specific electric measures within the newly constructed electrically heated site-built homes.
- **E+ Residential New Gas Rebate** - This prescriptive rebate program offers rebates on a whole-house basis for manufactured homes meeting the Northwest Energy Star certification standard and for specific gas measures within newly constructed natural gas heated site-built homes.
- **Low Income Appliance** – This pilot program was operated in partnership with Energy Share of Montana, a private non-profit agency, to provide free Energy Star refrigerators to qualified low income NWE customers who met certain eligibility criteria. The program is no longer offered.
- **Vending Miser** – This program involves the installation of energy efficient Vending Misers (VMs) in schools and local government facilities participating in other NWE programs. VMs are also installed in NWE facilities.
- **E+ Renewable** – This program offers incentives for qualifying renewable energy installations in residential and non-residential facilities. Prescriptive rebates are offered through qualifying installers primarily for residential solar photovoltaic (PV) and wind power projects. Custom incentives are considered through individual project proposal submittals. Funding decisions are made by NWE with input from the NWE USB Advisory Committee's renewable subcommittee. The majority of program projects are 1 to 3 kW PV systems on residential structures, followed by wind turbines, and a small number of other renewable projects such as solar thermal systems, low-head hydro, biomass, and larger PV arrays.
- **Building Operator Certification** – This is a NWE sponsored professional development program for managers and operating engineers of commercial and public facilities. NWE

contracts with the International Building Operator Association to conduct the training. The program is designed to teach best practices for optimizing energy and resource efficiency in the operation and maintenance of buildings. The program is open to commercial customers and trade allies. NWE provides scholarships to qualifying customers from public schools, local governments, and hospitals.

- **Motor Management Training** - This is a professional development program designed for those involved in electric motor system operation, maintenance, purchasing, or repair. The one day training program is presented in various locations around the state each year by the Green Motors Practices Group. Topics include motor operating costs, motor systems improvements, motor operating characteristics, rewinds and repair specifications, and legislation pertinent to the field. Motor management training is targeted to electricians and commercial facilities and open to NWE electric facilities and the trade allies who support them.
- **NEEA Initiatives** – NWE is a funding utility of the Northwest Energy Efficiency Alliance (NEEA). NEEA's portfolio is funded by electric utilities in the Northwest, BPA, and the Energy Trust of Oregon through multi-year contracts. A handful of other NEEA market transformation initiatives are separately funded by a subset of funders. This evaluation assessed the impacts of 18 NEEA initiatives for which NWE reported savings across the 2006-2011 program years. NEEA is counted as one of the 24 NWE programs in this evaluation.

1.3. Research Objectives

The research objectives for the impact portion of the evaluation are as follows:

- Estimate gas and electric gross savings, by program, for tracker years 2006-07 thru 2010-11 and calendar years 2007-2011.
- Estimate net savings, accounting for free ridership, spillover and leakage.
- Collect data on measure persistence to inform the estimation of measure life.
- Determine the impact of estimating savings for each program or calendar year based on measure installation date rather than measure rebate date.

We used the following information to address these objectives:

- NWE's project files (documentation of measure installation and inspection).
- Program tracking databases maintained by program staff and implementation contractors.
- On-site inspections of measure installation and operation, including in some cases collection of trend logs from special metering of customer control systems.
- NWE unit energy savings estimates and associated documentation.
- NWE Testimony and Exhibits related to USB or DSM in all relevant electric/natural gas dockets.

- Applicable impact evaluation studies conducted by NEEA and others.
- Telephone surveys with program participants and trade allies.
- NWE DSM potential assessments and end use surveys.

The research objective for the economic analysis portion of this evaluation is:

- Estimate benefits, costs and cost-effectiveness of each Program by calendar and program year.

We used the following to address this objective:

- NWE life cycle costing inputs, including program costs, avoided energy costs, discount rates, inflation rates and other economic parameters.
- Results from the impact evaluation.

The research objectives for the process portion of the evaluation are discussed in section 2.3.1

1.4. Organization of the Report

The following section of this report describes our methodology for the impact and process evaluation. This is followed by 24 sections, each devoted to a specific program. Within each program-specific section, there is further discussion of our methods, as they related to each program. In addition, each program-specific section contains impact, cost-effectiveness and process evaluation results, along with recommendations that are based on those results.

The program-specific sections are followed by three sections devoted to special evaluation topics (Residential CFL Operating Hours Study, Savings Persistence, and Installation vs. Rebate Date). These special topics are followed by sections that summarize impact, cost-effectiveness and process results for the entire portfolio. The final section of the main body of the report is devoted to portfolio-level recommendations. Following the main body of the report are a series of technical appendices that provide further detail about our research methods.

All impact and cost-effectiveness results presented in the main body of the report are on a calendar-year basis. However, parallel results for tracker years are also provided in an accompanying Excel workbook.

2. METHODOLOGY

2.1. Sample Design

In this evaluation, we collected data from samples of program staff (both NWE employees and their implementation contractors in this reference), program participants, nonparticipants, and trade allies (firms that participate in the delivery of efficiency measures, e.g., retail chains that sell CFLs). Table 3 shows the completed sample sizes. The samples of participants were drawn from a standardized database we developed from NWE program tracking records. All program-tracking records associated with each NWE account were grouped by type of measure to form the participant-sampling unit. We drew the file review samples from the first three years of program activity. The site visit samples were selected to represent program activity in 2010 and 2011, as were the lighting logger, free ridership and spillover samples.

Table 3: Portfolio Evalution Samples

		Completed Samples					
Type	Program	File-Review Only	Site Visit	Light Logger	Free Ridership	Spillover	Other Survey
Participant Samples							
	Building Operator Certification	-	-		-	-	
	DEQ Appliance	-	-		-	-	
	E+ Audit Home or Business	266	144		70	129	
	E+ Building Blocks Pilot	10	8		-	8	
	E+ Business Partners	32	12		7	8	
	E+ Commercial Existing Electric Rebate	17	16		10	11	
	E+ Commercial Existing Gas Rebate	39	22		38	18	
	E+ Commercial Lighting	98	61		83	50	
	E+ Commercial New Electric Rebate	5	5		3	1	
	E+ Commercial New Gas Rebate	15	10		-	7	
	E+ Electric Motor/Rewind Rebate	16	6		4	4	
	E+ Free Weatherization/Fuel Switch	86	-		-	-	
	E+ Irrigation	31	13		3	-	
	E+ New Homes	32	20		23	19	
	E+ Renewable	57	29		52	30	
	E+ Residential Existing Electric Rebate	43	27		28	13	
	E+ Residential Existing Gas Rebate	74	94		162	86	
	E+ Residential Lighting	285	129	220	403	92	
	E+ Residential New Electric Rebate	5	4		1	4	

		Completed Samples					
Type	Program	File-Review Only	Site Visit	Light Logger	Free Ridership	Spillover	Other Survey
	E+ Residential New Gas Rebate	55	31		29	22	
	Low Income Appliance	-	-		-	-	
	Motor Management Training	-	-		-	-	
	NEEA Initiatives	-	-		-	-	
	Vending Miser	15	7		6	6	
	All Participant Samples	1,181	638	220	922	508	
Non-Participant Samples							
	Existing Residential						67
	Existing Non-residential						
	Irrigation						30
	Other Small						67
	Other Large						67
	All Non-Participant Samples						231
Trade Ally Samples							
	Residential Insulation/Audit						28
	Residential Heating & Cooling and Other						30
	CFL Coupon Retailers						40
	CFL Buy-down Retailers						18
	Commercial Lighting						42
	Commercial Motors (including 4 Motor Rewind)						33
	Commercial Heating & Cooling and Other						20
	Irrigation						10
	Renewable Energy Systems						7
	All Trade Ally Samples						228
Program Staff Interviews							
	Corporate DSM Staff						8
	Other NWE Staff (e.g., Communications, Division Offices)						7
	Implementation Contractors Staff						15
	Low Income Free Weatherization Contacts (at state and local level)						5
	All Program Staff Interviews						35

The impact evaluation samples were designed to represent each of the NWE programs. Some of these programs are made up of multiple components. Table 4 lists the programs and their components. The table also shows how these components were assigned to evaluation studies.

For example, the E+ Residential Lighting program has six components each involving a different method for delivering lighting measures, e.g., Upstream Buy-Down. These six components were addressed in this evaluation by three studies.

In most cases, we used stratified sample designs. We stratified in order to achieve greater sampling precision within the fixed resources of this evaluation. In most cases, if stratification was used, it was based on NWE's reported savings for each of the participants. If the study covered participants with both gas and electric savings we converted these savings to the common energy unit of a million british thermal unit (MMBTU) and then used that common unit for stratification. In one case, instead of stratification by reported savings we stratified on the fuel type (gas or electric). Table 4 shows the stratification used for each study.

Table 4: Portfolio Evaluation Studies and Sample Stratification

Program	Study	Program Component	Sample Stratification
Building Operator Certification	Building Operator Certification	Building Operator Certification	No Sample
DEQ Appliance	DEQ Appliance	DEQ Appliance	No Sample
E+ Audit Home or Business	Home Electric Survey	Home Electric Survey	Reported Savings
	Home On-site Audit	Home On-site Audit	Fuel Type
	Small Business Electric Appraisal	Small Business Electric Appraisal	Reported Savings
E+ Building Blocks Pilot	E+ Building Blocks Pilot	E+ Building Blocks Pilot	Reported Savings
E+ Business Partners	E+ Business Partners	E+ Business Partners	Reported Savings
E+ Commercial Existing Electric Rebate	E+ Commercial Existing Electric Rebate	E+ Commercial Existing Electric Rebate	Reported Savings
E+ Commercial Existing Gas Rebate	E+ Commercial Existing Gas Rebate	E+ Commercial Existing Gas Rebate	Reported Savings
E+ Commercial Lighting	Commercial CFL Direct Install	Commercial CFL Direct Install	Reported Savings
	Commercial Lighting Rebate	Commercial Lighting Rebate	Reported Savings
E+ Commercial New Electric Rebate	E+ Commercial New Electric Rebate	E+ Commercial New Electric Rebate	Reported Savings
E+ Commercial New Gas Rebate	E+ Commercial New Gas Rebate	E+ Commercial New Gas Rebate	Reported Savings
E+ Electric Motor/Rewind Rebate	E+ Electric Motor/Rewind Rebate	E+ Electric Motor/Rewind Rebate	Reported Savings
E+ Free Weatherization/Fuel Switch	E+ Free Weatherization/Fuel Switch	E+ Free Weatherization/Fuel Switch	Reported Savings
E+ Irrigation	E+ Irrigation	E+ Irrigation	Reported Savings
E+ New Homes	E+ New Homes	E+ New Homes	Reported Savings
E+ Renewable	Business Renewable	Business Renewable	Reported Savings
	Residential Renewable	Residential Renewable	Reported Savings
E+ Residential Existing Electric Rebate	E+ Residential Existing Electric Rebate	E+ Residential Existing Electric Rebate	Reported Savings
E+ Residential Existing Gas Rebate	Residential Existing Gas Free Kits	Residential Existing Gas Free Kits	Reported Savings
E+ Residential Existing Gas Rebate	Residential Existing Gas Rebate	Residential Existing Gas Rebate	Reported Savings
E+ Residential Lighting	Residential CFL Owner Install	In-Store Coupon	Reported Savings

Program	Study	Program Component	Sample Stratification
		Trade Show	Reported Savings
		Mail-In	Reported Savings
		Mail-Out	Reported Savings
	Residential CFL Direct Install	Residential CFL Direct Install	Reported Savings
	Upstream CFL Buy-down	Upstream CFL Buy-down	No Sample
E+ Residential New Electric Rebate	E+ Residential New Electric Rebate	E+ Residential New Electric Rebate	Reported Savings
E+ Residential New Gas Rebate	E+ Residential New Gas Rebate	E+ Residential New Gas Rebate	Reported Savings
Low Income Appliance	Low Income Appliance	Low Income Appliance	No Sample
NEEA Initiatives	NEEA Initiatives	80 Plus Power Supply	No Sample
		Commercial Commissioning Public Buildings	No Sample
		Commercial Verdiem	No Sample
		Energy Codes 1997-2004	No Sample
		Energy Codes 1997-2011	No Sample
		Irrigation Soil Moisture Data Logger	No Sample
		Residential Ductless Heat Pump	No Sample
		Residential Energy Star CFL Bulbs	No Sample
		Residential Energy Star CFL Fixtures	No Sample
		Residential Energy Star Clothes Washers	No Sample
		Residential Energy Star Dishwashers	No Sample
		Residential Energy Star New Construction	No Sample
		Residential Energy Star Refrigerators	No Sample
		Residential Energy Star Specialty CFL Bulbs	No Sample
		Residential Energy Star TVs	No Sample
		Residential Energy Star Windows	No Sample
		Residential Multi-Family Codes > 2004	No Sample
		Residential Single-Family Codes > 2004	No Sample

Program	Study	Program Component	Sample Stratification
Vending Miser	Vending Miser	Vending Miser	Reported Savings

2.2. Impact Evaluation

We performed an impact evaluation on 24 programs in the NWE portfolio. For each program listed, we assessed gross and net energy in kilowatt hours (kWh) and dekatherms (dkt) and demand or kilowatt (kW) savings associated with participants that were paid during the 2010–2011 program years. The methods used to assess gross and net savings varied with the program being evaluated. Whenever possible, we based the gross program savings assessment on file reviews and site inspections for a representative sample of cases estimated to achieve 90/10 precision for each of the two program years. We performed a more limited savings assessment for some programs that was based on the review of previous evaluations, other available literature and the methods used by NWE to apply this previous work to the program estimates in their portfolio. We extrapolated the results from the sampled cases to the program level for all five program years that are included in this evaluation.

The evaluation of net savings included the assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. We also performed an economic analysis for each program that assessed its cost-effectiveness. Below is an overview of the methods that we used to assess gross and net energy (kWh and dkt) and demand (kW) savings and perform the economic analysis.

2.2.1. Site-Specific Impacts

This section describes the methods we used to assess gross and net energy (kWh and dkt) and demand (kW) savings for the programs we evaluated.

2.2.1.1. Gross Energy and Demand Savings

For most programs, we estimated annual gross savings based on the results of site inspections, customer interviews and subsequent engineering analysis. This included energy (dkt) savings for gas measures and energy (kWh) and average demand (kW) savings for electric measures. We computed average demand savings by dividing the evaluation kWh values by 8,760, the number of hours in a year. For some programs, we based the savings estimates on a critical review of prior evaluation work. Throughout, we applied results from the review of the program calculation methods (custom, simplified or UES) where appropriate.

The following sections provide an overview of the methods that we used for each type of program in the NWE portfolio. The procedures are described in more detail in the individual sections devoted to each program.

Review of Project Files

The first step in the impact evaluation procedure for most programs was to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. We made this comparison for all programs for which NWE claimed savings and provided access to samples of project files. We completed file reviews for entire samples drawn to represent 2007–2009 participation. We also completed file reviews for the site visit sample of 2010–2011 participants.

The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed wattages) to identify data entry errors. We made corrections to the errors that were found and we recalculated energy savings (kWh or dkt). We recorded reasons for differences between the evaluation savings and the program tracking savings.

Review of Program Savings Estimates

We performed a thorough review of the methods used by NWE to estimate program savings for each program where savings were claimed. Our review encompassed prescriptive measures with UES based savings; simplified measures (such as lighting and motors) that utilized simplified engineering techniques; and custom measures (such as Business Partners), that utilized more complex, customized engineering methods. NWE, NEEA and other organizations provided program materials and project files relevant to the methods used for all three measure types. We reviewed these materials for all sampled measures that were included in our impact analysis.

Our review of UES measures included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area. This documentation included:

- The Nexant potential assessment of 2010 and the KEMA potential assessments of 2003 and 2008
- The Nexant NWE evaluation of 2007
- Northwest Power and Conservation Council Regional Technical Forum (RTF) measure workbooks
- Energy Star calculators and supporting documents
- California Energy Commission Database for Energy Efficient Resources (DEER)
- Technical Reference Manuals for the states of New York, Massachusetts, Vermont, Ohio, Minnesota, Wisconsin, Maine, New Jersey, Connecticut and Pennsylvania.
- Department of Energy Technical Support Documents

We compared and contrasted unit energy savings values (kWh or dkt) that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment about the best available information, we determined the most appropriate unit savings values. In cases where we determined that changes to the UES values used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

For simplified and custom measures, we reviewed for reasonableness the application and rigor of the engineering algorithms used by NWE to estimate savings for the sampled measures. In cases where these engineering methods were found not to be reasonable, we developed a more appropriate and defensible approach that improved the rigor and accuracy of the savings estimates. For custom measures, we considered interactive effects between end uses within a measure and across measures, when appropriate to do so.

Estimation of Evaluation Savings for UES Measures

NWE provided project files for all sampled UES measures where project files were available. We reviewed the files to gain a thorough understanding of the measures that were installed. We completed site visits for the 2010–2011 sampled sites to verify the measures installed under the program. During the site visits we confirmed that the program measures were installed, were operational and produced energy savings. We collected data as necessary to support a re-estimation of energy (kWh and dkt) savings, using the unit energy savings method that resulted from the UES review, discussed above. In most cases our site data collection included a verification of the installed counts for each UES measure. It also included the collection of data necessary to support an estimate of the inputs to the UES method. We calculated evaluation energy savings (kWh or dkt) by applying the final UES method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

Estimation of Evaluation Savings for Audit Measures

We estimated both direct and indirect energy (kWh or dkt) and demand (kW) savings for NWE's residential and commercial audit programs. Direct savings were those associated with the measures installed by NWE during the audit. Indirect savings were associated with customer actions and/or measures implemented by the customer based on audit recommendations but for which the customer did not receive an incentive through any other NWE program, regardless of whether or not an incentive was available. We used the telephone survey of 2010–2011 participants and customer interviews during site visit recruitment to determine which of the audit participants received direct installation measures (water-related energy saving measures) or implemented audit recommendations without incentives. We conducted site visits and/or follow-up telephone interviews for those homes or businesses to gather the data needed to estimate savings.

We used the UES methods discussed above to estimate savings for prescriptive measures (direct and indirect). For other measures we used standard engineering methods to estimate energy (kWh or dkt) and demand (kW) savings. We then summed savings for each sample participant.

Estimation of Evaluation Savings for Simplified and Custom Measures

NWE provided project files for all sampled simplified and custom measures where project files were available. We reviewed the files to gain a thorough understanding of the measures that were installed. We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and produced energy savings. We collected data as necessary to support a re-estimation of energy (kWh and dkt) savings. For some sampled cases our data collection included one-time and/or short terms measurements of parameters relevant to the energy performance of the installed measures. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the as-built conditions observed during the site visit. For measures where the NWE method was not determined to be adequate, we recalculated energy (kWh or dkt) and demand (kW) savings using the more reliable techniques. To the extent possible, we documented reasons for differences between the evaluated and program savings

Estimation of Evaluation Savings for Residential CFLs

In general we estimated energy and demand savings for residential CFLs using the methods described above for simplified measures. However, because of the importance of residential CFLs to the NWE claim, we made a special effort to estimate the annual hours of operation based on detailed submetering of a representative sample of CFL lamps in participant homes. We installed light loggers in 76 homes throughout the NWE service area to directly measure CFL on-time for a period of up to 3 months. More detailed information on the estimation of residential CFL annual operating hours for the full evaluation period is provided in section 27, which is devoted entirely to this important aspect of the evaluation.

Estimation of Savings for Training Programs

We evaluated two NWE training programs; Building Operator Certification and Motor Management Training. We estimated annual energy (kWh or dkt) and demand (kW) savings for the Building Operator Certification program and attempted to do so for the Motor Management Training program. For both programs NWE provided tracking data that contained a list of training attendees and relevant information gathered from the registrants (e.g., floor area of the buildings operated) for each program year. We searched for and reviewed prior evaluations of these programs performed by NEEA and others. To the extent possible, we derived energy (kWh and dkt) and demand (kW) savings from this information and applied it to the registration data to estimate program savings.

Estimation of Savings for NEEA Initiatives

We reviewed the methodology used by NWE to develop their savings claims for the 18 NEEA Initiatives during the five year evaluation period. The review included a review of spreadsheet summaries provided by NWE that documented the methodology used to calculate the reported energy savings (kWh, kW and dkt) by measure for each program year

We also conducted detailed reviews of the NEEA sponsored evaluations that were performed during program cycles covered by the evaluation and relevant to savings claimed by NWE. We critiqued the methods used and results obtained by these evaluations and extracted important information relevant to the application of these results to NWE savings.

Based on the information gathered during the review of the NEEA programs and NWE methods, we calculated realization rates for measures and for each program year. We calculated an average realization rate for the initiatives and applied to NWE-reported energy savings to determine an adjusted energy (kWh or dkt) and demand (kW) savings.

Estimation of Savings for the CFL Buy-Down

We estimated the energy (kWh) and demand (kW) savings for this component of the E+ Residential Lighting[1] program by drawing on the results from three other elements of the evaluation work.

- **Proportion Non-residential**. A critical factor in this evaluation was the fraction of CFL Upstream Buy-Down bulbs that were purchased and installed by non-residential customers. The number of operating hours for such bulbs is typically much greater than observed for residential customers, thus the savings for buy-down program is very sensitive to the assumed split between residential and non-residential applications of the bulbs. It was not possible to directly determine the disposition of each buy-down bulb. Therefore, we obtained information on the sector split was obtained from the telephone survey of trade allies (CFL Buy-Down Retailers). We analyzed responses to support an estimate of the proportion of bulbs that went to non-residential applications.
- **Installation Rate**. We conducted site visits for samples of residential and non-residential CFL installations. During these site visits, we compared the number of bulbs purchased to those verified to have been installed or in storage. Since CFLs have a low effective useful life of six years and the site inspections occurred up to 2 years after initial installation, verification was based upon confirmation that the measure was installed by the program. We analyzed these data to yield the installation rate for both residential and non-residential applications.
- **Hours of Operation**. The metering subsample of residential CFL installations (see section 27) provided the data needed to estimate average residential hours of operation. The site visit data collection for non-residential direct install CFLs provided the average non-residential hours of operation.

We combined the data above with program tracking data on bulb counts by bulb Wattage to compute energy (kWh) and demand (kW) savings for this program.

Estimation of Savings for Other Programs

We performed a desk top review (i.e., no site visits) for a sample of the Low Income Appliance, and E+ Free Weatherization/Fuel Switch programs. We reviewed available and relevant prior evaluations for similar low-income programs, including evaluations currently available through the Montana Department of Public Health and Human Services (DPHHS), to derive unit energy (kWh or dkt) and demand (kW) savings that are appropriate to these participant populations and consistent with NWE customer characteristics. We applied these unit energy savings to the measures investigated in the desktop review to derive program savings.

Individual project files were not available for the DEQ Appliance program. NWE provided a detailed workbook that listed each appliance installed and provided the expected unit energy savings. We verified the counts of implemented measures, to the extent possible. We reviewed the unit energy savings for measures implemented in this program as part of the UES review

[1] The entire CFL Buy-Down component was funded under this residential program even though it provides savings from both residential and non-residential applications of the bulbs.

discussed above. We applied the final UES values, as appropriate, to estimate energy (kWh or dkt) and demand (kW) savings from this program.

2.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. The self-report method asked participants a series of carefully constructed survey questions to learn what participants thought they would have done in the absence of the program and their views of how the program influenced them. We used responses to the survey questions to construct a free ridership rate for each participant/site in the evaluation sample. Among E+ Audit Home or Business participants, we calculated free ridership only for participants who received directly installed measures during the audit.

We calculated attribution (the extent to which the program can be attributed with inducing the efficiency action, the converse of which is free ridership) using sets of questions appropriate to program type. We explored two components of attribution: 1) intention to carry out the energy-efficient project without program funds or support; and 2) influence of the program in the decision to participant and carry out energy-efficient upgrades.

We assessed intention by asking how the project likely would have differed if the respondent had not received the program incentive or program provided measures. For rebate programs, for example, we specifically asked how the project would have changed in the absence of the incentive. That is, from *no change* (would have done the project exactly as it was done), to *use of or purchase of less efficient equipment*, to *cancelling altogether or postponing the project for at least one year*.

For programs with incentives, we assessed program influence by asking the respondent how much influence – from “1” (no role at all) to “5” (major role) – elements of the program had on the decision to do the project the way it was done. The program elements we explored included, as applicable, the program incentive, NWE’s website or other information, the energy assessment, and the respondent’s interaction with a contractor or NWE program representative.

For programs with incentives, the free rider (FR) rate is given by the following equation. (Note that questions yield attribution scores, the converse of which is free ridership; thus, the equation begins with “1 minus” the measured values. Low attribution corresponds with high free ridership.)

FR rate = 1 – [(stated intention score, 0 to 0.5) + (program influence score, 0 to 0.5)]

For programs providing free energy-efficient measures, such as weatherization kits or direct-install items, it would not make sense to the participant to be asked the extent to which the program influenced them to have the efficiency measures; we assumed program influence plays a “major role” – a score of “5” on the influence scale. For these programs, we based free ridership solely on the assessment of intention, that is, the installation of specific items in the absence of the program offer.

FR rate = 1 – [(stated intention score 0 to 0.5)]

2.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs.

2.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

2.2.2. Estimation of Program-Level Impacts

To estimate program-level impacts, we estimated the following parameters:

- Savings realization rate
- Free ridership rate
- Spillover rate
- Leakage rate

For each program, we combined these parameters to produce the estimated net adjusted energy and demand savings (Equation 1).

$$NAED = SRR \times RPT \times ((1 - FR) \times SR) \times LR \quad (1)$$

where:

NAED = Net adjusted energy and demand savings

SRR = Savings realization rate

RPT = Reported gross energy and demand savings

FR = Free ridership rate

SR = Spillover rate

LR = Leakage rate

Note that $SRR \times ((1-FR) \times SR \times LR)$ is referred to as the *net savings adjustment rate*.

This section discusses the estimation of each of these parameters beginning with the savings realization rate, followed by the free ridership rate, the spillover rate, the leakage rate, and the reported net energy and demand savings. This section concludes with a discussion of three programs (the E+ Building Blocks Pilot Program, the E+ Residential Existing Gas Rebate Program, and the E+ Residential Lighting Program) that required different methods to estimate gross savings.

2.2.2.1. Savings Realization Rate

The savings realization rate is the product of the file-review realization rate and the site-visit realization rate. However, there are two complicating factors in the calculation of the savings realization rate that must first be discussed before presenting the details of its calculation. To help in describing these two factors, the period 2007–2009 is referred to as the file-review-only study period and the period 2010–2011 is referred to as the site-visit study period. The first complicating factor was that the file reviews and on-sites used the same baseline for calculating savings. This meant that the site-visit realization rates incorporated the adjustment already made in the file-review realization rates. The second complicating factor is that while file reviews were done for samples across the full evaluation period 2007–2011, site visits were only conducted for 2010–2011. This meant that a savings realization rate had to be imputed for the file-review-only study period. The first problem was addressed by recalculating the savings realization rate for the site-visit study period as the ratio of the site-visit energy savings to the file review energy savings. The second problem was addressed by multiplying the file-review realization for the file-review-only study period by the adjusted savings realization rate for the site-visit study period to produce a savings realization rate for the file-review-only study period. Both of these factors also complicated the calculation of the standard error for the savings realization rate which is also discussed in more detail below. Once these problems were addressed, for a given program, for each period, there was a savings realization rate. An overall savings realization rate was then calculated across both periods and inserted into Equation 1. The details of the calculation for the savings realization rate are presented next.

To estimate the savings realization rate, the ratio estimator approach (Cochran 1977) (TecMarket 2004) was used, which, based on samples, involved the estimation of realization rates (evaluated savings divided by reported savings). These ratios were then used to adjust the reported savings for the entire program. For most programs, stratified random sample designs were used, while in others simple random samples were used or a census was attempted for very small programs.

Equation 2 illustrates in general how the ratio approach was used to adjust the reported savings for a given program assuming that the sample design is a stratified random sample.

$$\hat{Y}_R = \frac{\bar{y}}{\bar{x}} X \qquad (2)$$

where:

$\hat{Y}_R$ = Ratio estimate of total kWh, kW or dkt impacts in the population of program sites

X = Total kWh, kW, or dkt savings reported by the program for all measures

$\bar{x}$ = Sample-based reported mean kWh, kW or dkt impacts

$\bar{y}$ = Sample-based evaluated mean kWh, kW, or dkt impacts

From Equation 2, we can see that the total reported kWh, kW, or dkt impacts for a program are adjusted using the ratio of the evaluated mean kWh, kW, or dkt impacts for the sampled sites to the mean kWh, kW, or dkt impacts reported by the program for the same sample. This ratio is referred to as the program gross savings realization rate.

The savings realization rate itself is composed of the product of two ratios or realization rates, the file review realization rate and the site-visit realization rate. Equation 3 illustrates that the product of these two components yields the savings realization rate, *b*.

$$b = \frac{\bar{y}}{\bar{x}} = \frac{\bar{y}_q}{\bar{x}_q} \times \frac{\bar{y}_a}{\bar{x}_a} \qquad (3)$$

where:

$b \text{ or } \frac{\bar{y}}{\bar{x}}$ =the savings realization rate for a given program

$\frac{\bar{y}_q}{\bar{x}_q}$ = The file-review realization rate: Sample mean evaluated kWh, kW or dkt impacts based on file review divided the sample mean kWh, kW or dkt impacts reported by the program

$\frac{\bar{y}_a}{\bar{x}_a}$ = The site-visit realization rate: Sample mean evaluated kWh, kW or dkt impacts based on site visits divided the sample mean kWh, kW or dkt impacts reported by the program

For each program, the file-review realization rates and site-visit realization rates were based either on stratified random samples of program records or on simple random samples of program records. Equation 1 is the same whether one is using a simple random sample or a stratified random sample. The main difference is in how the file-review and site-visit realization rates and their respective standard errors are calculated. The calculation of the savings realization rate and its standard error for stratified random samples are presented first followed by the method used for simple random samples (Cochran 1977).

Stratified Random Samples

First, for a given program, the means in the file-review ratio, $\frac{\overline{y}_q}{\overline{x}_q}$, were calculated based on stratified random samples. The calculations involved the following steps. Using Equation 4, the sample-based file-review realization rate was calculated.

$$q = \frac{\sum_{i=1}^{n} w_i y_i}{\sum_{i=1}^{n} w_i x_i} \tag{4}$$

where:

q = the file-review realization rate

w_i = case weight for measure i in stratum h (N_h/n_h)

y_i = sample evaluated savings using file review for measure i

x_i = sample savings reported for measure *i*

Note that, within each stratum, q is calculated as the sum of the file-review-adjusted savings divided by the program reported savings. It is this weighted realization rate to which case weights are then applied.

Next, using Equation 5, calculate the standard error of file-review realization rate, q, including the finite population correction factor (Taylor 1997) (TecMarket 2004).

$$\delta(q) = \frac{\sqrt{\sum_{i}^{n} w_i (w_i - 1) e_i^2}}{\sum_{i=1}^{n} w_i x_i} \sqrt{1 - \frac{n}{N}} \tag{5}$$

where:

e = the ex post value minus q times the reported value

The site-visit realization rate, a, which is based on a sample of site-visit study period participants, is computed using the same methods used for the file-review realization rate. However, there are several important differences. First, y is the evaluated savings for measures based on site visits and x is the savings for measures reported by the program. Within each stratum, a is calculated as the sum of the site-review-adjusted savings divided by the program reported savings. It is this weighted realization rate to which case weights are then applied. However, the original savings realization rate once calculated was then adjusted to account for the fact that both the file-review and site-visit realization rates used the same baseline resulting in an underestimate of the savings realization rate. The adjusted savings realization rate was calculated by dividing the site-visit savings for the site-visit study period by the file-review savings for the site-visit study period. This revised savings realization rate for the site-visit study period was then multiplied by the file-review realization rate for the file-review-only study period to produce a savings realization rate for the file-review-only study period.

This, of course, complicates the calculation of the standard error for the savings realization rate for the site-visit study period and the file-review-only study period. These calculations are illustrated using the variable names used in the discussion of the stratified random sample above. However, the calculations also apply to the case of simple random samples discussed later. We begin with the calculation of the standard error of the adjusted savings realization rate for the site-visit study period in Equation 6.

$$\delta z = \left(\sqrt{\left(\frac{\delta q}{|q|}\right)^2 + \left(\frac{\delta a}{|a|}\right)^2} \right) \times z \qquad \textbf{(6)}$$

where:

δz	=	standard error of the adjusted savings realization rate for the site-visit study period
δq	=	standard error of file-review realization rate for the site-visit study period
δa	=	standard error of the site-review realization rate for the site-visit study period
q	=	file-review realization rate for the site-visit study period
a	=	site-visit realization rate for the site-visit study period
z	=	the adjusted savings realization rate for the site-visit study period

In addition, because there was no estimate of the savings realization rate for the file-review-only study period (because there was no site-visit realization rate), this adjusted savings realization rate was also used to develop the savings realization rate for the file-review-only study period by multiplying it by the file-review realization rate for the file-review-only study period. This means that the standard error of the savings realization rate for the file-review-only study period is calculated using Equation 7.

$$\delta b' = \left(\sqrt{\left(\frac{\delta q}{|q|}\right)^2 + \left(\frac{\delta z}{|z|}\right)^2} \right) \times b' \qquad \textbf{(7)}$$

where:

$\delta b'$	=	standard error of the savings realization rate for the file-review-only study period
b'	=	the savings realization rate for the file-review-only study period
δq	=	standard error of file-review realization rate for the file-review-only study period
q	=	file-review realization rate for the file-review-only study period
δz	=	standard error of the adjusted savings realization rate for the site-visit study period
z	=	adjusted savings realization rate for the site-visit study period

The overall savings realization rate, $b_{overall}$, was calculated as the savings-weighted average of the savings realization rate across the file-review-only study period and the site-visit study period. Equation 8 was used to estimate the standard error of the savings realization rate across both the file-review-only and site-visit study periods.

$$\delta b_{overall} = \sqrt{\delta b'^{2}_{fro} + \delta z^{2}_{sv}} \times b_{overall} \quad \textbf{(8)}$$

where:

$\delta b_{overall}$ = Standard error of the overall savings realization rate across both the file-review-only study period and the site-visit study period

$b_{overall}$ = Overall savings realization rate across both the file-review-only study period and site-visit study periods

$\delta b'_{fro}$ = Standard error for the savings realization rate for the file-review-only study period

δz_{sv} = Standard error for the savings realization rate for the site-visit study period

Next, the 90% confidence interval around the gross savings realization rate, *b*, is calculated in Equation 9 by multiplying the appropriate t-statistic (1.645) by the standard error of the gross savings realization rate, δb.

$$CI = b \pm (1.645 \times \delta \mathrm{b}_{\mathrm{overall}}) \quad \textbf{(9)}$$

The 90% relative precision (rp) of the gross savings realization rate is calculated using Equation 10.

$$rp = 1.645 \frac{CI}{b_{overall}} \quad \textbf{(10)}$$

Simple Random Samples

The file-review realization rate based on a simple random sample is described first followed by a description of the site-visit realization rate based on a simple random sample. Recall that the file review determines whether the detailed documentation (referred to as project files) is consistent with program tracking records, i.e., correcting for data entry errors. This comparison was carried out for all programs for which NWE maintains or can provide access to samples of project files. File reviews were completed for samples drawn to represent participation in both the file-review-only study period and the site-visit study period. Note that site-visit realization rates were calculated only for those participants in the site-visit study period.

First, the means in the file-review ratio, $\hat{R}_q$, i.e., $\frac{\overline{\mathrm{y}}_{\mathrm{q}}}{\overline{\mathrm{x}}_{\mathrm{q}}}$, were calculated based on simple random samples. Note that $\hat{R}_q$ is calculated as the sum of the file-review-adjusted savings divided by the program reported savings, i.e., it is a weighted realization rate.

The 90% confidence interval for the ratio was then calculated. First, the variance of the ratio was estimated using Equation 11.

$$v(\hat{R}_q) = \frac{(1-f)}{n\bar{x}^2}(s_y^2 + \hat{R}^2 s_x^2 - 2\hat{R}s_{yx}) \quad \textbf{(11)}$$

where:

$v(\hat{R}_q)$ = Variance of the file-review ratio

f = Sampling fraction

n = Size of sample

$\bar{y}$ = Sample-based evaluated mean kWh, kW, or dkt impacts

$\bar{x}$ = Sample-based evaluated mean kWh, kW, or dkt savings reported by the program

s_y^2 = Variance of the evaluated kWh, kW, or dkt impacts

s_x^2 = Variance of the kWh, kW, or dkt impacts reported by the program

s_{yx} = Sample covariance between y_i and x_i

Next, using Equation 12, the standard error of the ratio was calculated.

$$\delta\hat{R}_q = \sqrt{v(\hat{R}_q)} \quad \textbf{(12)}$$

As in the case of stratified random sample, the site-visit realization rate, a, ($\hat{R}_a$, i.e., $\frac{\bar{y}_a}{\bar{x}_a}$), which is based on a sample of site-visit-study period participants, is computed using the same methods used for the file-review realization rate. However, there are several important differences. First, y is the evaluated savings for measures based on site visits and x is the savings for measures reported by the program. The site-visit realization rate, a, is calculated as the sum of the site-review-adjusted savings divided by the program reported savings. It is this weighted realization rate to which case weights are then applied. However, the original savings realization rate once calculated was then adjusted to account for the fact that both the file-review and site-visit realization rates used the same baseline resulting in an underestimate of the savings realization rate. The adjusted savings realization rate was calculated by dividing the site-visit kWh for the site-visit study period by the file-review kWh for the site-visit study period. This revised savings realization rate for the site-visit study period was then multiplied by the file-review realization rate for the file-review-only study period to produce a savings realization rate for the file-review-only study period.

2.2.2.2. Exceptions

Three programs, the E+ Building Blocks Pilot Program, the E+ Residential Existing Gas Rebate Program, and E+ Residential Lighting Program, required different methods for estimating gross savings. The methods used for each are discussed below.

E+ Building Blocks Pilot Program

Since NWE does not report savings for this Program, the stratified ratio estimator was not possible. Instead, the mean savings was estimated based on a simple random sample of measures. Total Program savings were then calculated using Equation 13.

$$\hat{Y} = N\bar{y} \quad (13)$$

where:

$\hat{Y}$ = Estimated total savings for the Program

N = Total number of measures in the program tracking database

$\bar{y}$ = Estimated mean savings per measure

The standard error of $\bar{y}$ is calculated using Equation 14.

$$s_{\bar{y}} = \frac{s}{\sqrt{n}}\sqrt{1-f} \quad (14)$$

where:

n = Sample size

f = Sampling fraction

s = The standard deviation of mean (See equation 15 for calculation of the variance of the mean).

$$s^2 = \frac{\sum_{1}^{n}}{n-1}(y_i - \bar{y})^2 \quad (15)$$

where:

y_i = Estimated savings for measure i

$\bar{y}$ = Estimated mean savings per measure

n = Sample size

Equation 16 was used to calculate the confidence interval for the mean savings, $\bar{y}$.

$$\bar{y}_{st} \pm \mathrm{ts}(\bar{y}\ ) \quad (16)$$

where:

t = the critical value from the t distribution for the 90% confidence interval (i.e., 1.645)

s = the standard error of $\bar{y}$

E+ Residential Existing Gas Rebate Program

While the estimated realization rate was 56.1%, the correlation between the reported savings and the evaluated savings was only 0.13, making the ratio estimator approach unreliable. Instead, the mean savings for the site-visit period were first estimated based on the existing stratified random sample. Equation 17 was used to estimate the stratified mean, $\bar{y}_{st}$.

$$\bar{y}_{st} = \sum_{h=1}^{L} W_h \bar{y}_h \tag{17}$$

where:

$\bar{y}_{st}$ = the mean resulting from a stratified random sample (*st* for *stratified*)

W_h = $\frac{N_h}{N}$ which is the stratum weight

$\bar{y}_h$ = the mean of y for stratum h

With stratified random sampling, Equation 18 yields an unbiased estimate of the variance of $\bar{y}_{st}$

$$s_2(\bar{y}_{st}) = \sum_{h=1}^{L} \frac{W_h^2 s_h^2}{n_h} - \sum_{h=1}^{L} \frac{W_h s_h^2}{N} \tag{18}$$

where:

s_h^2 = The variance of the y within stratum h

Note that the second term in Equation 18 represents the finite population correction.

Equation 19 was used to calculate the confidence interval for the stratified mean savings, $\bar{y}_{st}$.

$$\bar{y}_{st} \pm ts(\bar{y}_{st}) \tag{19}$$

where:

t = the critical value from the t distribution for the 90% confidence interval (i.e., 1.645)

s = the standard error of $\bar{y}_{st}$

Once the mean for the site visit period was calculated, the total savings for the site-visit period was calculated using Equation 20.

$$\hat{Y} = N\bar{y}_{st} \tag{20}$$

where:

N = Population of reported measures in the site-visit period

To calculate the total savings for the file-review-only study period, information from the site-visit study period was used. First, the ratio of the evaluated mean to the reported mean savings was calculated for the site-visit study period. Next, this ratio or realization rate was then used to adjust the savings in the file-review-only study period. The totals for both periods were then summed to yield the total evaluation savings for the Program.

E+ Residential Lighting Program

The E+ Residential Lighting Program Lighting Program is comprised of three separate components: 1) Direct Install, 2) Owner Install, and 3) the CFL Buydown. For components #1 and #2, the methods used to estimate the savings realization rate were the same as described in section 2.2.2.1. However, for the CFL Buydown component, gross savings were based on a review of all records in the program tracking database. Evaluation gross savings were based on adjustments to reported quantities shipped. The savings realization rate was calculated as the ratio of the total evaluation savings to the total reported savings. An overall savings realization rate was then calculated across all three components. The savings realization rate was then applied to the total claimed savings for CFLs and divided by the total number of evaluation bulbs to produce an overall unit energy savings (UES) per bulb. This UES was then multiplied by the quantity of bulbs estimated to be residential bulbs to yield the total gross savings for CFLs in the residential sector. This same UES was then multiplied by the quantity of bulbs estimated to be non-residential bulbs to yield the total gross savings for CFLs in the non-residential sector.

2.2.2.3. Free Ridership Rate

The free-ridership rate was estimated using simple random samples or stratified random samples of participants in the site-visit study period. Once estimated for each program, the net-to-gross ratios (NTGRs) were extrapolated to participants in the file-review-only study period. When simple random samples were used, the NTGR is calculated as an ex post savings weighted mean and the standard error is simply the standard error of the weighted NTGR.

However, when a stratified random sample was used, the calculation was somewhat more complicated. The mean is then calculated using Equation 21.

$$\bar{y}_{st} = \sum_{h=1}^{L} W_h \bar{y}_h \tag{21}$$

where:

$\bar{y}_{st}$ = the mean resulting from a stratified random sample (*st* for *stratified*)

W$_h$ = $\frac{N_h}{N}$ which is the stratum weight

$\bar{y}_h$ = the mean of y for stratum h

With stratified random sampling, Equation 22 yields an unbiased estimate of the variance of $\bar{y}_{st}$.

$$s_2(\bar{y}_{st}) = \sum_{h=1}^{L} \frac{W_h^2 s_h^2}{n_h} - \sum_{h=1}^{L} \frac{W_h s_h^2}{N} \quad (22)$$

where:

s_h^2 = The variance of the NTGR within stratum h

Note that the second term in Equation 22 represents the finite population correction.

Equation 23 was used to calculate the confidence interval for the NTGR.

$$\bar{y}_{st} \pm ts(\bar{y}_{st}) \quad (23)$$

where:

t = the critical value from the t distribution for the 90% confidence interval (i.e., 1.645)

s = the standard error of $\bar{y}_{st}$

See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

2.2.2.4. Spillover Rate

The NTGR is calculated as 1 – FR (i.e., the free rider rate). The NTGR is used to adjust the ex post gross estimates of savings. The NTGR can be adjusted upwards by the spillover rate to produce the spillover-adjusted NTGR ($NTGR_{SA}$) using Equation 24.

$$NTGR_{SA} = (1 - FR) \times (1 + SR) \quad (24)$$

where:

FR = The free-ridership rate and 1-FR equals the net-to-gross ratio (NTGR)

SR = The spillover rate

This is referred to as the multiplicative version of the spillover adjustment. For this multiplicative version of the spillover-adjusted NTGR to work, the spillover rate was calculated using Equation 25.

$$SR = \frac{\textit{Net}\ \text{SO}}{\text{Net Energy Savings}} \quad (25)$$

where:

SR = Spillover rate

Net SO = The net energy or demand spillover savings

The spillover rate was based on sample of participants in the site-visit study period. Once the spillover-adjusted NTGR was calculated for a given program, it was inserted in Equation 17 to produce the $NTGR_{SA}$.

For the CFL Buydown component, the calculation of the spillover rate was somewhat more complex. All telephone surveys included a battery of questions regarding Buydown bulbs. Those respondents who indicated that they had **not purchased** any additional non-Buydown bulbs were assigned a spillover value of zero. Next, respondents who indicated that they **had purchased** additional non-Buydown bulbs because of their experience with the Buydown bulbs were then visited on-site if they met one condition. The condition was that they were part of one of the site visit samples drawn for the other programs. If they were not part of any site visit sample, they were dropped from the spillover sample. Once all site visits were completed, the savings associated with verified non-Buydown bulbs were averaged with the zero values for all the respondents in the other surveys to derive the total net spillover. The spillover rate (SR) was then calculated using Equation 17. Once the spillover-adjusted NTGR was calculated for the Buydown component of a given program, it was inserted in Equation 17 to produce the $NTGR_{SA}$

See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

2.2.2.5. Leakage Rate

The estimated leakage rates were all 1.0. They are included in the calculation for completeness.

2.2.2.6. Net Savings

The net savings adjustment rate for a given program was calculated using Equation 26.

$$\text{The Net Savings Adjustment Rate} = b_{overall} \times \text{NTGR}_{\text{SA}} \times (1 - LR) \tag{26}$$

where:

- LR = Leakage rate
- $b_{overall}$ = savings realization rate across both the file-review-only study period and late periods
- $NTGR_{SA}$ = Spillover-adjusted net-to-gross ratio

Finally, for each program, for each calendar year or tracker year, the net adjusted energy (or demand) savings was calculated using Equation 27.

$$\textit{Net}\ \text{Adjusted Energy Savings} = \text{RPT} \times \text{N}\textit{et}\ \text{Savings Adjustment Rate} \tag{27}$$

where:

- RPT = Program-reported savings

2.2.3. Economic Analysis

NWE’s cost-effectiveness calculator was reviewed and compared to the California Standard Practice Manual. The objective was to identify any significant aspects of the NWE calculator that did not conform to national best practices or regional requirements. These issues were then discussed with NWE and agreement reached on appropriate changes to the NWE calculator. Finally, an evaluation benefit-cost calculator was created by making these modifications to the NWE calculator.

2.2.3.1. Cost-Effectivness Model Review

The first step in this review involved examining the benefit-costs models used in the most recent evaluation of NWE program (Nexant 2007) which attempted to adhere closely to the industry standard methods prescribed in the *California Standard Practice Manual* (SPM) (California Public Utilities Commission and the California Energy Commission 2001). As part of its 2007 evaluation, Nexant calculated four benefit-costs tests:

- Total Resource Cost (TRC)
- Program Administrator (PA) Test,
- Rate Impact Measure (RIM) Test, and
- Societal Cost (SC) Test.

Note that the Participant Test was not conducted because Nexant felt that, while useful for DSM program planning purposes, it adds little value in a retrospective evaluation study; program attractiveness from this perspective is demonstrated in the very fact of customer participation.

The equations for the benefits and costs for each of the four tests used by Nexant are presented below.

TRC Test

$$TRC\ Benefits = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} \tag{28}$$

$$TRC\ \text{Costs} = \sum_{t=1}^{N} \frac{PRC_t + PC_t}{(1+d)^{t-1}} \tag{29}$$

where:

UAC	=	Utility avoided costs in year t
PRC_t	=	Program administration and marketing costs in year t
PC_t	=	Participant device costs (*before* INC is received), i.e., incremental costs in year t
d	=	Discount rate
t	=	The number of periods over which future values are discounted

Program Administrator Test

$$B_{pa} = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} \tag{30}$$

$$C_{pa} = \sum_{t=1}^{N} \frac{PRC_t + INC_t}{(1+d)^{t-1}} \tag{31}$$

where:

UAC = Utility avoided costs in year t

PRC_t = Program administration and marketing costs in year t

INC_t = Incentive costs, restricted to include only dollar benefits such as rebates or rate incentives (bill credits) in year t

d = Discount rate

t = The number of periods over which future values are discounted

Ratepayer Impact Measure (RIM) Test

$$B_{RIM} \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} \tag{32}$$

$$C_{RIM} \sum_{t=1}^{N} \frac{RL_t + PRC_t + INC_t}{(1+d)^{t-1}} \tag{33}$$

where:

UAC = Utility avoided costs in year t

RL_t = Revenue loss from reduced sales in year t

PRC_t = Program administration and marketing costs in year t

INC_t = Incentive costs, restricted to include only dollar benefits such as rebates or rate incentives (bill credits) in year t

d = Discount rate

t = The number of periods over which future values are discounted

Nexant noted that the estimation of economics from the RIM Test was slightly altered from the SPM to improve on the accuracy of results.

In the SPM methodology, RIM benefits of a DSM program are defined as avoided utility supply costs. RIM costs are defined as utility program administration costs plus incentives plus revenue losses due to reduced sales. The concept of lost revenues representing the under-recovery of the fixed-cost portion of rates is defined by the difference between revenues “lost” because of reduced energy sales (impact times rates) and the energy supply costs avoided (impact times marginal costs). The SPM recognizes the difficulty in estimating lost revenues as one of the weaknesses of the RIM test in the following statement (Nexant 2007):

> *Results of the RIM test are probably less certain than those of other tests because the test is sensitive to the differences between long-term projections of marginal costs and long-term projections of rates, two cost streams that are difficult to quantify with certainty.*

To address the weakness inherent in the dependence on forecasts of both avoided costs and rates, the study methodology estimates lost revenues directly from the *fixed-cost portion* of electricity and gas rates. The fixed-cost portion of rates is a known quantity for each of the calendar years of the study and is expected to remain constant in nominal terms throughout the lifetime of expected program impacts. To derive the correct *net* lost revenues, the study defines RIM costs as utility program administration costs plus incentives plus reduced collection of fixed-cost rate components plus avoided utility supply costs. RIM benefits are defined per SPM methods as avoided utility supply costs. Since the term representing avoided utility costs can be netted out of both benefits and costs to the RIM test, the resulting term representing *net* lost revenues is independent of projections of retail rates and thus more accurate than in the SPM methodology. (p. 18-1)

Nexant went on to note that:

> *The RIM benefit-to-cost ratio (one of the secondary measures of test results) can be slightly skewed because of the change in expressing RIM costs. The increased accuracy of the net present value of RIM net benefits—a primary measure of cost-effectiveness—more than offsets the potential decrease in accuracy of the secondary measure. (p. 18-1)*

Societal Test

$$SC\ Benefits = \sum_{t=1}^{N} \frac{(UAC_t * (1+EA))}{(1+d)^{t-1}} \tag{34}$$

$$SC\ \text{Costs} = \sum_{t=1}^{N} \frac{PRC_t + PC_t}{(1+d)^{t-1}} \tag{35}$$

where

UAC_t	=	Utility avoided costs in year t
EA	=	Environmental adder equal to 10%.
PRC_t	=	Program administration and marketing costs in year t
PC_t	=	Participant device costs (*before* incentive is received), i.e., incremental costs in year t
d	=	Discount rate
t	=	The number of periods over which future values are discounted

Avoided Utility Costs

The avoided utility costs used by Nexant originated from NWE documents in the public domain. The Nexant study examined cost-effectiveness indicators using two scenarios of avoided costs for the electric utility system to reflect a shift in forecast costs during the 2004 to 2006 implementation period. One scenario used 2005 avoided costs (produced midway through three-year implementation period under study), and another used the 2003 avoided costs forecast that was first used during the program planning process. The study used a 2005 NorthWestern Energy forecast of avoided gas costs. In all, the studies relied on three avoided cost forecasts, two for electric and one for gas. The benefit cost tests relied on these three forecasts for all calendar years and tracker years.

Lost Revenues

There were three lost revenue forecasts, one for residential electric, one for residential gas, and one for non-residential electric. As noted above, these were forecast of the *fixed-cost portion* of electricity and gas rates. Note that there was no non-residential gas lost revenue forecast since NWE did not offer non-residential gas programs prior to 2008. The benefit-cost tests relied on these three forecasts for all calendar years and tracker years.

2.2.3.2. Changes to Cost-Effectiveness Model

The comparison of the current NWE and SPM revealed two important inconsistencies:

- The participant costs (PC_t) in the TRC and SC tests (see Equations 29 and 35 above) should have been adjusted by the net-to-gross ratio (NTGR). However, they were rarely adjusted by the NTGR.

  This feature of the TRC and SC cost calculation was introduced into the SPM in 1988 as a way to adjust both the benefits *and* costs for attribution, i.e., ensure symmetrical treatment of costs and benefits. This point was clarified in the 2007 SPM Clarification Memo (D.07-09-043) (California Public Utilities Commission and the California Energy Commission 2007).

- The incentives paid to free riders were not being counted as a cost in the TRC.

  This feature was introduced in the 2007 SPM Clarification Memo (D.07-09-043) as a way to correct for the fact that revenue requirements associated with paying free riders incentives were not being counted. It stated that in the current formulation of the TRC, the costs of all revenue requirements associated with paying free riders a rebate incentive are removed. The memo went on to note:

  > *However, an equivalent financial incentive to the customer offered under a direct install program would not be removed. In other words, if instead of offering a cash rebate to the customer, the utility directly installs that same measure and requires a customer co-payment (such that the out-of-pocket cost to the customer is the same under either approach), the financial incentive to free rider participants would be included in the costs. This is because all of the direct install costs would appear in the "program administrative cost" (PRC) term. (p. 2)*

More details are provided in the 2007 SPM Clarification Memo.

- For the RIM test, the application of Equation 33 to the calculation of the net present value of the fixed cost portion of electricity and gas rates was incorrect, i.e., the first year value was discounted. This resulted in an overestimate of the B/C ratio.

These three changes are reflected in Equations 37, 41, and 43 later in this section.

2.2.3.3. Incremental Participant Costs

When available, incremental participant costs came directly from or were estimated based on tracking data. Otherwise, participant costs were estimated for each energy efficiency measure based on the 2003 electric potential assessment (KEMA 2003) and the 2008 gas potential assessment (KEMA 2008 (b)).

2.2.3.4. Program Administration and Marketing Costs

To derive the program administration and marketing costs, the program costs were first extracted from the USB and DSM gas and electric costs sheets in the tracker reports. Then the incentives paid were subtracted from the program costs to arrive at administration and marketing costs. Additionally, general, non-program-specific costs were allocated across applicable programs.

2.2.3.5. Program Incentive Costs

When available, program incentive costs came from the costs sheets in the tracker files. Otherwise, incentive costs were estimated based on tracking data.

2.2.3.6. Effective Useful Life

When available, effective useful life (EUL) came from tracking data. Otherwise, EUL were determined for each energy efficiency measure based on the 2003 electric potential assessment (KEMA 2003) and the 2008 gas potential assessment (KEMA 2008 (b)).

2.2.3.7. Discount Rates

All discount rates were provided by NWE. The source of all discounts rates for both gas and electric for both residential and non-residential are contained in the following files:

- Resource Value Spreadsheet 2006 RR.xls (Worksheet: NPV)
- Resource Value Spreadsheet 2007 RR.xls (Worksheet: NPV)
- Resource Value Spreadsheet 2008 20080101 RR.xls (Worksheet: Electric NPV)
- Resource Value Spreadsheet 2009 20090102 Rev 1 RR.xls (Worksheet: Electric NPV)
- Resource Value Spreadsheet 2010 20091203 Rev 1 RR.xls (Worksheet: Electric NPV)
- Resource Value Spreadsheet 2011 FINAL 20101227 RR.xls (Worksheet: Electric NPV)

- Resource Value Spreadsheet 2006 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2007 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2008 20080101 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2009 20090102 Rev 1 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2010 20091203 Rev 1 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2011 FINAL 20101227 RR.xls (Worksheet: Gas NPV)

Because the discount rates are in calendar years, each tracker year was assigned the calendar-year discount rate that matched the first year in the tracker year. For example, tracker year 2008–2009 was assigned the discount rate for calendar year 2008 and tracker year 2010–2011 was assigned the discount rate for calendar year 2010.

2.2.3.8. Lost Revenues

For each calendar year and tracker year, lost revenues for both electric and gas and for both residential and non-residential were calculated in the same way that Nexant did for the same reasons (see discussion of the RIM Test in section 2.2.3.1).

Gas Lost Revenues

All data for calculating gas lost revenues for both tracker years and calendar years were from the worksheet *5. Calc Lost Revenues Tracker Year* contained in workbook *EXHIBIT__(WMT-3) 2011–2012 Tracker 9+3 Natural Gas Lost Revenues – final.XLS*. The worksheet contains data that are in *tracker-year* format.

Tracker-Year Calculations: For each tracker year, the sum of gas distribution rate, gas transmission rate, and gas storage rate was calculated. These rates are in dollars ($) per dekatherm (dkt).

For the *non-residential sector*, gas savings have been reported since 2008. The starting values were determined as follows:

- Since there was no reported rate for tracker year 2007–2008, the non-residential value for Tracker 2008–2009 was used. This is consistent with the fact that the residential 2007–2008 and the 2008–2009 rates were identical.
- Since there was no reported rate for tracker year 2008–2009, the rate was calculated as 2.5% less than the 2009–2010 rate.
- The starting tracker-year rate for 2009–2010 was based on the Tracker 2009–2010 rates.
- The starting tracker-year rate for 2010–2011 was based on the Tracker 2010–2011: July-December 2010 rates.

For the *residential sector*, gas savings have been reported since 2007. The starting values were determined as follows:

- There were no rates for the 2006–2007 or the 2007–2008 tracker years. The January-June 2008 values were used for both of these tracker years.
- The starting tracker-year rate for 2008–2009 was based on tracker year 2008–2009.
- The starting tracker-year rate for 2009–2010 was based on tracker year 2009–2010.
- The starting tracker-year rate for 2010–2011 was based on tracker year 2010–2011: July-December 2010.

Once the starting rate for each tracker year for each sector was established, each was forecasted through 2014 at a compound annual growth rate (CAGR) of 2.5%. The value was set to zero beginning in 2013-2014, the approximate date of the next rate case.

Note that a reset of Lost Revenues to a zero starting point is only momentary since on the effective date of the Final Rate Order, the Lost Revenues begin to build up immediately. By the end of the first year following new rates, there will be new Lost Revenues as DSM program participation proceeds and energy savings again accumulate.

Calendar Year Calculations: Because only tracker-year gas rates were available, starting values for calendar-year rates were simply the year associated with the first year in the tracker year. For example, the value for the tracker year 2007–2008 was used as the value for calendar year 2007.

For the *non-residential sector*, the starting rates for each calendar year were calculated as follows:

- For 2008, the value was the same as that for the 2008–2009 tracker year.
- For 2009, the value was the same as that for the 2009–2010 tracker year.
- For 2010, the value was the same as that for the 2010–2011: July-December 2010 tracker-year.
- For 2011, the value was the same as that for the 2011–2012 tracker year.

For the *residential sector*, the starting rates for each calendar year were calculated as follows:

- For 2007, the value was the same as that for the 2007–2008 tracker year.
- For 2008, the value was the same as that for the 2008–2009 tracker year.
- For 2009, the value was the same as that for the 2009–2010 tracker year.
- For 2010, the value was the same as that for the 2010–2011 tracker year.
- For 2011, the value was the same as that for the 2011–2012 tracker year
- Note that, for the reasons noted earlier, the values for both residential and non-residential sectors were set to zero beginning in 2013.

Electric Lost Revenues

Tracker-Year Calculations: The data used to calculate the residential and non-residential tracker-year lost revenues for electricity were contained in the following Excel workbooks:

- Appendix 3B - 2008–2010 LRAM (Worksheet: *2. Rates*)
- Appendix 3A - 2004–2008 LRAM (Worksheet: *2. Rates*)

The starting rates for each tracker year were calculated as follows:

- The starting tracker-year rate for 2006–2007 was based on rates as of May 1, 2006.
- The starting tracker-year rate for 2007–2008 was based on rates as of May 1, 2007.
- The starting tracker-year rate for 2008–2009 was based on rates as of January 1, 2008.
- The starting tracker-year rate for 2009–2010 was based on rates as of January 1, 2009.
- The starting tracker-year rate for 2010–2011 was based on rates as of January 1, 2010.

Residential rates were calculated as the sum of transmission energy rate per kWh and distribution energy rate per kWh.

The calculation of *non-residential* rates was more complicated. It involved:

- Transmission energy and distribution energy rates for GS-1 Secondary, Non-Demand Customers
- Transmission demand, distribution energy, and distribution demand rates for GS-1 Secondary, Demand Customers
- Transmission energy and distribution energy rates for GS-1 Primary, Non-Demand Customers
- Transmission energy, distribution energy, and distribution demand rates for GS-1 Primary, Demand Customers

These values were used to calculate the following fixed-cost component of rates:

A. GS-1 Secondary, non-demand

B. GS-1 Secondary, demand (kWh)

C. GS-1 Secondary, demand (kW)

D. General Service - 1 Primary, Non Demand (kWh)

E. General Service - 1 Primary, Demand (kWh)

F. General Service - 1 Primary, Demand (kW)

Also involved in the calculation were the following:

- The percent of commercial and industrial savings by class:

  G. GS-1 Secondary, non-demand

  H. GS-1 Secondary, demand

I. GS-1 Primary, non-demand

J. GS-1 Primary, demand

- The calculation of billing demand per kWh of impact:

K. C/I Average Monthly Load Factor

L. Monthly kW reduction per kWh of impact

M. Annual demand reduction (kW-months) per kWh

N. Coincidence factor

The following formula was used to calculate electric lost revenues for the non-residential sector:

$$Lost\ Revenue_{C,I} = G \times A + H \times (B + M \times N \times C) + I \times D + J \times (E + M \times N \times F)$$

Calendar-Year Calculations: The starting rates for each calendar year were calculated as follows:

- The starting calendar-year rate for 2007 was based on rates as of May 1, 2007.
- The starting calendar-year rate for 2008 was based on rates as of January 1, 2008.
- The starting calendar-year rate for 2009 was based on rates as of January 1, 2009.
- The starting calendar-year rate for 2010 was based on rates as of January 1, 2010.
- The starting calendar-year rate for 2011 was based on rates that were identical to the rates as of January 1, 2010.

Once the starting rate for each tracker year for each sector was established, each was forecasted through 2013-2014 at a compound annual growth rate (CAGR) of 2.5%. The value was set to zero beginning in 2014-2015, the approximate date of the next rate case. For calendar years, once the starting rate for each calendar year for each sector was established, each was forecasted through 2013 at a compound annual growth rate CAGR of 2.5%. The value was set to zero beginning in 2014 the approximate date of the next rate case.

Note that a reset of Lost Revenues to a zero starting point is only momentary since on the effective date of the Final Rate Order, the Lost Revenues begin to build up immediately. By the end of the first year following new rates, there will be new Lost Revenues as DSM program participation proceeds and energy savings again accumulates.

Thus, for both electric and gas, there are 38 forecasts—19 that covered the five tracker years, for each fuel, and for each sector,[2] and 19 that covered the five calendar years, for each fuel, and for each sector.

[2] Non-residential gas lost revenues only cover four tracker years since NWE did not offer a non-residential gas program prior to 2008.

2.2.3.9. Avoided Supply Costs

Electric Avoided Cost

Electric avoided cost data in calendar years were obtained from the following sources:

- Resource Value Spreadsheet 2006 RR.xls (Worksheet: NPV)
- Resource Value Spreadsheet 2007 RR.xls (Worksheet: NPV)
- Resource Value Spreadsheet 2008 20080101 RR.xls (Worksheet: Electric NPV)
- Resource Value Spreadsheet 2009 20090102 Rev 1 RR.xls (Worksheet: Electric NPV)
- Resource Value Spreadsheet 2010 20091203 Rev 1 RR.xls (Worksheet: Electric NPV)
- Resource Value Spreadsheet 2011 FINAL 20101227 RR.xls (Worksheet: Electric NPV)

Calendar-Year Calculations: The calendar-year forecasts for 2007 through 2011 calendar years were provided in the appropriate worksheets in the Excel workbooks listed above. All data are in *calendar-year* format. To handle the largest possible EULs, each forecast was extended through 2045 at a compound annual growth rate of the original series.

Tracker-Year Calculations: The forecasts for 2006–2007 through 2010–2011 tracker years were based on the data provided in the appropriate worksheets in the Excel workbooks listed above. Each tracker year was assigned the calendar-year value that matched the first year in the tracker year. For example, tracker year 2008–2009 was assigned the value for calendar year 2008 and tracker year 2010–2011 was assigned the value for calendar year 2010.

Gas Avoided Cost

Gas avoided cost data in calendar years were obtained from the following sources:

- Resource Value Spreadsheet 2006 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2007 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2008 20080101 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2009 20090102 Rev 1 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2010 20091203 Rev 1 RR.xls (Worksheet: Gas NPV)
- Resource Value Spreadsheet 2011 FINAL 20101227 RR.xls (Worksheet: Gas NPV)

Calendar-Year Calculations: The forecasts for 2007 through 2011 calendar years were provided in the appropriate worksheets in the Excel workbooks listed above. To handle the largest possible EULs, each forecast was extended through 2045 at a compound annual growth rate of the original series.

Tracker-Year Calculations: The forecasts for 2006–2007 through 2010–2011 tracker years were based on the data provided in the appropriate worksheets in the Excel workbooks listed above. Each tracker year was assigned the calendar-year value that matched the first year in the tracker year. For example, tracker year 2008–2009 was assigned the value for calendar year 2008 and tracker year 2010–2011 was assigned the value for calendar year 2010.

Thus, for both electric and gas, there are 20 forecasts—10 that covered the five *tracker years*, for each fuel, and 10 that covered the five calendar years, for each fuel.

2.2.3.10. Calculation of Cost-Effectiveness Tests

The following equations were used to calculate the four benefit-costs tests. The TRC and SC have been modified to better conform to the SPM.

TRC Test

$$TRC\ Benefits = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} \quad (36)$$

$$TRC\ \text{Costs} = \sum_{t=1}^{N} \frac{PRC_t + NTGR_{SA} * PC_t + (1.0 - NTGR\ ) * INC_t}{(1+d)^{t-1}} \quad (37)$$

where:

UAC_t	= Utility avoided costs in year t
PRC_t	= Program administration and marketing costs in year t
$NTGR_{SA}$	= Spillover-adjusted net-to-gross ratio
PC_t	= Participant device costs (*before* incentive (INC) is received
$NTGR$	= Net-to-gross ratio (NTGR), i.e., unadjusted for participant spillover
INC_t	= Incentive costs, restricted to include only dollar benefits such as rebates or rate incentives (bill credits) in year t

Program Administrator Test

$$B_{pa} = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} \quad (38)$$

$$C_{pa} = \sum_{t=1}^{N} \frac{PRC_t + INC_t}{(1+d)^{t-1}} \quad (39)$$

where

UAC_t	= Utility avoided supply costs in year t
PRC_t	= Program administration and marketing costs in year t
INC_t	= Incentive costs, restricted to include only dollar benefits such as rebates or rate incentives (bill credits) in year t.

Ratepayer Impact Measure (RIM) Test

$$B_{RIM} \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} \quad (40)$$

$$C_{RIM} \sum_{t=1}^{N} \frac{RL_t + PRC_t + INC_t}{(1+d)^{t-1}} \quad (41)$$

where

UAC_t = Utility avoided supply costs in year t

RL_t = Revenue loss from reduced sales in year t

PRC_t = Program administration and marketing costs in year t

INC_t = Incentive costs, restricted to include only dollar benefits such as rebates or rate incentives (bill credits) in year t

Societal Test

$$SC\ Benefits = \sum_{t=1}^{N} \frac{(UAC_t * (1+EA_t))}{(1+d)^{t-1}} \quad (42)$$

$$SC\ \text{Costs} = \sum_{t=1}^{N} \frac{PRC_t + NTGR_{SA} * PC_t + (1.0 - NTGR\ ) * INC_t}{(1+d)^{t-1}} \quad (43)$$

where:

UAC_t = Utility avoided supply costs in year t

EA_t = Environmental adder equal to 10% of the total utility avoided supply cost in year t. The environmental adder is an upward adjustment to utility avoided costs as a way of internalizing the external costs of energy generation

PRC_t = program administration and marketing costs in year t

$NTGR_{SA}$ = Spillover-adjusted net-to-gross ratio

PC_t = participant device costs (*before* INC is received) in year t

$NTGR$ = Net-to-gross ratio (NTGR), i.e., unadjusted for participant spillover

INC_t = incentive costs, restricted to include only dollar benefits such as rebates or rate incentives (bill credits) in year t

Note that the discount rate varies depending on the program or tracker year. Discount rates can also vary within a given program or tracker year by fuel. Note also that the avoided cost and lost revenue forecasts are unique for each calendar and tracker year. Details regarding the calculation of lost revenues and avoided costs for the residential and non-residential sectors are provided in preceding portions of this section.

The societal test includes an environmental adder of 10% as way of internalizing the external costs associated with fossil-fuel-based electricity generation. As noted in the previous portfolio evaluation (Nexant 2007), the adder approach is easy to apply, and a general consensus has been reached that adders in the range of 5-15% are an acceptable way to account for the environmental benefits of demand side management programs and renewable resources.

2.3. Process Evaluation

2.3.1. Objectives

The process portion of the evaluation addresses a variety of research objectives, as shown in Table 5, and employs a variety of information sources. The table indicates the primary information sources with a check mark; secondary or supporting information is indicated with an "S".

Table 5: Information Sources to Be Used to Meet Process Evaluation Objectives

ObjectiveTo Assess	Information Sources				
	Program Documents	Interviews		Surveys	
		Program Staff	Participating Customers	Participating Trade Allies	Nonparticipating Customers
Appropriateness of design and participation procedures	Descriptions; design docs; process descriptions; flow charts; application forms	√	√	√	√
Appropriateness of application and payment processing activities (e.g., ease of use, cycle time)		√	√	√	
Accuracy, consistency, completeness of program records	Participant program records				
Barriers to participation		√	√	S	√
Effectiveness of incentives in motivating action	Incentives rationale (e.g. % buy down)	S	√	√	√
Effectiveness of marketing and promotional efforts	Marketing materials	√	√	√	√
Participant satisfaction with programs		S	√	√	
Opportunities for process improvement		√	√	√	S

ObjectiveTo Assess	Information Sources				
	Program Documents	Interviews		Surveys	
		Program Staff	Participating Customers	Participating Trade Allies	Nonparticipating Customers
Effectiveness of internal communication		√	S	S	
Comparison to best practices	All documents	√			
Obtain data for assessment of free riders, spillover and leakage			√	√	√
Obtain data for assessment of savings persistence			√		

2.3.2. Data Collection Activities

To develop an understanding of the individual programs in NWE's E+ Efficiency Portfolio of efficiency programs, we reviewed program documents and discussed program processes with NWE and contractor implementation staff during a two and one-half -day evaluation kick-off meeting held January 30 through February 1, 2012. During that meeting, we refined researchable issues for individual programs and identified data files needed to support the evaluation including contact information for program participants, trade allies, and nonparticipating customers.

Early evaluation team efforts included review and summary of best practices applicable to NWE programs, further review of program collateral and processes, and in-depth interviewing of key program staff. These efforts supported our development of survey instruments that addressed research objectives applicable to residential and commercial customer by program. For comparison across programs, we designed survey instruments to include a subset of questions administered to all participants, as well as questions applicable to individual program. In addition to measures of program satisfaction, we asked all participants about their awareness and knowledge of NWE's energy efficiency activities, and their interest in receiving additional efficiency information from NWE. In collaboration with NWE staff, we reviewed and refined all survey instruments prior to fielding.

We completed telephone surveys with several samples of program actors, including participants, trade allies, and nonparticipants. We began fielding the surveys on April 16 and concluded on September 19, 2012. Table 3, above, provides our sample sizes.

2.3.2.1. Participants

The telephone surveys with participant decision-makers served multiple purposes: to support the process evaluation, gather data needed to compute net savings, and recruit participants for site visits. The audit participant sample comprised audit participants that did not subsequently receive an incentive from NWE; our survey explored their responses to the audit recommendations, including recommendations that involved behavioral changes. Residential and commercial participant surveys included questions about the purchase of compact fluorescent lamps (CFLs) to determine whether they purchased discounted bulbs from retailers participating in the CFL Upstream Buy-Down program.

As described (section 2.1), process surveys were administered to samples of program participants drawn by the impact team using program information provided by NWE. Our surveys with NWE E+ program participants (a sample of those participating between January 2010 and December 2011) were conducted by expert interviewers, primarily those at a reputable survey research firm using computer-assisted telephone interviewing (CATI) software, yet also including members of the process evaluation team. To reach program and strata goals for completed surveys and agreements to on-site visits by the impact team, we placed calls to residential and commercial participants at various times of the day and evening (no call attempts were made on Sundays). Repeated call attempts are made when calls are not answered by the household or business; we do not repeat a call when the customer contact we are seeking declines to be surveyed. Five call attempts to complete a survey is the industry standard and the standard we initially employed. For critical strata with small samples and low response rates, we called up to ten times; for a few strata, we called up to 14 times.

To encourage residential participants to volunteer to an on-site inspection of program related measures, we offered these participants a one-in-ten chance of winning a $100 gift card.[3] Because of low response rates, this offer was later changed to a $25 gift card for each on-site inspection volunteer.

Although participant surveys continued into early September to obtain free ridership data for impact estimation purposes, process results include only those responses collected before July 31, 2012, as we needed sufficient time for data analysis.

2.3.2.2. Trade Allies

We collected program specific data from trade allies via a telephone survey to support the impact and process evaluation. NWE provided lists of trade allies classified by type (for example: residential insulation, commercial lighting). We drew simple random samples representative of each type. Table 3, above, provides our sample sizes.

2.3.2.3. Nonparticipants

We surveyed a random sample of residential and commercial customers who had not participated in the NWE program during 2010–2011. Table 3, above, provides our sample sizes.

[3] Initially, residential respondents were offered a one-in-twenty chance of winning a $100 gift card. To encourage a higher acceptance rate we changed the offer to a one-in ten chance.

We conducted telephone surveys with the sampled customers to support both the process and impact evaluations.

2.3.3. Response Weighting

As described in section 2.1, we conducted participant process evaluation surveys with participants drawn for the impact sample. We designed the nested sampling plan to achieve a complete understanding – process, impact, free ridership – for each sampled participant.

Because the impact sampling plan was developed for the purpose of accurately estimating program savings, it necessarily oversampled projects with large savings, to minimize total savings estimation uncertainty. To ensure that each participant, regardless of project size, was given an equal "voice" in our process findings, we used proportional weighting to adjust for this oversampling. We developed proportional weights for each stratum within a program according to the following formula:

$$Stratum\ weight = \frac{\%\ of\ stratum\ in\ program\ population}{\%\ of\ stratum\ in\ program\ sample}$$

For programs with a simple random sample (that is, with no strata), no weights were applied to participant responses. Similarly, all trade ally and nonparticipant responses are presented without weights.

2.3.4. Best Practices

We assessed NWE's program activities in comparison with efficiency program best practices. Our primary source of best practices was *Best Practices Benchmarking for Energy Efficiency Programs* (eebestpractices.com). To our knowledge, this source provides the results of the only "true" best practices study, as distinguished by its methodology. The research started with a Delphi Panel of efficiency professionals identifying, for specified program categories (examples: audits, commercial equipment, residential lighting), the programs they believed to be most successful. Nominated programs spanned the country, and included programs of both investor-owned utilities and municipal utilities. The evaluators then systematically investigated these programs to determine their practices within each of seven categories (examples: program planning and design, marketing and outreach), and judged the resulting set of practices as "best."

For the current research, we further synthesized this work, identifying commonalities across the program categories. We identified a set of 54 best practices, many with subcomponent practices. Many of these best practices are applicable to all program types, although some relate specifically to a single program type, such as audits.

Augmenting this national research, we used a study we conducted for a consortium of funders active nationally, *Lesson Learned After 30 Years of Process Evaluation*. (Peters 2007) This study identifies "good" practices; it does not use the methodology of a true "best" practices study.

We considered NWE's staffing ratio in light of findings from a study of 39 efficiency program administrators around the country. (Goldman, et al. 2010)

Finally, we sought to identify efficiency best practices for rural utilities. We contacted a leading energy efficiency consultant who specializes in serving community-owned utilities, which are predominantly rural.[4] She reported being unaware of any report summarizing efficiency best practices for utilities serving rural populations. In our best practices assessment in this evaluation, we took into account NWE's unique service territory and customer base.

[4] The consultant is Jill K. Cliburn, who has the website Clean and Efficient Energy Program for Public Power (cleanefficientenergy.org).

3. E+ AUDIT HOME OR BUSINESS

3.1. Program Description

The E+ Audit Home or Business program has three components, Home Electric Survey, Home On-site Audit, and Small Business Electric Appraisal. All are funded through USB.

Home Electric Survey

The Home Electric Survey began in 1999 and is a mail-in survey available to residential electric customers who use electricity for lighting and appliances only (base load customers) and are not using NWE electricity or NWE natural gas for space heat or domestic water heat. Eligible homes may be manufactured or site built; single family and multifamily buildings. In the 2007–2011 program year period, an average of 2,800 surveys were done each year.

Primarily, customers are recruited for this program through direct mail campaigns where the survey is sent to qualifying customers. Mail-in audits require the customer to complete a survey form on their home, providing information on the structure, appliances, and energy use patterns. After processing, customers receive a customized E+ Audit Report with electric usage data, energy-saving recommendations for their residences and information about NWE's residential rebate programs.

The following service may be provided as part of the audit process but is considered a separate program–both in terms of budget dollars and associated energy savings:

Once the Mail-In Audit customer completes and returns their questionnaire, they receive a free CFL by mail. This is NWE's Mail-Out program component, part of the E+ Residential Lighting program.

Home On-site Audit

The Home On-site Audit program component began in 1992[5]. Customer eligibility requires NWE gas or electricity for space heat and/or domestic water heating, and a home at least five years old. Eligible homes can be manufactured or site built; single family and multifamily buildings ≤ four units.

This program component is the gateway for most of NorthWestern Energy's (NWE) residential energy efficiency programs. In the 2007–2011 program year period, an average of 3,400 on-site audits were done each year. The audits are thorough and can take up to five hours of staff time to complete, including processing the custom report for the customers. A home may not receive more than one NWE on-site audit. If the home has had a previous audit and is not eligible for a second audit, customers may request a copy of the previous audit report.

NWE contract auditors collect extensive data on the house structure, heating, cooling, domestic water heating, and occupant energy-use patterns. While on-site, auditors provide education on

[5] Utility staff performed energy audits on homes from 1979 to 1992. Since then, the Home On-Site Audits have been conducted by an implementation contractor.

best home-energy efficiency practices and other opportunities observed while conducting the audit. The audits may include free installation of water heater wraps, low-flow showerheads and aerators, hot-water-pipe insulation, a blower-door test to measure infiltration, and gas-appliance safety checks. The two-person audit team typically takes 1½ - 2 hours to complete the on-site portion of the audit.

As a follow-up to the on-site audit, customers receive a customized E+ Audit Report with energy usage data, energy saving recommendations and next steps to participate in NWE's residential rebate programs. An additional follow-up letter is sent several weeks after the audit to remind customers of recommendations, and to survey customers about action taken or intended as a result of the audit.

The following services may be provided as part of the audit process but are considered separate programs in all respects - budget dollars and associated energy savings:

- CFLs may be installed in high use locations of electric customers' homes. Costs and savings are reported in the E+ Residential Lighting Program.
- Weatherization kits may be provided to the home-heating customer. Kits may include: window plastic, door sweep weather stripping, insulating foam spray, and outlet covers. Costs and savings are reported in the E+ Residential Existing Gas Rebate Program.

Small Business Electric Appraisal

The Small Business Electric Appraisal program component began in 1999 and is available to commercial electric supply and electric choice (< 1 MW) customers with < 300 kW demand. Funding is through USB. In the 2007–2011 program years, an average of 300 on-site audits were performed each year.

The audits provide customer education on improving facility energy efficiency and developing operation and maintenance strategies to reduce energy use. Emphasis is on electric energy-saving measures. The program targets smaller commercial customers that are unlikely to participate in the E+ Business Partners program.

At the time of the audit, facilities with electric storage water heaters may receive the installation of water heater blankets, pipe wrap for the first ten feet of pipe leaving the heater, low-flow showerheads and faucet aerators.

At the time of the audit, free CFLs are installed as part of the CFL Direct Install program component of the E+ Commercial Lighting program. This activity is reported separately from the audit program –both in terms of budget dollars and associated energy savings. Customers receive up to 20 free CFLs or CFLs for 10% of the qualifying fixtures whichever is greater. CFLs are provided for fixtures operating three or more hours a day.

Customers receive a follow-up E+ Energy Appraisal Report which includes a facility equipment inventory, energy use profile, energy appraisal recommendations with cost/benefit analyses, and next steps information for participating in NWE's commercial rebate programs.

3.1.1. Energy Savings

Audit unit energy savings (UES) values are comprised of direct savings (Nexant 2007) and indirect savings (NCAT, Summit Blue 2008). Direct savings are the result of the installation of measures as part of the audit, e.g., a water heater tank wrap or faucet aerators. Indirect savings are the result of changes in occupant behavior as a result of the audit. The results from both studies are applied to audits for the 2008–2011 program years. UES values for the 2007 audit programs were based on a previous evaluation study (Hagler Bailly Consulting, Inc. 1995).

For the 2008–2011 program years, UES values are applied to each of the program components as follows:

- Residential electric survey audits receive credit only for indirect electric savings.
- Residential on-site audits receive credit for direct and indirect electric and gas savings which vary by residential audit type category.
- Commercial audits receive credit for electric and gas savings regardless of the mix of fuels at the facility. One set of kWh and dkt savings values are used for all audits. Electric savings are direct and indirect, gas savings are indirect only. Prior to the 2008 program year, savings were based on the residential program estimates for the same year.

3.1.2. History

The program is mature and stable. As described above, UES values changed in 2008; one set of values was used in the 2007 program year and another set in the 2008–2011 program years as a result of previous evaluations.

Domestic hot water-savings devices' GPM ratings were lowered over the five year evaluation period as follows:

Table 6: Showerhead and Aerator GPM Ratings by Year for E+ Audit Home or Business

Program Year	Fixture Type	GPM
2006 – 2007	Showerheads	2.5
2008 – 2011	Showerheads	2.0
2006 – 2007	Kitchen Aerators	2.2
2008 – 2011	Kitchen Aerators	1.5
2006 – 2007	Bathroom Aerators	1.5
2008 – 2011	Bathroom Aerators	1.0

3.1.3. Marketing

Residential

NWE and their contract marketing team promote the residential audits to customers and trade allies through the following marketing activities:

- Direct customer marketing is done through customer bill inserts and through direct mail campaigns to residential gas customers whose home has not been previously audited.
- NWE's presence at home improvement shows, farmers' markets, fall NWE weekday distribution events (2005-2011), and Saturday customer-appreciation and distribution events (2005–2010) to which all NWE residential customers were invited. Live radio remotes during Saturday events were utilized to draw attention to the events as well as the E+ programs and rebates available to customers to save energy. The 2009 and 2010 customer-appreciation Saturday events included contests for Home Energy Prizes. The distribution trucks were wrapped with signage promoting the 2010 and 2011 events. Customer Appreciation events were not held in 2011. Weatherization kit materials were distributed at smaller scale events to which natural gas customers who had not participated in the past were invited through a direct mail campaign in 2011. Costs and energy savings associated with the distribution events are not included in the audit program.
- Mass media buys on television, radio, and newspapers
- News releases
- Occasional earned media
- NWE's website
- Preferred Contractors
- Flyers in NWE offices, community centers, senior centers, libraries, post offices, and other public bulletin board locations.

The marketing approach for the distribution events where energy audits are promoted changed for 2011 when promotion was primarily direct mail targeting non-participant natural gas customers. No mass media or Customer Appreciation events were held in 2011. Weatherization events in 2006–2011 primarily targeted residential natural gas customers.

By design, the residential audit programs are a marketing channel for NWE's residential rebate programs. Customers receive information on the CFL Rebate programs and the Electric and Gas Rebate programs.

Commercial

NWE and their contract marketing team promote commercial audits to customers and trade allies through the marketing channels established for all non-residential programs:

- Direct customer marketing by meeting with customers at their business sites, conferences, and community events.

- Attending and presenting at professional and trade association meetings such as those for the healthcare and hospitality industries, the architectural and engineering communities, and service organizations.
- Direct program marketing to trade allies, electrical equipment distributors, HVAC and lighting contractors, and others who promote products and services to utility customers.
- Targeted advertising in television and print media.
- Web site support and the electronic newsletters to commercial customers providing valid email addresses or those who self-nominate to receive the newsletter online and to lighting trade allies.
- Co-sponsoring Montana energy conferences with state government and NEEA.

Although NWE's commercial programs do not use preferred contractors, many contractors participating in the residential preferred contractor program are familiar with the commercial rebate programs and promote them to commercial customers.

3.1.4. Program Steps

Home Electric Survey

A set of residential electric customers (no gas account with NWE) identified by billing attributes are sent an Energy Usage Survey. Customers who complete and return the survey receive a customized report based on their responses and free CFL (CFL not funded through the audit program). Generally, there are two survey-mailing campaigns per year. Additionally, as electric baseload customers (non-NWE space or water-heat customers) call to inquire about an on-site audit, they are offered the Energy Usage Survey.

On-site Audit

To request an on-site audit, customers mail in a business reply card included in a mailing or obtained at an event, phone NWE's E+ program hotline, or sign up at an event. Audits are scheduled to accommodate customer scheduling needs and auditor travel schedules. Audit reports are generated and sent to the customer within 10 business days of the audit.

Program staff determines which audit program the customer qualifies for and schedules an on-site audit, sends a mail-in audit package, or offers the customer a report of a previous audit performed on the home as appropriate.

Small Business Electric Appraisal

Customers normally phone NWE's E+ hotline to request an Energy Appraisal. Program staff determine if the customer qualifies and schedules the on-site audit.

3.2. Impact Evaluation

3.2.1. Methodology

We performed an impact evaluation of the three components of this program to assess the gross and net energy (kWh and dkt) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision for each component.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh and dkt) and demand (kW) savings and perform the economic analysis.

3.2.1.1. Estimation of Gross Savings

We applied the same gross savings methodology to all three components of this program. We estimated both direct and indirect energy (kWh or dkt) and demand (kW) savings, as they were applicable. Direct savings were those associated with the measures installed by NWE during the audit. Direct savings were applicable to the two on-site components. Indirect savings were associated with customer actions and/or measures implemented by the customer based on audit recommendations but for which the customer did not receive an incentive through any other NWE program, regardless of whether or not an incentive was available. Indirect savings were applicable to all three components. We used results from the telephone survey of 2010–2011 participants and customer interviews during site visit recruitment to determine which of the audit participants received direct installation measures (other than CFLs) or implemented audit recommendations without incentives. We evaluated direct install CFLs as part of the E+ Residential Lighting program. In addition, we evaluated the free gas kits left with customers during the residential on-site audit component under the E+ Residential Existing Gas Rebate program. We conducted site visits and/or follow-up telephone interviews for those homes or businesses to gather the data needed to estimate savings.

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., audit type, installed units) to identify data entry errors. We corrected errors that were found and recalculated energy (kWh and dkt) and demand (kW) savings. We recorded reasons for differences with the program tracking savings.

We used the UES methods to estimate savings for prescriptive measures (direct and indirect). We reviewed these methods as part of the evaluation of the prescriptive programs in the portfolio. For other measures, we used standard engineering methods to estimate energy (kWh or dkt) and demand (kW) savings.

We performed site visits on the sampled sites to verify the direct-install measures installed under the on-site audit components of the program. The site visits also verified the installation of indirect measures, implemented in response to recommendations provided in the audit report. The verification process included confirmation that the program measures were installed, were operational and were producing energy savings. For non-prescriptive measures, we collected data as necessary to support a re-estimation of energy (kWh and dkt) and demand (kW) savings. We calculated evaluation energy savings (kWh and dkt) by applying the UES or standard engineering method to the data observed during the site visit. We then summed savings for all measures, both direct and indirect, for each sample participant. The site-level savings were then summed across all sampled participants to arrive at a sample-level savings for comparison to the tracking claimed savings. To the extent possible, we documented reasons for differences between the evaluated and program savings.

3.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

3.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

3.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas

service territory. We considered as "leaked" any measures we found that left the relevant service territory.

3.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

3.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh and dkt) and demand (kW) savings for each of the sampled cases. Separate discussions of the gross and net savings realized for this program are provided below.

3.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 120 sampled cases for the Home On-site Audit component of this program across the five program years. We also reviewed 90 files for the Home Electric Survey and 56 files for the Small Business Electric Appraisal program components. The results from these reviews revealed no entry errors in the program tracking database associated with energy savings.

Review of Program Estimate Methods

We reviewed the program UES values used to determine savings for both direct-installed and indirect-installed measures for the ten audit types comprising the E+ Audit Home or Business Program. The results of these two reviews are provided in the next two tables and the total impact of the findings is presented in a third table that sums the results of the first two tables.

For the four direct-install measures, we examined the sources of the program savings and performed a literature review, resulting in adjusted UES values for low-flow showerheads and aerators, but found no change necessary for tank or pipe wraps (see section 17.2.2.1). Using the adjusted UES values, we calculated direct-install measure savings for all sampled audits within each audit type, taking into account the number of each of the installed components found at each site.

We then calculated a weighted total evaluation audit program savings value from the individual audit-type savings sums. We compared this weighted program-wide total to the weighted claimed savings value to arrive at an overall direct-install net savings adjustment rate (NSAR). We applied this single rate to the program UES values for each of the audit-types. The resulting NSAR-adjusted values for direct-installed measures are provided in the next table.

Table 7: E+ Audits Home or Business adjusted UES values for direct-installed measures

Audit Type	Space Heat Fuel	Water Heat Fuel	Customer Type	Electricity Provider	On-site or Mail-in	Reported Savings UES			Net Savings Adjustment Rate-adjusted UES			Audit Type Sample Size	Audit Type Population
						kWh	kW	dkt	kWh	kW	dkt		
A	Natural Gas NWE	Natural Gas NWE	Residential	NWE	On-site	47	-	5.69	34	-	2.36	26	4,184
B	Natural Gas NWE	Natural Gas NWE	Residential	Other	On-site	-	-	5.16	-	-	2.14	12	833
C	Natural Gas NWE	Electric Other	Residential	Other	On-site	-	-	-	-	-	-	2	351
D	Electric NWE	Electric NWE	Residential	NWE	On-site	467	-	-	334	-	-	8	235
E	Other Fuel Other	Electric NWE	Residential	NWE	On-site	467	-	-	334	-	-	3	109
F	Natural Gas NWE	Electric NWE	Residential	NWE	On-site	467	-	0.73	334	-	0.30	3	765
G	Electric NWE	Natural Gas NWE	Residential	NWE	On-site	47	-	5.69	34	-	2.36	-	47
H	Electric NWE	Electric NWE	Residential	NWE	On-site	467	-	-	334	-	-	4	75
O	Any fuel	Any fuel	Commercial	NWE	On-site	442	0.22	-	316	0.16	-	27	498
R	Natural Gas Other	Natural Gas Other	Residential	NWE	Mail-in	-	-	-	-	-	-	59	2,469

Determination of adjusted UES values for the indirect-installed audit measures was accomplished in much the same way as were the corresponding values for the direct-install measures. The difference was in the measures that were implemented, some of which were conducive to the application of a UES approach and some of which required a simple calculation using an algorithm developed for each such measure and inputs from data gathered during site visits. The resulting savings were treated in the same manner as that described above for the direct-install measures.

Table 8: E+ Audits Home or Business adjusted UES values for indirect-installed measures

Audit Type	Space Heat Fuel	Water Heat Fuel	Customer Type	Electricity Provider	On-site or Mail-in	Reported Savings UES			Net Savings Adjustment Rate-adjusted UES			Audit Type Sample Size	Audit Type Population
						kWh	kW	dkt	kWh	kW	dkt		
A	Natural Gas NWE	Natural Gas NWE	Residential	NWE	On-site	193	0.07	8.41	138	0.05	3.49	26	4,184
B	Natural Gas NWE	Natural Gas NWE	Residential	Other	On-site	-	-	6.51	-	-	2.70	12	833
C	Natural Gas NWE	Electric Other	Residential	Other	On-site	-	-	4.38	-	-	1.82	2	351
D	Electric NWE	Electric NWE	Residential	NWE	On-site	1,047	0.40	-	749	0.29	-	8	235
E	Other Fuel Other	Electric NWE	Residential	NWE	On-site	135	0.04	-	97	0.03	-	3	109
F	Natural Gas NWE	Electric NWE	Residential	NWE	On-site	288	0.08	6.93	206	0.06	2.87	3	765
G	Electric NWE	Natural Gas NWE	Residential	NWE	On-site	443	-	1.86	317	-	0.77	-	47
H	Electric NWE	Electric NWE	Residential	NWE	On-site	970	0.10	-	694	0.07	-	4	75
O	Any fuel	Any fuel	Commercial	NWE	On-site	410	0.03	6.81	293	0.02	2.82	27	498
R	Natural Gas Other	Natural Gas Other	Residential	NWE	Mail-in	126	0.03	-	90	0.02	-	59	2,469

Indirect-installed measures included both behavioral and non-behavioral measures. Behavioral measures depend on the actions of someone remembering to implement the measure when applicable (e.g. manually setting back a thermostat setpoint each night or laundering with cold water), whereas non-behavioral measures involve some observable physical or controls change (e.g. adding insulation or programming temperature setpoints to automatically set back each night). Twenty-six behavioral measures were installed across a total of 16 sites (one Small Business Electric Appraisal site, six Home Electric Survey sites and nine On-Site Home Audit site). Evaluated savings for these measures amounted to 11,325 kWh and 14.6 dkt.

A total of 101 non-behavioral measures were implemented across 51 total sites (eight Small Business Electric Appraisal sites, 12 Home Electric Survey sites and 31 On-Site Home Audit sites). Evaluated savings for these measures amounted to 40,373 kWh and 121 dkt.

We summed the results of the direct- and indirect-install measure UES adjustments to arrive at final adjusted UES values for consideration in assigning audit savings to the individual audit types in the future. These values are provided in the next table.

Table 9: E+ Audits Home or Business total (direct + indirect) adjusted UES values

Audit Type	Space Heat Fuel	Water Heat Fuel	Customer Type	Electricity Provider	On-site or Mail-in	Reported Savings UES			Net Savings Adjustment Rate-adjusted UES			Audit Type Sample Size	Audit Type Population
						kWh	kW	dkt	kWh	kW	dkt		
A	Natural Gas NWE	Natural Gas NWE	Residential	NWE	On-site	240	0.07	14.10	172	0.05	5.85	26	4,184
B	Natural Gas NWE	Natural Gas NWE	Residential	Other	On-site	-	-	11.67	-	-	4.84	12	833
C	Natural Gas NWE	Electric Other	Residential	Other	On-site	-	-	4.38	-	-	1.82	2	351
D	Electric NWE	Electric NWE	Residential	NWE	On-site	1,514	0.40	-	1,083	0.29	-	8	235
E	Other Fuel Other	Electric NWE	Residential	NWE	On-site	602	0.04	-	430	0.03	-	3	109
F	Natural Gas NWE	Electric NWE	Residential	NWE	On-site	755	0.08	7.66	540	0.06	3.18	3	765
G	Electric NWE	Natural Gas NWE	Residential	NWE	On-site	490	-	7.55	350	-	3.13	-	47
H	Electric NWE	Electric NWE	Residential	NWE	On-site	1,437	0.10	-	1,027	0.07	-	4	75
O	Any fuel	Any fuel	Commercial	NWE	On-site	852	0.25	6.81	609	0.18	2.82	27	498
R	Natural Gas Other	Natural Gas Other	Residential	NWE	Mail-in	126	0.03	-	90	0.02	-	59	2,469

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. The table covers both the residential and commercial segments of the program. "Total Recruited" is the total number of customers who volunteered for an on-site inspection. "Total Completed" is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection.

We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited.

For the E+ Audit program, we successfully visited 152 sites encompassing six different strata. For the residential section, it was difficult to get in touch with customers; the Special Effort recruiting team was unable to speak with 26% of the sites they attempted to contact. There were also a high percentage of customers who declined a site visit (35%) or who could not be reached by the site inspector when it came time to schedule the visit or meet at the site (18 total "Onsite Refused")

Table 10: Site Recruitment Disposition for E+ Audit Home or Business

	Stratum						Total n	%
	1	2	9	10	11	(blank)		
Recruitment								
Telephone Lab	36	2	1	12	51	73	175	
Special Effort								
Attempts	0	0	2	18	0	14	34	
No Reply	0	0	0	7	0	2	9	26.5%
Refused	0	0	0	4	0	8	12	35.3%
Recruited	0	0	2	7	0	4	13	38.2%
Total Recruited	**36**	**2**	**3**	**19**	**51**	**77**	**188**	
Onsite								
Refused	1	0	0	4	8	5	18	9.6%
Not Needed	11	0	0	0	0	7	18	9.6%
Total Completed	**24**	**2**	**3**	**15**	**43**	**65**	**152**	**80.9%**

Site Inspections

We performed site inspections for a sample of 58 cases for the Home On-Site Audit, 59 cases for the Home Electric Survey and 27 cases for the Small Business Electric Appraisal components of the program for the 2010–2011 program years. Two Small Business Electric Appraisal sites that we inspected were subsequently not used in the evaluation because we met the stratum 1 quota without them. Also, six Home Electric Survey site visits that were assigned zero savings were removed from the sample when it was discovered subsequent Home On-Site Audits were performed at those sites.

The site visits allowed us to inspect both direct- and indirect-installed measures. We found that few indirect-install measures were implemented relative to the total number of such measures recommended in the audit reports. This is due to the fact that the list of recommended measures for each site was quite exhaustive. On the other hand, indirect-installed measures were implemented at 32 of the 58 sampled Home On-Site Audits cases, which is significant. Indirect-installed measures were found at 14 of the 59 sampled Home Electric Survey sites and at eight of the 27 sampled Small Electric Business Appraisal sites. The table below shows the frequency of indirect-installed measures for sites where such measures were implemented.

Table 11: Frequency of implemented indirect-install measures for the Home Audit On-Site and Home Electric Survey components

	Home Audit On-Site		Home Electric Survey	
Recommended Measures	**Count**	**Frequency**	**Count**	**Frequency**
Adjust Heating Setpoint	NA	NA	2	6.5%
Attic Insulation	6	8.3%	NA	NA
CFLs	10	13.9%	5	16.1%
Programmable T'Stats	2	2.8%	NA	NA
Adjust Cooling Setpoint	NA	NA	2	6.5%
Clean Refrigerator Coils	11	15.3%	4	12.9%
Electrical Box Foam Gaskets	NA	NA	1	3.2%
Furnace Filters	8	11.1%	2	6.5%
Launder with Cold Water	2	2.8%	2	6.5%
Low Flow Showerheads	NA	NA	2	6.5%
Reduce DHW Setpoint	4	5.6%	4	12.9%
Unplug second freezer	1	1.4%	1	3.2%
Unplug Second Refrigerator	1	1.4%	1	3.2%
Weatherstrip/Caulk Windows	4	5.6%	5	16.1%
Adjust Freezer Setpoint	1	1.4%	NA	NA
Adjust Refrigerator Setpoint	3	4.2%	NA	NA
Efficient Refrigerator	1	1.4%	NA	NA
Heating Fuel Switch	1	1.4%	NA	NA
Heating System Service	5	6.9%	NA	NA
Improve Window U-Value	5	6.9%	NA	NA
Insulate attic hatch	1	1.4%	NA	NA
Insulate Crawl Space	1	1.4%	NA	NA
Insulate Exterior Wall	1	1.4%	NA	NA
Insulate Rim Joist	1	1.4%	NA	NA

	Home Audit On-Site		Home Electric Survey	
Recommended Measures	**Count**	**Frequency**	**Count**	**Frequency**
Weatherstrip/Caulk Doors	3	4.2%	NA	NA
Total	**72**	**100%**	**31**	**100%**

We found a portion of the direct-install measures had been removed for the Home On-Site Audits after the audits were performed. A little more than half of the reported faucet aerators and low-flow showerheads were no longer in place, the most common reasons being bathroom remodels and dissatisfaction with the measure performance. Approximately 25% of the reported hot water tank and pipe wraps were also found to be missing.

Direct- and indirect-install measures were addressed for the Small Business Electric Appraisal component of the program in the same manner as they were for the residential components of the program. The commercial site inspections identified indirect-installed measures at eight of the 27 sampled sites for the Small Business Electric Appraisal component. The table below shows the frequency of installed recommendations for sites where measures were implemented.

Table 12: Frequency of implemented indirect-install measures for the Small Business Electric Appraisal component

Recommended Measures	Measure Count	Frequency	Number of Sites Receiving Measure[1]
Adjust Heating Setpoint	1	4%	1
Attic Insulation	1	4%	1
CFLs	10	42%	3
Programmable T'Stats	6	25%	2
Reduce Fan Hours	1	4%	1
Reduce Lighting Hours	1	4%	1
T5s	1	4%	1
T8s	3	13%	2
Total	**24**	**100%**	**8**

[1] The number of sites at which the measure was applied. Multiple types of measures installed at a single site resulted in the site being counted once for each implemented measure type. Eight separate sites actually installed indirect measures.

For the direct-install measures, we found an increase in the number of hot water tank wraps (from two to seven) and hot water pipe wraps (from 20 total feet of wraps to 43 feet), relative to the quantities reported. The only other reported direct-install measure was bathroom aerators, both of which were found to still be installed.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed to file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 13: File Review and Site Visit Adjustment to Savings for E+ Audit Home or Business

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	Home Electric Survey	kWh	1,319,803	1,319,803	726,910	943,669	1.00	0.55	0.72
	Home On-site Audit	kWh	5,858,730	5,858,730	2,860,946	4,189,035	1.00	0.49	0.72
	Small Business Electric Appraisal	kWh	1,255,306	1,255,306	1,903,460	897,553	1.00	1.52	0.72
Natural Gas									
	Home On-site Audit	dkt	178,920	178,920	75,614	74,207	1.00	0.42	0.41
	Small Business Electric Appraisal	dkt	10,371	10,371	2,949	4,301	1.00	0.28	0.41

3.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates by calendar year for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 14: Savings Adjustments by Calendar Year for E+ Audit Home or Business

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	E+ Audit Home or Business	kWh	2007	1,731,545	0.72	-	-	0.72	1,238,067	141
	E+ Audit Home or Business	kWh	2008	1,680,648	0.72	-	-	0.72	1,201,676	137
	E+ Audit Home or Business	kWh	2009	1,952,819	0.72	-	-	0.72	1,396,280	159
	E+ Audit Home or Business	kWh	2010	1,665,158	0.72	-	-	0.72	1,190,600	136
	E+ Audit Home or Business	kWh	2011	1,403,669	0.72	-	-	0.72	1,003,634	115
	E+ Audit Home or Business	kWh	All Years	8,433,839	0.72	-	-	0.72	6,030,257	688
Natural Gas - USB										
	E+ Audit Home or Business	dkt	2007	25,557	0.41	-	-	0.41	10,600	
	E+ Audit Home or Business	dkt	2008	35,389	0.41	-	-	0.41	14,678	
	E+ Audit Home or Business	dkt	2009	48,353	0.41	-	-	0.41	20,054	
	E+ Audit Home or Business	dkt	2010	43,633	0.41	-	-	0.41	18,097	
	E+ Audit Home or Business	dkt	2011	36,359	0.41	-	-	0.41	15,080	
	E+ Audit Home	dkt	All	189,291	0.41	-	-	0.41	78,509	

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	or Business		Years							
Electric										
	E+ Audit Home or Business	kWh	All Years	8,433,839	0.72	-	-	0.72	6,030,257	688
Natural Gas										
	E+ Audit Home or Business	dkt	All Years	189,291	0.41	-	-	0.41	78,509	

3.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 15: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Audit Home or Business

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	E+ Audit Home or Business	kWh	2007	1,238,067	0.31	0.31	0.26	0.35
	E+ Audit Home or Business	kWh	2008	1,201,676	0.31	0.31	0.27	0.34
	E+ Audit Home or Business	kWh	2009	1,396,280	0.41	0.41	0.36	0.45
	E+ Audit Home or Business	kWh	2010	1,190,600	0.36	0.36	0.33	0.40
	E+ Audit Home or Business	kWh	2011	1,003,634	0.42	0.42	0.38	0.46
	E+ Audit Home or Business	kWh	All Years	6,030,257	0.36	0.36	0.32	0.39
Natural Gas - USB								
	E+ Audit Home or Business	dkt	2007	10,600	1.30	1.30	0.80	1.43
	E+ Audit Home or Business	dkt	2008	14,678	2.57	2.57	1.55	2.82
	E+ Audit Home or Business	dkt	2009	20,054	0.91	0.91	0.74	1.00
	E+ Audit Home or	dkt	2010	18,097	0.86	0.86	0.74	0.95

	Business							
	E+ Audit Home or Business	dkt	2011	15,080	0.63	0.63	0.56	0.69
	E+ Audit Home or Business	dkt	All Years	78,509	1.01	1.01	0.80	1.11
Electric								
	E+ Audit Home or Business	kWh	All Years	6,030,257	0.36	0.36	0.32	0.39
Natural Gas								
	E+ Audit Home or Business	dkt	All Years	78,509	1.01	1.01	0.80	1.11

3.3. Process Evaluation

3.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with residential and commercial participants from the three components of the E+ Audit Home or Business program. We surveyed 83 Home On-site Audit participants, 110 Home Electric Survey participants, and 55 Small Business Electric Appraisal participants. No trade allies were involved with this program.

3.3.2. Implementation Findings

3.3.2.1. Interview Findings

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

NWE offers energy audits to both residential and business customers within its Efficiency Plus (E+) program portfolio. The residential offer consists of two different types of audits, an on-site, the Home On-site Audit, and a mail-in Home Electric Survey. Business customers receive the audit through the Small Business Electric Appraisal. The residential and commercial on-site audit process parallel each other, while the mail-in audit follows a different set of procedures.

An implementation contractor runs the audit programs and acts as a "transparent" agent for NWE.

On-Site Audits

Customers have several entry points into the audit process via numerous vehicles. Once a customer contacts NWE (the implementation contractor), program staff verifies the customer meets program participation requirements.[6] If a customer meets the requirements, staff schedules an appointment with the customer, and a team of two auditors, who are full-time implementation contractor employees with extensive residential and commercial knowledge, arrives on-site and begins the audit process.

During the process, the auditors collect details about the structure, the condition of equipment including HVAC and other types, levels of insulation, and tightness of windows and doors. In addition, if it is a home, the auditors perform natural gas appliance safety checks, tests for carbon monoxide levels, and performs a blower door test. The auditors conduct an energy use survey about how energy is used in the home or business. The auditor informs the customer which rebates the customer may be eligible for, provides copies of applicable rebate forms, preferred contractor lists, and other NWE literature. The customer may accompany the auditors throughout the process during which time auditors explain the conditions found to educate the customer about the energy savings potential of improvements.

During the audit, auditors also install low-cost, energy saving measures. Depending upon the customer qualifications and need, measures in a home or business audit consist of all or some of the following: water-heater insulation blankets, up to 10 feet of pipe insulation on a hot water supply line, low-flow faucet aerators and showerheads, and CFLs in high use locations (reported in the E+ Residential Lighting program or E+ Commercial Lighting program as appropriate), and , for home audits for gas space heat customers, the auditor leaves behind air-infiltration measures as appropriate that may include the following: door sweeps and weather strip, foam gasket outlet and switch-plate covers, spray foam insulation, window plastic, and a DVD on how to install each measure. A postage paid customer satisfaction comment card is provided to each customer to be returned to NWE staff.

During the audit, the auditors manually capture the audit data on an audit form. To minimize customer time requirements, the auditor performs all calculations and completes the audit form in the van. Then the auditor mails the audit form to the implementation contractor.

A program staff member reviews all audit forms. Staff who review the audits are former field personnel with experience and training in both the commercial and residential sectors. If staff identify discrepancies, they contact the auditor to address them. Once the audit forms are complete and verified, a different staff person enters the audit data into one of two database systems. The databases are RECAP for residential audit data and IN-SITE for commercial audit data. For residential audits, program staff electronically imports customers' NWE billing data into the corresponding audit record in RECAP. For commercial audits, staff manually enter the customer's NWE electric billing data into the IN-SITE database. The databases then generate a draft audit report.

[6] Residences using NWE natural gas or electricity for space heat or domestic water heat, that are at least five years old, and have not been previously audited are eligible for an on-site audit.

Program staff examine each audit report, disaggregate the energy use, and check for imbalances between estimated and billed energy use. If the reviewer notices an imbalance, the supporting data and calculations are reviewed, and if necessary, corrected prior to running the final audit report, which identifies energy saving recommendations, provides customer payback information, and provides information about NWE's E+ rebate programs.

Program staff mails the final audit report to the customer along with any other appropriate information. The customer then determines what improvements or upgrades to undertake. If a customer has a question or concern, staff attempts to resolve the issue.

Several weeks after the report is sent to the residential customer, a follow-up survey is sent to the customer. The survey reminds the customer of audit recommendations and asks for feedback about whether measures have been installed, and whether the customer intends to act on the recommendations. Customers are asked to complete the follow-up survey and return it to NWE.

Mail-In Audit (Home Electric Survey)

NWE customers targeted for a mail-in audit are residential customers who use NWE electricity for lighting and appliances only (base-load customers), that is, customers who do not use NWE electricity or NWE natural gas for space heat or domestic hot water heating.

These "do-it-yourself" audits require customers to provide information about the building-shell characteristics, appliances, and the customers' energy-use behavior. Customers return the completed survey to the program contractor where staff enter the information into the RECAP database and otherwise follow similar analytical processes of an on-site audit. The database generates a customized Home Electric Survey Report with electric usage data, energy-saving recommendations, and information about NWE's residential rebate programs. Customers receive a CFL as an incentive along with the report. According to NWE, the current mail-in audit return rate is approximately 10%, but that rate is declining, perhaps due to market saturation.

Audit Quality Assurance Practices

Quality assurance steps for residential and commercial energy audit program reports are identical except for one detail: the method of transferring customer billing data for report processing. For residential customers, billing data is transferred electronically from the utility to the implementation contractor's database. For commercial customers, billing data must be entered into the audit database manually, providing an opportunity for the introduction of typographical errors in the data transfer. Other quality assurance activities for both programs include:

- Review of the draft audit reports by analysts that were formerly auditors, prior to generation of final reports,
- Ongoing audit software development processes that include comparison of audit estimates of savings with actual *ex post* savings, and
- Postage-paid, customer-satisfaction cards left at each of the audited premises.

3.3.2.2. Best Practices Assessment

Table 16 through Table 19 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 16: Program Planning and Design Best Practices for E+ Audit Home or Business

Practice	NWE Assessment
Develop a sound program plan	NWE programs reflect this planning
▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	Opportunity exists to formalize the outcome of its planning efforts with written program plans Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions	NWE programs reflect strong understanding of local market conditions
▪ Conduct market research as necessary for understanding	▪ Example: NWE has multiple audit paths for different customer types
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate (especially evident in Audit programs)
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Maintain program funding throughout the year	Programs run year-round

Table 17: Program Management and Administrative Best Practices for E+ Audit Home or Business

Practice	NWE Assessment
Develop written process plan	Program roles, responsibilities, and management activities are clear to staff and implementers

Practice	NWE Assessment
▪ Include program management activities ▪ Identify roles and responsibilities	▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections
Keep participation simple	The program implementation contractor facilitates audit participation; participation is simple for the customer
Offer a single point of contact for AUDIT customers	The implementation contractor provides a single point of contact; program application materials clearly identify who to contact
Offer assistance in preparing and submitting program applications	The auditor and audit report facilitate participants' applications to the rebate programs for recommended measures
Use internet to facilitate participation	NWE's website clearly presents program information
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Make customer follow-up part of the implementation contractor's responsibility ▪ Conduct follow-up calls to provide estimate of number of measures installed without rebates	Opportunity exists for systematic follow-up after audits

Table 18: Marketing and Outreach Best Practices for E+ Audit Home or Business

Practice	NWE Assessment
Feature links to audits prominently on utility website	NWE has a link to audits on the first page of the energy efficiency section

Practice	NWE Assessment
For mail-based audits, include the audit form with the audit offer and make the offer letter succinct and compelling	Audit program does this
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures	NWE emphasizes energy and cost savings
▪ Tailor messages to audiences	▪ Opportunities exist to further promote non-energy benefits
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 19: Program Quality Control Best Practices for E+ Audit Home or Business

Practice	NWE Assessment
Develop accurate algorithms and assumptions on which to base savings estimates	NWE and its implementation contractor has developed such algorithms; NWE conducts periodic impact evaluations and revises its algorithms as warranted back on evaluation outcomes
Assess customer satisfaction	Audit participants receive a "How did we do?" card. NWE assesses satisfaction with all programs during its program cycle evaluation each five years

3.3.3. Participant Findings

As part of our process evaluation of the E+ Audit Home or Business program, we completed telephone surveys with participants of three separate components of this program: the Home On-site Audit, the Home Electric Survey, and the Small Business Electric Appraisal.

Interpreting Response Frequencies from Stratified Samples

For the Home On-site Audit and the Small Business Electric Appraisal components, we surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding "don't know" or "not applicable") and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

3.3.3.1. Home On-site Audit

We conducted 83 phone surveys with Home On-Site Audit participants to assess their experiences with this component of the E+ Audit Home or Business program.

Information Access, Awareness, and Decision Making

Program participants provided general feedback about how they learned about energy efficiency home on-site audits from NorthWestern Energy, the types of additional information they wanted, as well providing information about their decision to install items recommended in the Home On-site Audit Program.

Few respondents (29%) had visited the utility website. While 20% of the participants reported "no internet access" as the reason, for three-quarters of respondents the reason could be summarized as a lack of interest (Table 20).

Table 20: Reasons Website Not Used, among Home On-site Audit Participants

	Weighted Percent (n=57)
Don't like to use it much	44%
Don't have access	20%
No need or no reason to	19%

	Weighted Percent (n=57)
Never thought to	6%
Didn't know they had one	4%
Just haven't	3%
Other	4%

For the participants who did use the website there were two primary motivations: about half looked for utility contact information, and half paid their utility bill (Table 21).

Table 21: Website Use, among Home On-site Audit Participants

Reasons for use (Allowed Multiple)	Weighted Percent (n=24)
Utility contact information (n=24)	49%
Pay utility bill (n=24)	46%
Learn about rebates or audits (n=24)	41%
Money saving tips (n=24)	17%
Energy saving educational opportunities (n=24)	15%
How-to videos (n=24)	6%
Track energy usage (n=24)	6%
Other use of website (n=24)	10%

Two-thirds (69%) of the 21 respondents who had used the website thought the website information was easy to find and helpful. Just two individuals disagreed and reported difficulty navigating (Figure 1).

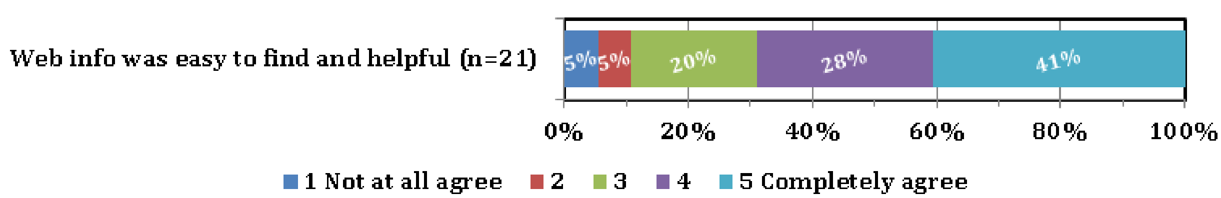

Figure 1: Website Effectiveness, among Home On-site Audit Participants

Nearly half (48%) of these participants do not want further information from the utility, but about the same number (46%) would like information on energy saving education opportunities (Table 22).

Table 22: Further Information Desired, among Home On-site Audit Participants

(Allowed Multiple)	Weighted Percent
Does not want any (n=83)	48%

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=83)	46%
Energy efficiency programs (n=83)	29%
Workshops or events on energy efficiency (n=83)	20%

Home audit participants in this program prefer to receive information by mail (86%), followed by email and telephone outreach (Table 23).

Table 23: Information Delivery Preference, among Home On-site Audit Participants

(Allowed Multiple)	Weighted Percent
Mail (n=43)	86%
Email (n=43)	32%
Phone (n=43)	26%
Community event (n=43)	17%
Trainings, workshops or seminars (n=43)	17%
Webinar (n=43)	9%
Other (n=43)	8%

Participants became aware of the home on-site audit program chiefly through noticing a utility publication or advertisement (94%). Over one-third directly contacted the utility themselves (Table 24).

Table 24: Means of Program Awareness, among Home On-site Audit Participants

Means (Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=80)	94%
Directly contacted utility (n=79)	38%
Utility representative appearance (n=82)	15%
Word of mouth (n=82)	14%
Heard of program other ways (n=82)	14%
Building professional, vendor, or contractor (n=82)	4%

Respondents were asked about reasons they wished to have a home energy audit, and they cited reducing energy costs and increasing the comfort of their home most often (Table 25).

Table 25: Reasons for Audit, among Home On-site Audit Participants

Received audit because I wanted to… (Allowed Multiple)	Weighted Percent
Reduce energy costs (n=83)	91%
Increase home comfort (n=82)	70%
Check on specific equipment performance/safety (n=83)	47%
Renovate home soon (n=83)	10%
Purchase new appliances (n=83)	8%

Respondents cited many reasons to participate in the home audit program: to save energy, to save money, because items were free, and because they trusted utility-selected equipment and utility programs (Table 26).

Table 26: Reasons For Program Participation, among Home On-site Audit Participants

(Allowed Multiple)	Weighted Percent
Save energy (n=83)	93%
Save money (n=83)	88%
Items were free (n=83)	76%
Installed equipment would be reliable (n=83)	71%
Good experience with utility program	29%

When considering the offer of an audit, 95% of respondents said they had no concerns about accepting the on-site program offer. Four individuals among the 83 respondents hesitated at first.

Program Experience

Respondents reported on their audit program experience during the audit, installation, and follow-up processes, as well as on their overall satisfaction with the program.

Respondents agreed that the great majority (77%) of the on-site auditors offered to help toward implementing recommendations. Eight in ten of surveyed participants agreed or completely agreed that the auditor helped them understand their choices to increase energy efficiency and pursue installation (Figure 2).

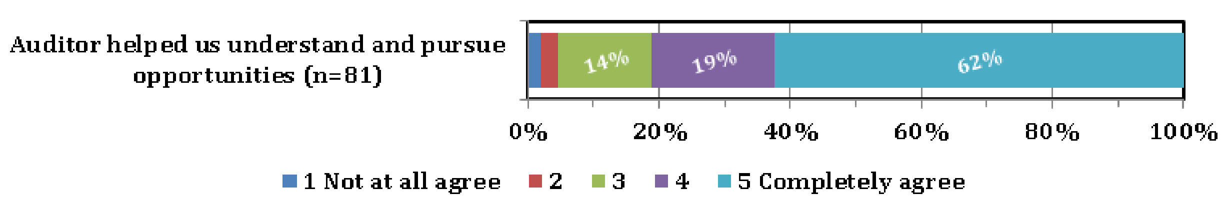

Figure 2: Auditor Advice Quality, among Home On-site Audit Participants

Sixty percent of respondents recalled that auditors made energy efficiency equipment recommendations; 76% of those had installed at least some of the recommendations and 26% had installed all recommendations. About half of the non-implementers (49%) still intended to implement the other recommendations in the next year (Table 27).

Table 27: Audit Recommendations and Implementation, among Home On-site Audit Participants

	Weighted Percent
Recalled Auditor making recommendations (n=82)	60%
Equipment or upgrades (any) have been installed (n=49)	85%
Some recommendations have been implemented (n=42)	74%
"All" recommendations have been Implemented (n=42)	26%
Planning to implement recommendations this year (n=29)	49%

As might be expected, respondents cited many barriers to the installation of recommended upgrades (Table 28).

Table 28: Barriers to Installation, among Home On-site Audit Participants

Barrier (Allowed Multiple)	Weighted Percent
Costs too much (n=17)	35%
Already efficient (n=17)	28%
Moving soon (n=17)	15%
Takes too much time (n=17)	14%
Don't need to (n=17)	7%
Not sure what to do (n=17)	2%
Don't know why (n=17)	0%

The vast majority (91%) of respondents recalled the inclusion of free or inexpensive recommendations in their audit, and there was a healthy uptake of these low-cost recommendations: 95% of these participating households had taken some of the steps (Table 29).

Table 29: Low-Cost Steps Taken, among Home On-site Audit Participants

(Allowed Multiple)	Weighted Percent
Turn Down Thermostat Temperature (n=72)	60%
Turn Off Lights (n=72)	37%
Turn Off Entertainment Devices (n=72)	13%

(Allowed Multiple)	Weighted Percent
Turn Down Temperatures on Appliances (n=72)	10%
Install Weatherization Item (n=72)	10%
Change To Compact Fluorescent Lights (n=72)	8%
Turn Off Electronics (n=72)	7%
Wash Clothes in Cold Water (n=72)	7%
Install Insulation (n=72)	6%
Install Low-Flow Plumbing Item (n=72)	4%
Close Window Coverings (n=72)	3%
Unplug Devices (n=72)	3%
Get Programmable Thermostat (n=72)	3%

Nearly all (97%) of the installed audit recommended items were still installed at the time of the survey. One or two participants felt the aerators did not allow enough water to pass through.

Respondents were asked, in the event the auditor had *not* installed items for them, if they would have installed energy-saving items on their own in the next year. Items identified, in descending order, were water heater tank wraps, pipe insulation, low-flow showerheads, and faucet aerators (Table 30).

Table 30: Items Would Install On Own, among Home On-site Audit Participants

(Allowed Multiple)	Weighted Percent
Water heater tank wrap (n=16)	58%
Low-flow showerhead (n=16)	42%
Faucet aerators (n=16)	42%
Pipe insulation (n=16)	30%

Inertia was a frequent reason respondents gave for not installing items in the past: 42% indicated they "haven't gotten around to it" (Table 31).

Table 31: Reasons Energy Efficiency Items Not Installed Before, among Home On-site Audit Participants

Reason	Weighted Percent (n=14)
Haven't gotten around to it	41%
Too difficult	16%
Takes too much time	8%
Other	35%

Home on-site audit respondents were highly satisfied with the clarity of program information offered, with half or more saying the information on most topics was "Very Clear" (Figure 3).

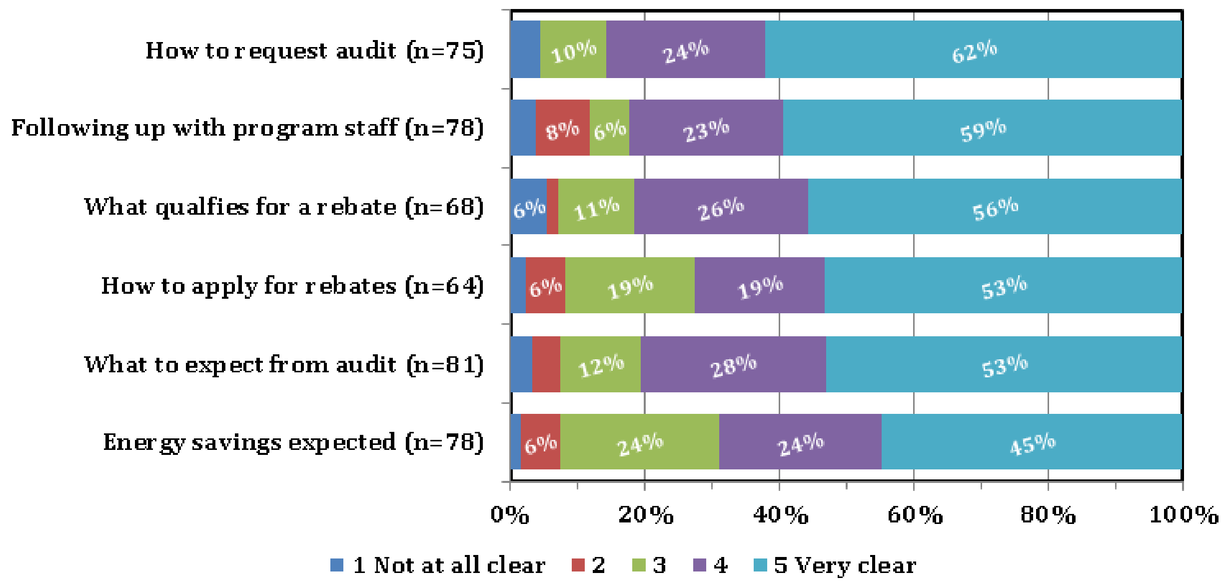

Figure 3: Clarity of Program Information, among Home On-site Audit Participants

Likewise, a strong majority of respondents "Completely Agreed" with nearly all of the statements presented that describe customer satisfaction with the audit phases. The only exception was that only 23% of the respondents "Completely Agreed" they noticed a comfort improvement at home (Figure 4).

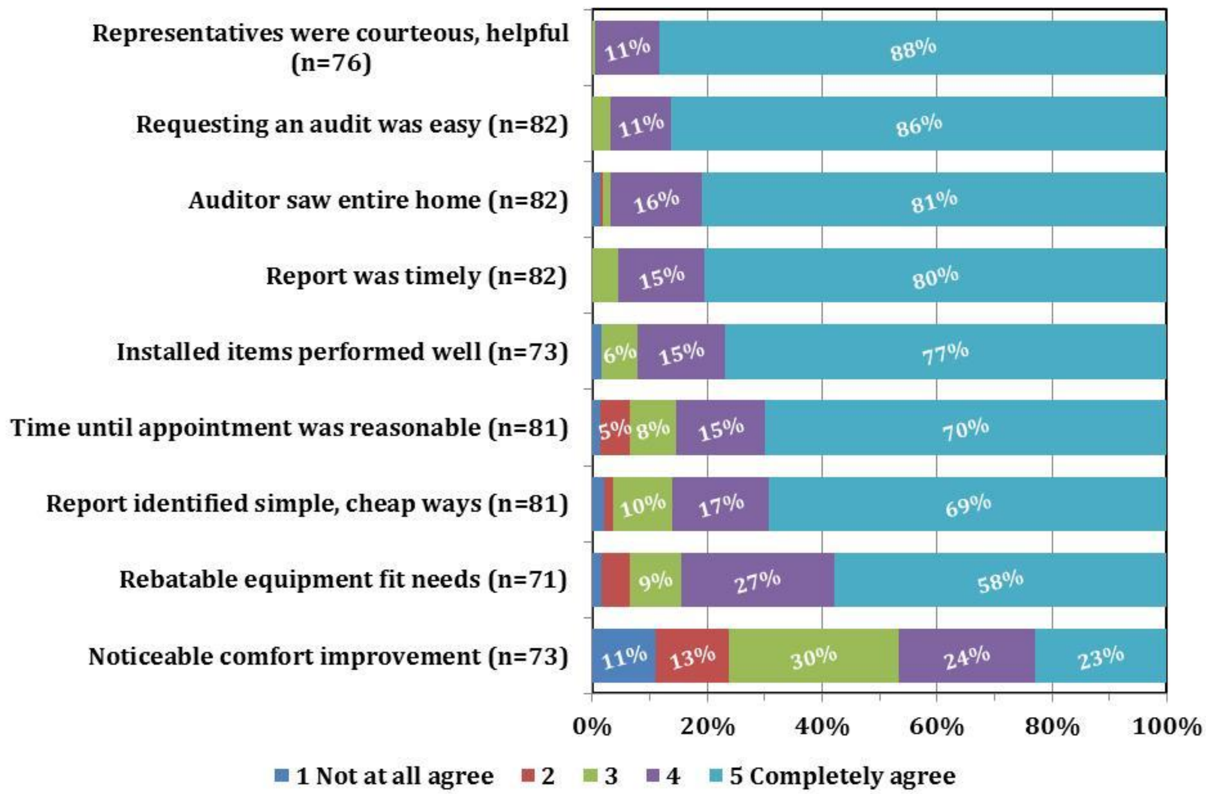

Figure 4: Satisfaction with Audit Process, among Home On-site Audit Participants

For general indicators of overall satisfaction with NorthWestern Energy's efficiency activities, the survey asked respondents about future program participation. Three-fourths of respondents were likely or very likely to participate in future utility energy efficiency programs (Figure 5).

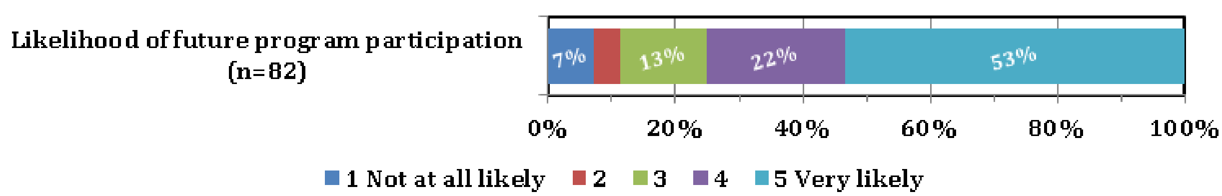

Figure 5: Likelihood of Future Participation, among Home On-site Audit Participants

Concluding open-ended comments were most often neutral suggestions or positive praise, other than criticism of CFL bulb performance by 29% of the commenters.

3.3.3.2. Home Electric Survey

We conducted 110 phone surveys with Home Electric Survey participants to assess their experiences with this component of the E+ Audit Home or Business program.

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NorthWestern Energy and what types of additional information they wanted from the utility, as well as providing information about their decision to purchase appliances or other actions recommended by the Home Electric mail survey results.

Respondents became aware of the home electric efficiency program chiefly through noticing a utility publication or advertisement (88%). Another 12% heard about it from a utility representative appearing at an event or meeting (Table 32).

Table 32: Means of Program Awareness, among Home Electric Survey Participants

Means (Allowed Multiple)	Percent
Utility publication or advertisement (n=108)	88%
Utility representative appearance (n=110)	12%
Directly contacted utility (n=109)	10%
Word of mouth (n=109)	9%
Building professional, vendor, or contractor (n=108)	7%
Other (n=108)	16%

Few respondents (26%) had visited the utility website. Almost one-third (30%) of those participants reported “no internet access” as the reason. One-third of non-visitors reported they didn’t like to use the internet much (Table 33).

Table 33: Reasons Website Not Used, among Home Electric Survey Participants

Reason	Percent (n=80)
Don't like to use it much	34%
Don't have access	30%
No need or no reason	18%
Never thought to	8%
Just haven't	6%
Didn't know they had one	3%
Other	3%

For the quarter of respondents who did use the website there were two primary motivations: at least two-thirds were looking for utility contact information, and/or paid their utility bill. About one in five of the internet users looked for money-saving tips on energy bills as well (Table 34).

Table 34: Website Use, among Home Electric Survey Participants

(Allowed Multiple)	Percent
Pay utility bill (n=28)	71%
Utility contact information (n=28)	64%
Money saving tips (n=28)	21%
Learn about rebates or audits (n=28)	14%
How-to videos (n=28)	7%
Energy saving educational opportunities (n=28)	7%
Track energy usage (n=28)	4%

Two-thirds of the 27 website users in this survey reported that the website information was easy to find and helpful. Just one individual disagreed and reported difficulty finding information (Figure 6).

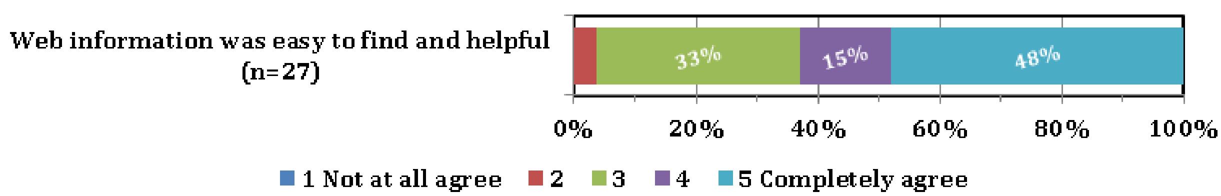

Figure 6: Website Effectiveness, among Home Electric Survey Participants

Half of respondents, 52%, would like more information on energy efficiency educational opportunities, while about four in ten would like to learn more about utility energy efficiency programs. Over one-third require no further information from NorthWestern (Table 35).

Table 35: Further Information Desired, among Home Electric Survey Participants

Information Type (Allowed Multiple)	Percent
Energy saving educational opportunities (n=110)	52%
Does not want any (n=110)	41%
Energy efficiency programs (n=110)	39%
Workshops or events on energy efficiency (n=110)	15%

Those wanting further information prefer to receive information sent by mail (98%), followed by email (33%). Community events and telephone outreach were requested by one in four of these interested respondents (Table 36).

Table 36: Information Delivery Preference, among Home Electric Survey Participants

(Allowed Multiple)	Percent
Mail (n=64)	98%
Email (n=64)	33%
Phone (n=64)	25%
Community event (n=64)	25%
Trainings, workshops or seminars (n=64)	17%
Webinar (n=64)	11%

Participants who filled out the mailed-in energy audit form were most interested in reducing energy costs (74%) and increasing home comfort (50%; Table 37).

Table 37: Reasons To Participate, among Home Electric Survey Participants

Reason (Allowed Multiple)	Percent
Reduce energy costs (n=108)	74%
Increase home comfort (n=109)	50%
Check specific equipment performance (n=110)	26%
Looking to buy new appliances (n=110)	15%
Plans to renovate (n=109)	9%

When considering whether to fill out the Home Electric Survey, 93% of the participants said they had no concerns about participating. A few (7) individuals among the 104 participants hesitated at first, anticipating too much length or difficulty.

Program Experience

Respondents reported on their experience after mailing in their home audit questionnaire, receiving results, installing any upgrades, as well as on their overall satisfaction with the home Electric Survey.

Respondents recalled recommendations made by mail 45% of the time. Over half of those respondents reported implementing at least some of these recommendations. Of these twenty respondents who made changes, 25% implemented "all" and 75% implemented "some" of the suggestions from the utility (Table 38).

Table 38: Audit Recommendations and Installation, among Home Electric Survey Participants

	Percent
Recalled audit making recommendations (n=87)	45%
Equipment or upgrades (any) have been installed (n=38)	55%
"Some" recommendations have been implemented (n=20)	75%
"All" recommendations have been Implemented (n=20)	25%
Planning to implement recommendations this year (n=13)	38%

The most common barrier to respondents' installation of recommended upgrades was that the changes would "cost too much" (Table 39).

Table 39: Barriers to Installation, among Home Electric Survey Participants

Barrier (Allowed Multiple)	Percent
Costs too much (n=10)	60%
Already efficient (n=10)	20%
Don't know why (n=10)	10%
Don't need to (n=10)	10%
Takes too much time (n=10)	0%
Not sure what to do (n=10)	0%
Moving soon (n=10)	0%

Just over three-quarters (76%) of respondent reported that their audit reports included free or inexpensive recommendations. There was significant follow-through on these types of recommendations with 78% of the participating households taking some of the low-cost steps. This can be compared to the 55% who implemented any of the total, possibly expensive recommendations (Table 40).

Table 40: Low-Cost Steps Taken, among Home Electric Survey Participants

Steps Taken (Allowed Multiple)	Percent (n=60)
Turn down thermostat temperature (n=60)	52%
Turn off lights (n=60)	47%
Change to compact fluorescent lights (n=60)	15%
Turn Down Temperatures on Appliances (n=60)	13%
Turn off entertainment devices (n=60)	12%
Install weatherization item (n=60)	10%
Unplug devices (n=60)	8%

Steps Taken (Allowed Multiple)	Percent (n=60)
Install insulation (n=60)	8%
Turn off electronics (n=60)	5%
Open window coverings (n=60)	3%
Get programmable thermostat (n=60)	3%
Close window coverings (n=60)	2%
Use fan instead of AC (n=60)	2%
Watch household member usage (n=60)	2%

The majority (63%) of electric survey participants gave high ratings to the clarity of the program information offered, rating it to be “clear” or “very clear” (Figure 7).

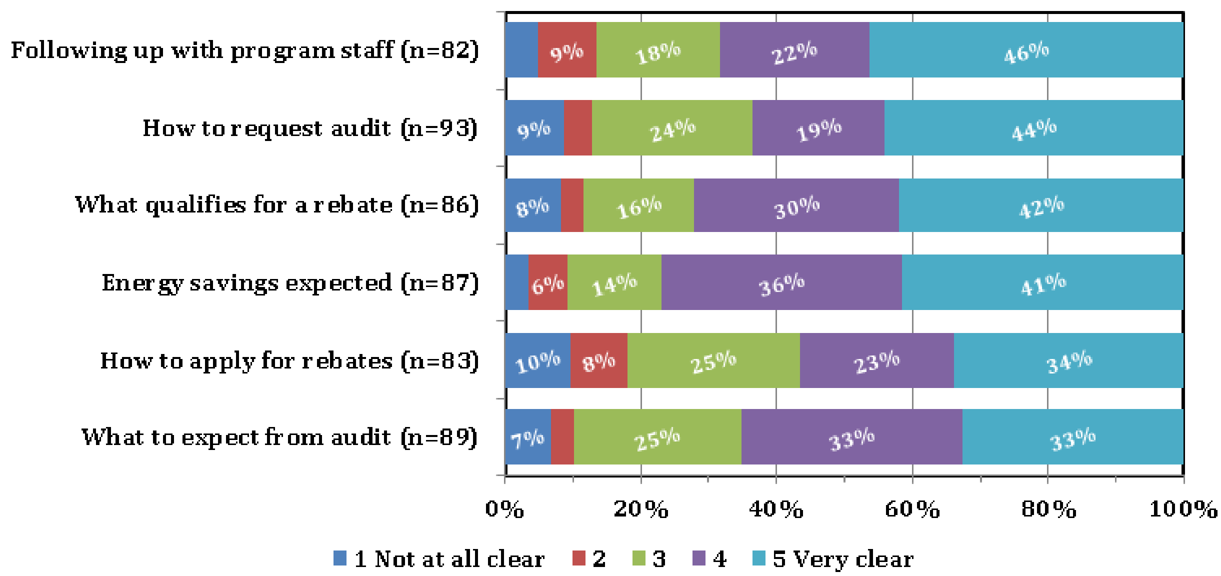

Figure 7: Clarity of Program Information, among Home Electric Survey Participants

As a general indication of overall satisfaction with NWE’s efficiency activities, the survey asked participants about future participation. The majority of participants (54%) said they were likely or very likely to participate in future utility energy efficiency programs (Figure 8).

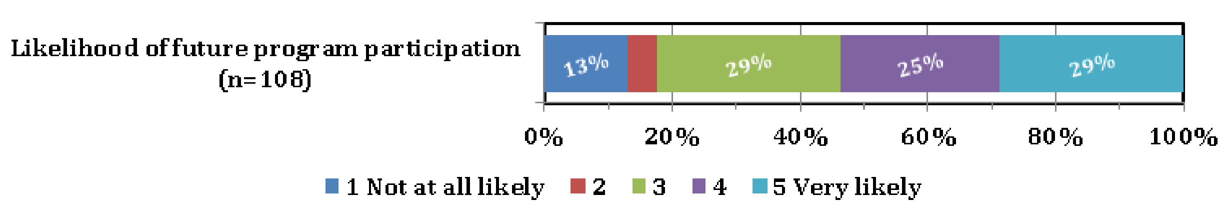

Figure 8: Likelihood of Future Participation, among Home Electric Survey Participants

3.3.3.3. Small Business Electric Appraisal

We surveyed 55 commercial customers who received an electric energy appraisal from NWE's Small Business Electric Appraisal Program.

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NorthWestern Energy and what types of additional information they wanted from the utility, as well providing information about their decision to purchase appliances or other actions recommended by the Home Electric mail survey results.

Just under 40% of these commercial respondents had visited the utility website. Most who had not visited the website mainly reported having "no need" or "reason" to go to the site (39%; Table 41).

Table 41: Reasons Website Not Used, among Small Business Electric Appraisal Participants

	Weighted Percent (n=27)
No need or no reason	39%
Don't have access	25%
Just haven't	16%
Never thought to	8%
Don't like to use it much	5%
Other	4%
No time	4%

Among 21 respondents in this group who had been to the website, at least half accessed the site to pay their utility bill or find utility contact information. Additionally, 46% wanted to learn about rebates or audits (Table 42).

Table 42: Website Use, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=21)	59%
Pay utility bill (n=21)	54%
Learn about rebates or audits (n=21)	46%
Money saving tips (n=21)	34%
Energy saving educational opportunities (n=21)	15%
Other reasons (n=21)	10%
How-to-videos (n=21)	10%

Among those accessing the site, most "agree" or "completely agree" that the web information they were looking for was easy to find and helpful (Figure 9).

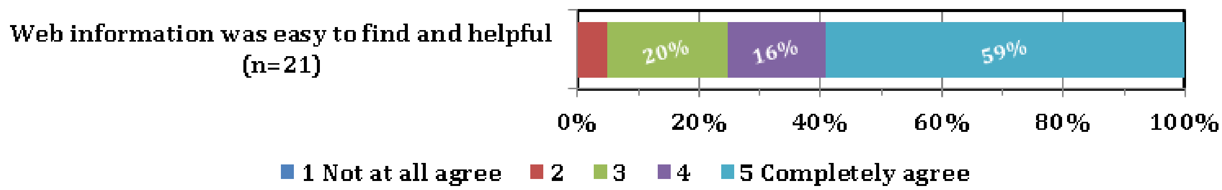

Figure 9: Website Effectiveness, among Small Business Electric Appraisal Participants

About half of Small Business Electric Appraisal respondents would like more information on energy–saving educational opportunities (56%). A substantial minority (44%) also wanted more information about energy efficiency programs (Table 43).

Table 43: Further Information Desired, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=55)	56%
Energy efficiency programs (n=55)	44%
Does not want any (n=55)	39%
Workshops or events on energy efficiency (n=55)	27%

About two-thirds of those desiring further information prefer to receive information by mail (62%) or email (60%). All other distribution methods were preferred by less than one-fourth of these respondents (Table 44).

Table 44: Information Delivery Preference, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
US mail (n=34)	62%
Email (n=34)	60%
Webinar (n=34)	25%
Community event (n=34)	21%
Workshop (n=34)	12%
Phone (n=34)	10%
Other (n=34)	3%

Respondents became aware of the NWE's appraisal offer chiefly through an advertisement or publication about the program (73%), or they directly contacted the utility (50%). Additionally, about 35% heard of program by word of mouth or from a building professional (Table 45).

Table 45: Means of Program Awareness, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=54)	73%
Directly contacted utility (n=55)	50%
Building professional, vendor, or contractor (n=55)	38%
Word of mouth (n=54)	36%
Utility representative appearance (n=55)	25%
Other (n=55)	2%

The great majority of respondents (92%) had no issues or concerns when first considering the appraisal opportunity. Those four who were concerned thought the program might be too difficult or confusing.

When reflecting on their reasons for deciding to participate in the appraisal program, by far the largest group of respondents (87%) were motivated by the chance to reduce energy costs. Other reasons had majority response as well, such as ease of arranging an audit, increased building comfort, and checking on specific equipment's performance (Table 46).

Table 46: Reasons for Program Participation, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
Reduce energy costs (n=55)	87%
Easy to use the program (n=55)	55%
Increase facility comfort (n=55)	53%
Check specific equipment performance (n=55)	52%
Considering upgrades to operations already (n=55)	50%
Good experience with other NWE efficiency program (n=53)	37%
Contractor recommendation (n=54)	22%
Utility suggested participation (n=54)	21%

Program Experience

Surveyed participants reported on their program experience and rated the appraisal and installation process in the Small Business Electric Appraisal program, then reflected on future participation in NWE efficiency programs.

A strong majority of Small Business Electric Appraisal respondents rated information they received about certain program process steps as "clear" or "very clear." Fewer (53%) of these respondents rated as highly the clarity of information on "how to apply for rebates" (Figure 10).

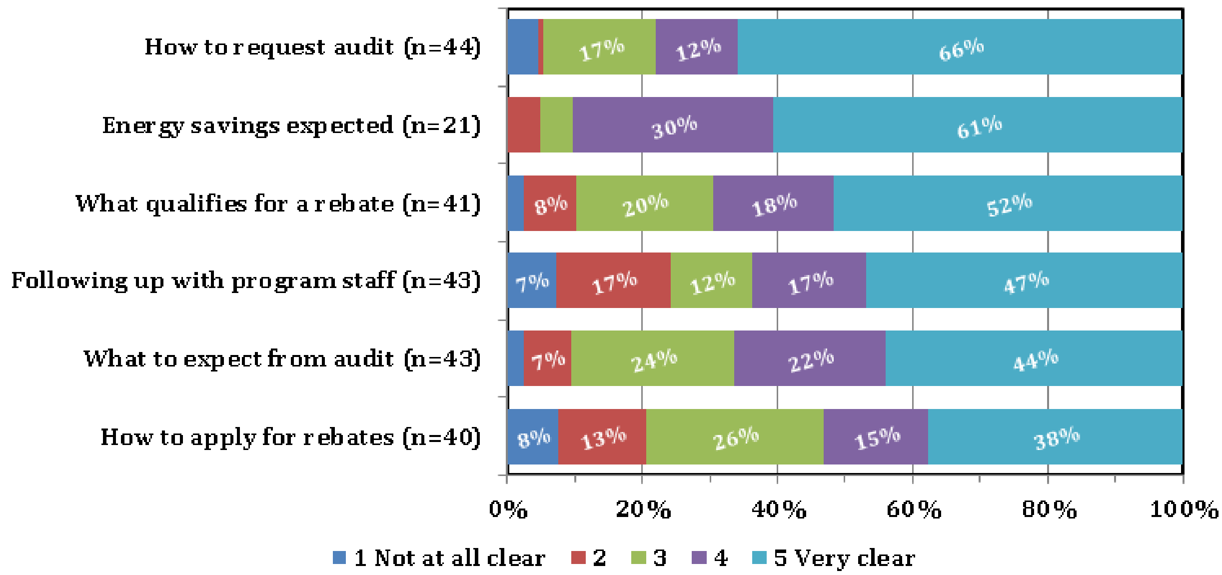

Figure 10: Clarity of Information, among Small Business Electric Appraisal Participants

When asked to rate their agreement with six positive statements about the quality of the implementation process, majorities of Small Business Electric appraisal respondents either "completely agreed" or "agreed" with each statement (Figure 11). For example, 87% "completely agreed" the utility representatives were courteous and helpful.

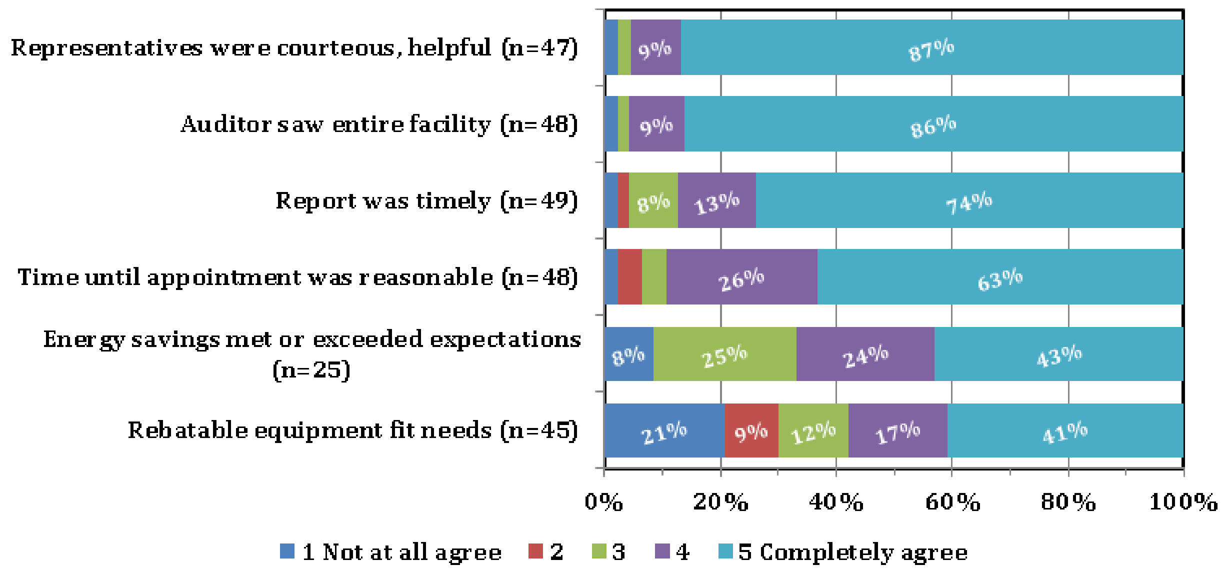

Figure 11: Experience With Appraisal Process, among Small Business Electric Appraisal Participants

Most respondents agreed (81%) that their auditor helped them understand the recommendations and pursue the energy-saving opportunities (Figure 12).

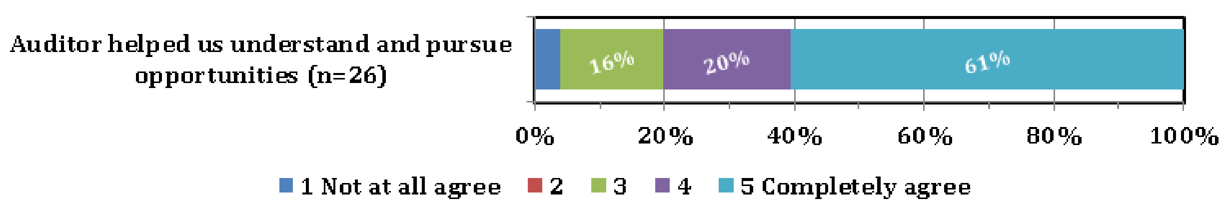

Figure 12: Auditor Performance, among Small Business Electric Appraisal Participants

Table 47 summarizes the types of recommendations and assistance provided by the auditor, as well as respondents' progress on implementing these recommendations. Over half (58%) of respondents reported their energy auditors offered help on how to implement recommendations. Over half (59%) also reported that their organization had already implemented at least some of the recommendations. Among those who had not yet implemented appraisal recommendations (41%), over half said they planned to take action next year.

Among those three-fourths of respondents reporting that their appraisal reports included free or inexpensive recommendations, a high proportion (89%) had taken at least some of these recommended steps.

Table 47: Recommendations and Implementation, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
Auditors offered to help implement (n=46)	58%
Has your organization implemented ANY of the equipment/upgrades recommended in audit report? (n=45)	59%
Do you plan to implement any of the recommendations in the next year? (n=20)	59%
Did the audit report include free or inexpensive steps? (n=50)	77%
Has your organization taken any of those steps? (n=38)	89%
All of the low-cost steps? (n=27)	15%
Some of the low-cost steps? (n=27)	81%

When asked about the types of steps taken to save energy that do not require equipment upgrades, 34 of 55 respondents (62%) reported taking no or low cost actions. Several contacts actually mentioned installing controls, including programmable thermostats and motion sensors. Behavioral actions mentioned included turning down temperatures and turning off electronics when not in use (Table 48).

Table 48: Low-Cost Items Installed, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
Turn off electronics (n=34)	43%
Turn down temperatures (n=34)	32%
Get programmable thermostat (n=34)	29%
Install motion sensors (n=34)	9%
Close off unused areas (n=34)	9%
Install weatherization item (n=34)	3%

Those respondents who said they had not yet installed all of the recommended equipment commented on the potential barriers to completing these upgrades in the next year (Table 49). The most commonly mentioned barrier was cost. None of these respondents mentioned not knowing what to do as a barrier.

Table 49: Barriers to Installation, among Small Business Electric Appraisal Participants

Barrier	Weighted Percent
Costs too much (n=23)	72%
Takes too much time (n=23)	13%
Other (n=23)	15%

While conducting appraisals, and where applicable, auditors directly installed some or all of the energy saving items listed below (Table 50). Respondents were asked to recall which of these efficiency equipment items were installed during their appraisal. Just under half of the respondents (45%) recalled at least one item being installed.

Table 50: Items Installed, among Small Business Electric Appraisal Participants

(Allowed Multiple)	Weighted Percent
None of those mentioned installed (n=55)	55%
Water-heater blanket installed (n=55)	30%
Pipe wrap installed (n=55)	19%
Low-flow showerhead(s) installed (n=55)	15%
Low-flow faucet aerators installed (n=55)	13%

As a general indication of overall satisfaction with NWE's efficiency activities, the survey asked participants about future participation in efficiency programs. Three-quarters of respondents were inclined toward future participation in NWE efficiency programs (57% "very likely" and 18% "likely" to participate; Figure 13).

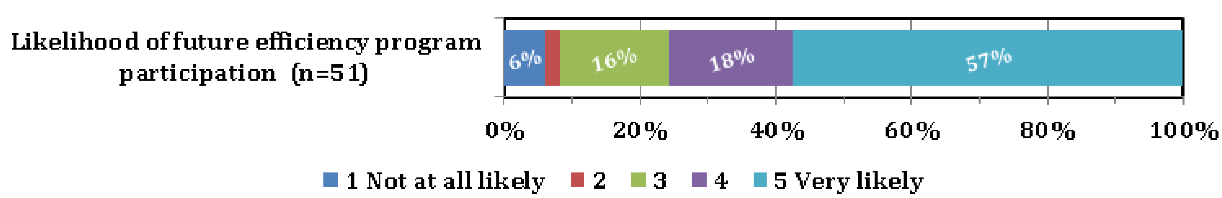

Figure 13: Likelihood of Future Participation, among Small Business Electric Appraisal Participants

3.3.4. Trade Ally Findings

No trade allies were involved in this program.

3.4. Recommendations

3.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Report improvements**: First, consider reorganizing audit reports so recommendations are more obvious to a customer who is reading the report quickly. The site inspections for the residential mail-in and on-site audits revealed that many of the customers who received an audit did not remember that they received energy savings recommendations. Many customers did not remember receiving the audit report. Many of those who did receive the report did not see the recommendations because they were included in the Energy Summary section of the report, which was rarely read.

  Second, consider making audit recommendations in the report as specific as possible. Customers are less likely to pay attention to generically-worded recommendations.

  Third, consider redesigning the audit report envelope so that customers are less likely to discard the report without opening it.

- **Report follow-up**: Consider placing follow-up phone calls to each audit customer after they receive the report to make sure that they received it, see if they read it, and answer any questions they may have. A simple tracking of follow-up results could inform NWE of the effectiveness of the reports and provide an opportunity for customer feedback.
- **Flow rate adequacy**: Residential site inspections revealed that customers sometimes removed direct-install aerators and showerheads because the flow rate was too low. This was especially true at homes with low water pressure. In the future, auditors should pay more attention to the flow rate after these items are installed and demonstrate measure performance to the customer (if this is not being done already) before leaving the home. The measure should be removed if the customer is not satisfied. A measurement of the post-retrofit flow rate by the auditor may assist in this decision process.
- **Revised unit savings**: Develop revised UES values for each audit type, based on the results of this evaluation.
- **Increased marketing:** Consider increasing marketing efforts to increase awareness of the efficiency opportunities that NWE offers. During the site inspections, many customers inquired about getting incentives for efficiency improvements that they were considering. Often they were not aware that they could go to the NWE website to get information regarding the efficiency programs.

3.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. It follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Audit participants (recall the sample was restricted to Audit-only; no rebate participation) are interested in efficiency: over half of audit participants would like more information on energy saving opportunities. Just over half of participants recalled that their auditor had made recommendations for upgrades. Of these, nearly all reported having completed at least some of the upgrades. At the same time, nearly a fifth of respondents said they had no plans this year to implement any of the recommendations received, most commonly due to cost considerations. While most participants found information about rebates and following up with program staff clearly communicated, a minority of participants were confused about the next steps. This was particularly true of Home Electric Survey participants and Small Business Electric Appraisal participants: over a fifth of small business participants were unclear about how to apply for rebates, and even more felt that the rebated equipment would not meet their needs.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.

- **Mail rebate reminders:** Consider mailing, about six to twelve months after the audit, those participants for whom the audit identified specific rebate opportunities, reminding them of incentives. Consider cross-referencing the audit participants with rebate participants at the six- or twelve-month juncture to estimate conversion rates and to target participants for the mailing.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

4. E+ Building Blocks Pilot

4.1. Program Description

The Building Blocks Pilot was developed in 2009 to offer free high-quality investment-grade audits within a concentrated area with a goal of increasing participation in NWE electric rebate, gas rebate, and/or custom incentive programs. The pilot program differs from the E+ Appraisal for Business commercial audit program in that the audits were not requested by the customer and that a more extensive audit service was provided. The pilot targeted small commercial customers within a three square block area on East Main Street in downtown Bozeman. Although the focus was on small commercial customers, a few of the buildings also included residential units which were audited as part of the building. The program was funded by DSM funds.

The three block area has approximately 45 buildings with 50 gas and 100 electric accounts. All customers in the pilot area were contacted and offered the free energy audits. The outreach effort resulted in 46 audit reports with recommendations for energy efficiency measures and improvements to operation and maintenance practices. The reports presented analyses to support the case for energy efficiency measures and, in many cases, estimated NWE rebates where applicable.

The audit reports are detailed and contain an educational component with summaries of the customer's energy use, NWE tariff information, NWE energy efficiency program information, lighting equipment schedules, energy savings tips, Energy Star program information, lighting equipment information, and articles on energy efficiency selected for relevance to the site.

The audit reports specify particular NWE programs for which the customer is eligible and how to access those services.

4.1.1. Energy Savings

NWE did not claim energy savings for the pilot. After about one year, a survey of NWE program records did not reveal any participation in NWE's energy efficiency programs by the accounts in the pilot area.

4.1.2. Marketing

NWE or its audit contractor, the National Center for Appropriate Technology (NCAT), met in person with each customer (building owner and current tenants in each building) eligible for the Building Blocks Pilot to offer the audits. At the completion of the pilot, events were held for the participants to encourage follow through with the recommendations of the audit and to present results. The customers (building owners and building tenants) were contacted primarily by phone approximately six months and one year after the audits were completed to remind them about the audit and continue to encourage them to participate in NWE's various electric and natural gas conservation programs. Outreach and follow-up for this pilot was provided by both NCAT and NWE staff.

4.2. Impact Evaluation

4.2.1. Methodology

We performed an impact evaluation of this pilot program to assess the gross and net energy (kWh and dkt) and demand (kW) savings associated with program participants during the 2010–2011 program years. We based the gross program savings assessment on site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision for each component.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh and dkt) and demand (kW) savings and perform the economic analysis.

4.2.1.1. Estimation of Gross Savings

We estimated indirect energy (kWh or dkt) and demand (kW) savings associated with customer actions and/or measures implemented by the customer based on audit recommendations but for which the customer did not receive an incentive through any other NWE program. We used results from the telephone survey of 2010–2011 participants and customer interviews during site visit recruitment to determine which of the audit participants implemented audit recommendations without incentives. We conducted site visits and/or follow-up telephone interviews for these businesses to gather the data needed to estimate savings.

We used the UES methods to estimate savings for prescriptive measures. We reviewed these methods as part of the evaluation of the prescriptive programs in the portfolio. For other measures we used standard engineering methods to estimate energy (kWh or dkt) and demand (kW) savings. We then summed savings for each sample participant.

We performed site visits on the sampled sites to verify the installation of indirect measures, implemented is response to audit recommendations. The verification process included confirmation that the program measures were installed, were operational and produced energy savings. We collected data as necessary to support a re-estimation of energy (kWh and dkt) and demand (kW) savings. We calculated evaluation energy savings (kWh and dkt) by applying the UES or standard engineering method to the data observed during the site visit.

4.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

4.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

4.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

4.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

4.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh and dkt) and demand (kW) savings for each of the sampled cases. Separate discussions of the gross and net savings realized for this program are provided below.

4.2.2.1. Estimation of Gross Savings

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. "Total Recruited" is the total number of customers who volunteered for an on-site inspection. "Total Completed" is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection.

We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited.

For the E+ Building Blocks program we successfully visited eight sites. Between the Telephone Lab and the Special Effort team, we attempted to contact all the potential sites. There were a high percentage of customers who we were unable to contact (65%), and three recruits who the site inspector was subsequently unable to contact by phone or at the site.

Table 51: Site Recruitment Disposition for E+ Building Blocks Pilot

	Total n	%
Recruitment		
Telephone Lab	5	
Special Effort		
Attempts	20	
No Reply	13	65.0%
Refused	1	5.0%
Recruited	6	30.0%
Total Recruited	11	
Onsite		
Refused	3	27.3%
Not Needed	0	0.0%
Total Completed	**8**	**72.7%**

Site Inspections

We performed site inspections for a sample of 8 businesses that participated in the program. During the site visits, we found that 6 of the 8 participants did not implement the audit recommendations. We also found that some of the recommendations were implemented at two sites. For these cases we calculated evaluation savings for each measure by applying the evaluation methods discussed above to the as-built conditions observed during the site visit. Total annual estimated savings for these two sites were 981 kWh and 83 kWh, respectively. We did not compare evaluation savings to program savings because NWE did not claim saving for this program.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 52: File Review and Site Visit Adjustment to Savings for E+ Building Blocks Pilot

Funding	Study Name	Units	Savings			Savings Adjustment Rates		
			Reported	Site Visit	Final	File Review	Site Visit	Final
Electric								
	E+ Building Blocks Pilot	kWh	-	9,639	9,639	NA	NA	NA
Natural Gas								
	E+ Building Blocks Pilot	dkt	-	3	3	NA	NA	NA

4.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program. NWE claimed no savings for this program. However, we conducted site visits and found the evaluation energy savings shown in the table. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net adjustment rate times the evaluation energy savings

Table 53: Savings Adjustments by Calendar Year for E+ Building Blocks Pilot

Funding	Program	Units	Year	Evaluation Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Building Blocks Pilot	kWh	2010	9,639	NA	NA	NA	NA	9,639	1
	E+ Building Blocks Pilot	kWh	All Years	9,639	NA	NA	NA	NA	9,639	1
Natural Gas Supply - DSM										
	E+ Building Blocks Pilot	dkt	2010	3	NA	NA	NA	NA	3	
	E+ Building Blocks Pilot	dkt	All Years	3	NA	NA	NA	NA	3	
Electric										
	E+ Building Blocks Pilot	kWh	All Years	9,639	NA	NA	NA	NA	9,639	1
Natural Gas										
	E+ Building Blocks Pilot	dkt	All Years	3	NA	NA	NA	NA	3	

4.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 54: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Building Blocks Pilot

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Building Blocks Pilot	kWh	2010	9,639	0.13	0.13	0.13	0.14
	E+ Building Blocks Pilot	kWh	All Years	9,639	0.13	0.13	0.12	0.14
Natural Gas Supply - DSM								
	E+ Building Blocks Pilot	dkt	2010	3	0.00	0.00	0.00	0.00
	E+ Building Blocks Pilot	dkt	All Years	3	0.00	0.00	0.00	0.00
Electric - USB								
	E+ Building Blocks Pilot	kWh	All Years	-				
Natural Gas - USB								
	E+ Building Blocks Pilot	dkt	All Years	-				
Electric								
	E+ Building Blocks Pilot	kWh	All Years	9,639	0.13	0.13	0.12	0.14
Natural Gas								
	E+ Building Blocks Pilot	dkt	All Years	3	0.00	0.00	0.00	0.00

4.3. Process Evaluation

4.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand program processes and participant experiences, we conducted phone surveys with nine commercial firms who had participated in the E+ Building Blocks Pilot. No trade allies were involved with this program.

4.3.2. Implementation Findings

4.3.2.1. Interview Findings

Building Blocks Pilot is a pilot program targeting the commercial sector, with special focus on downtown Bozeman. All businesses in a three-block area were eligible for a free custom in-depth energy audit. These audits were conducted by two-person teams, usually consisting of an electrical engineer and a mechanical engineer that assessed the facilities' opportunities to save both electricity and natural gas.

To market the program, NWE's implementation contractor visited every business in the three-block area. About one-third of the businesses (46 out of 145) accepted the audit offer.

Audits identified energy efficiency and operations-and-maintenance opportunities. Program staff presented the audit reports to the customers in one-on-one meetings, explaining the results and the opportunity to receive incentives from NWE to upgrade their facilities. Program staff said the audit reports were well received.

Program staff, including both NWE and implementation contractor, followed up multiple times with the audit participants, including holding a follow-up reception, to encourage them to take the recommended actions. Despite this extensive follow-up, none of these participants have participated in additional NWE programs. It is important to note, however, that the audits may nonetheless have benefited these customers, as they may have heightened their awareness of energy efficiency and led them to take low- or no-cost approaches to save energy.

The program team has discussed possible reasons why participants did not follow through with additional energy efficiency measures after the initial audit. One of the factors that led to reduced success in follow-through is thought to be the lack of buy-in of the participants. These audits were entirely free, so there was no monetary stake that a participant may feel they had to justify with results. The participants were highly encouraged, and the process was made so easy, that they may not have developed the same sense of value that participants of other audit programs may have witnessed. Other key roles may have also made a difference, such as a third party vendor or contractor to confirm the benefits of following through with additional measures. These participants may have also benefited from a designated energy champion to connect energy efficiency to an individual business model.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

4.3.2.2. Best Practices Assessment

Table 55 through Table 57 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; and marketing/ outreach and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 55: Program Planning and Design Best Practices Relevant to E+ Building Blocks Pilot

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE program reflects this planning
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE program reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	Program sought the participation of every customer within a specified geographic region ▪ Opportunity exists for future program of similar type to identify and work with firms more likely than their peers to implement recommendations

Table 56: Program Management and Administrative Best Practices Relevant to E+ Building Blocks Pilot

Practice	NWE Assessment
Develop written process plan Include program management activities Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections
Keep participation simple	Participation was very simple through the services of the implementation contractor
Offer a single point of contact for customers of audit and non-residential programs	The implementation contractor provided a single point of contact; program application materials clearly identify who to contact
Offer assistance in preparing and submitting program applications	The implementation contractor offered customers full assistance
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers to be accurate
Capture and retain "program memory" in-house	Opportunity exists for NWE to learn program implementer's perspectives on reasons audited businesses did not complete recommendations, and alternative program designs that would likely increase uptake

Table 57: Marketing, Outreach, and Quality Control Best Practices Relevant to E+ Building Blocks Pilot

Practice	NWE Assessment
[pilot differs from typical efficiency program; general marketing and outreach best practices are eclipsed by NWE's actual practice]	The implementation contractor marketed the pilot through personalized, on-on-one contacts with all business owners in geographic area; also worked with business community groups
[pilot differs from typical efficiency program; general marketing and outreach best practices are eclipsed by NWE's actual practice]	Program implementation contractor had engineering expertise; worked with customers individually to deliver quality audit services; tracked findings and recommendations
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs

4.3.3. Participant Findings

We surveyed nine business respondents who received appraisals and audit reports through the E+ Building Blocks Pilot program.

Interpreting Response Frequencies

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

4.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about NWE's energy efficiency programs, additional efficiency information they would like to receive, and their decision-making process.

When asked if they had ever visited NWE's website, these commercial respondents generally had not: two of nine reported visiting the website. Many non-users (43%) said they had "no need or no reason" to visit the NWE website (Table 58).

Table 58: Reasons Website Not Used, among E+ Building Blocks Pilot Participants

	Percent (n=7)
No need or no reason	43%
Don't like to use it much	29%
Other	29%

The two respondents who had visited the utility website were getting utility contact information and paying their utility bill, primarily. These two respondents gave opposite ratings to the statement "web information was easy to find and helpful."

Just over one-half of respondents (5 of 9) would like to receive more information on energy-saving educational opportunities (Table 59).

Table 59: Further Information Desired, among E+ Building Blocks Pilot Participants

(Allowed Multiple)	Percent
Energy saving educational opportunities (n=9)	56%
Energy efficiency programs (n=9)	33%
Does not want any (n=9)	33%
Workshops or events on energy efficiency (n=9)	11%

All respondents in this group who desired further information preferred to receive information via mail and email (Table 60).

Table 60: Information Delivery Preference, among E+ Building Blocks Pilot Participants

(Allowed Multiple)	Percent
US mail (n=6)	100%
Email (n=6)	100%
Community event (n=6)	50%
Phone (n=6)	17%
Workshop (n=6)	17%
Webinar (n=6)	17%

Participants became aware of the program primarily through a NWE publication or advertisement (78%; Table 61).

Table 61: Means of Program Awareness, among E+ Building Blocks Pilot Participants

(Allowed Multiple)	Percent
Utility publication or advertisement (n=9)	78%
Directly contacted utility (n=9)	22%
Building professional, vendor, or contractor (n=9)	22%
Other (n=9)	11%

None of the respondents had any initial concerns or questions about participating in the Building Blocks Pilot program.

We asked these respondents whether a list of typical reasons for participating in the audits applied to them. As seen in the table below, most (67%) mentioned participating "(to) reduce energy costs," but over half reported that they had previously been considering upgrades (Table 62).

Table 62: Reasons For Program Participation, among E+ Building Blocks Pilot Participants

(Allowed Multiple)	Percent
Reduce energy costs (n=9)	67%
Considering upgrades to operations already (n=9)	56%
Utility suggested participation (n=9)	44%
Easy to use the program (n=8)	38%
Good experience with other NWE efficiency program (n=9)	33%
Increase facility comfort (n=9)	33%

(Allowed Multiple)	Percent
Check specific equipment performance (n=9)	33%
Contractor recommendation (n=9)	22%

4.3.3.2. Program Experience

Participants reported on their experience with the E+ Building Blocks Pilot and rated any equipment acquired through the process.

Over 75% of respondents rated as "clear" or "very clear" the clarity of program information provided on most of the program elements. Half of respondents gave equally high ratings to clarity of information on "following up with program staff," and just two of nine contacts were able to rate the expected energy savings (Figure 14). Respondents also agreed that the visiting auditor helped them understand opportunities.

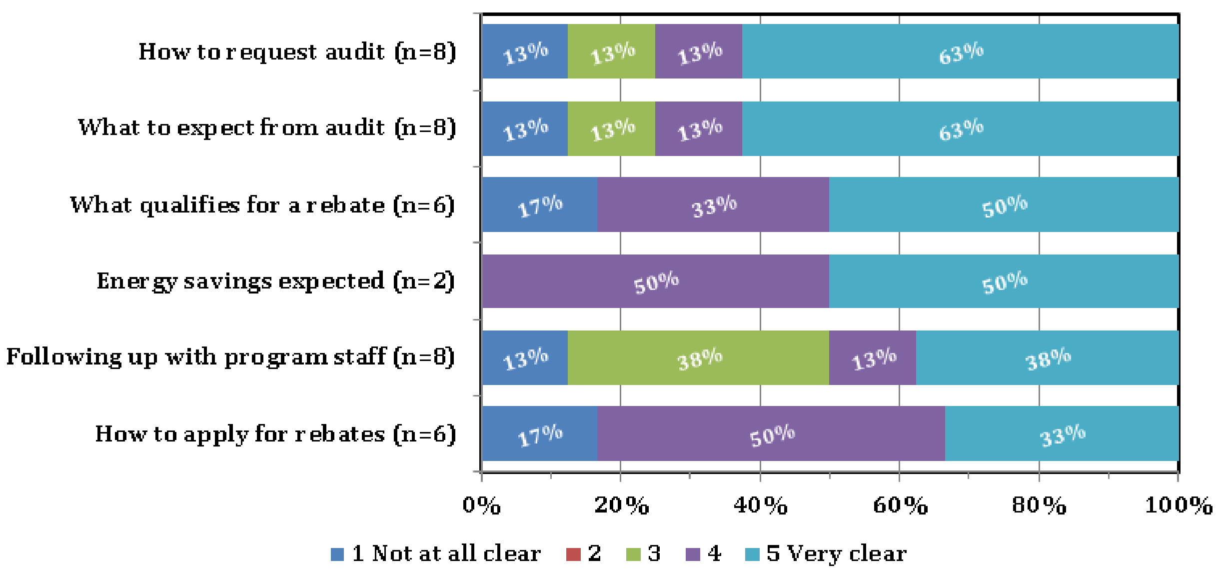

Figure 14: Clarity of Program Information, among E+ Building Blocks Pilot Participants

We asked respondents whether they had implemented the audit recommendations. Just two of seven reported implementing any upgrades or equipment changes, and an additional two reported planning to complete upgrades in the next year. Four respondents said their audit report also included recommendations requiring little or no cost to implement. Three of these four respondents reported taking some low-cost steps to save energy. These respondents had either installed programmable thermostats or lowered the temperature on their existing thermostat.

Table 63: Recommendations and Implementation, among E+ Building Blocks Pilot Participants

	Percent
Auditors offered to help implement (n=5)	60%
Implemented ANY of the recommended equipment upgrades? (n=7)	29%
Did the audit report include free or inexpensive steps? (n=6)	67%
Do you plan to implement any of the recommendations in the next year? (n=2)	100%
Taken any of these low cost steps? (n=4)	75%

Most respondents said they "completely agreed" with a list of positive statements related to various program processes. The exception was the lower agreement ratings for energy savings meeting expectations (Figure 15).

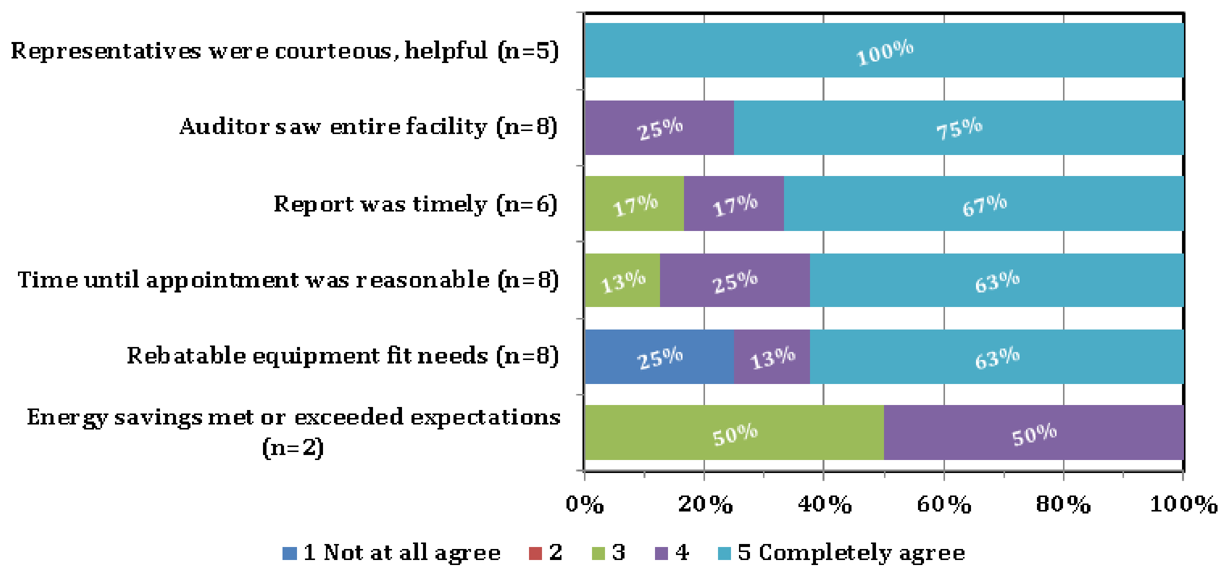

Figure 15: Experience With Program, among E+ Building Blocks Pilot Participants

As a general indication of overall satisfaction with NWE's efficiency activities, the survey asked participants about future participation in efficiency programs. About half (55%) of respondents would be "likely" or "very likely" to participate in energy efficiency programs in the future (Figure 16).

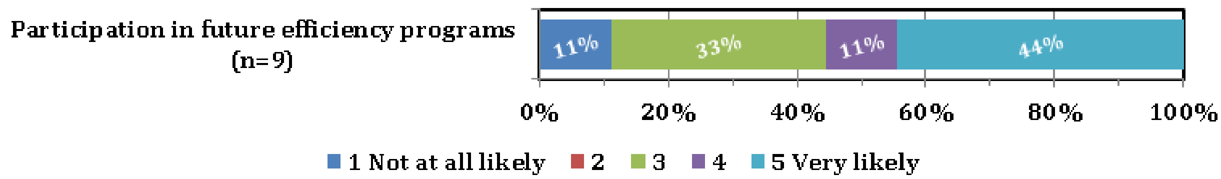

Figure 16: Likelihood of Future Participation, among E+ Building Blocks Pilot Participants

4.3.4. Trade Ally Findings

No trade allies were involved in this program.

4.4. Recommendations

4.4.1. Impact Evaluation

No recommendations are provided for this program, because NWE no longer offers it.

4.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Over half of surveyed E+ Building Blocks participants (5 of 9) report wanting more information about ways to save energy. Although participants reported positive program experiences, less than a third reported completing either low-cost changes or equipment upgrades since participating. Participants' ratings of the clarity of information about rebates was also lower that their ratings of the clarity of other program information. Just a third of participants explicitly remembered their auditor offering to help implement the recommendations, and less than half recalled that the audit included low-cost steps to reduce energy use. These findings suggest that more follow-up about recommended changes and more information about upgrades might increase participants' completion of upgrades. As an alternative interpretation, the findings are also consistent with a conclusion that these participants are not especially attuned to energy efficiency (as they did not remember key aspects of the services they received) and that the pilot activities did little to motivate them.

5. E+ Business Partners

5.1. Program Description

E+ Business Partners began in 1992 and is a custom incentive program serving electric supply, gas supply, and electric choice customers (< 1 MW) in the commercial, industrial, institutional, multifamily, and agricultural sectors. The program includes both retrofit and new construction projects. Any measure that achieves energy savings may be proposed for funding, provided it is not offered through prescriptive rebate programs. Most program incentives and marketing is funded through DSM supply rates. Projects for choice electric customers with loads <1MW and irrigation projects are funded using USB dollars.

Customers may develop projects on their own; however, third party consultants and contractors are involved in the majority of program projects. The program relies on these trade allies to market, develop, design, and provide savings analyses for projects. These firms fall into two groups:

- E+ Program Contractors who receive training on NWE’s programs and procedures, and are paid directly by NWE based upon the cost effective energy savings the customer projects delivered to NWE.
- Contractors and consultants unaffiliated with NWE who work directly for NWE customers

All third party fees are considered to be part of project costs and are considered to be part of the total project cost.

Alternative delivery mechanism

NWE contracts with engineering and contracting firms to be E+ Program Contractors who support customers in the development and implementation of program projects. These contractors are paid by NWE a fixed percentage of the resource savings generated by the project, part at contract signing and the remainder when the project is successfully completed. E+ Program Contractors may offer additional services, such as equipment installation, separately from the scope of their project-development services for the customer. The number of E+ Program Contractors has increased from one in 2007 to six in 2011. The contract period for E+ Program Contractors is two years and they must generate one-quarter Average MegaWatt hour (about 2.2 MWh) of annual savings by the second year to be considered for contract renewal.

Additional Services Offered

NWE may provide technical assistance for customers during the project or may refer the customer to one of the E+ Program Contractors.

5.1.1. Energy Savings

Energy savings estimates for custom incentives are derived from a range of engineering methods such as bin calculations, hourly building simulation modeling, and other types of engineering calculations.

Customer incentives are linked to the total resource cost (TRC). Calculated measure energy savings are entered into NWE's TRC spreadsheet calculator, along with measure life expectancy, forecast future energy costs, and other factors to determine the project's TRC and the TRC cost ratio. The TRC ratio must be ≥ 0.9 for the measure to be eligible. NWE reserves the right to de-rate measure life, and therefore the incentive, if there is evidence that the full measure life expectancy may not be achieved at any particular site.

5.1.2. History

This is a mature, well established program. Several notable changes occurred over the course of the 2007–2011 program years:

- Gas measures became eligible for the program in 2008.
- NWE began contracting with E+ Program Contractors to market, design, and provide measure analyses for customers in 2007.
- In 2009, to increase customer convenience and reduce program operation costs, a number of gas measures were removed from this program and became prescriptive rebate measures offered through the E+ Commercial New Gas Rebate and the E+ Commercial Existing Gas Rebate programs.
- Similarly, in 2010, many electrical measures were removed from this program and became prescriptive rebate measures offered through the E+ Commercial Existing Electric Rebate and the E+ Commercial New Electric Rebate programs.

5.1.3. Marketing

NWE, their contract marketing team, and E+ Program Contractors promote the program to customers and trade allies through the marketing channels established for all non-residential programs:

- Direct customer marketing through NWE's E+ Energy Appraisal for Small Business Program, the small commercial audit program
- Direct customer marketing by meeting with customers at their business sites, and at conferences and community events
- Attending and presenting at professional and trade association meetings such as those for healthcare, hospitality, architects, engineers, and service organizations
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors

- Targeted advertising in television and print media
- Co-sponsoring Montana Energy Conferences with the state government and Northwest Energy Efficiency Alliance
- Although NWE's commercial programs do not use preferred contractors as its residential programs do, many contractors participating in the residential preferred contractor program are familiar with the commercial rebate programs and promote them to their commercial customers

Beginning in the fourth quarter of 2011, there was an increase in non-residential marketing activity due to the expansion of the contract marketing team.

5.1.4. Program Steps

Project development times vary and NWE may provide technical assistance to help customers with the process or refer the customer to one of the E+ Program Contractors. The formal project review process begins with the submission of a proposal to NWE for review.

Customers submit detailed project proposals and must demonstrate to NWE that projects and measures are cost effective and the technology reliable. Measures may be presented for consideration individually or bundled. Each measure must individually pass the TRC test to be eligible for funding through the program.

Provided the TRC test is met, incentives may not have a simple payback to the customer of less than 1.5 years. If a measure has a payback of less than 1.5 years, the customer incentive is reduced to the point where the customer's payback equals 1.5 years.

Project proposals follow a rigorous twelve point format, summarized below:

- Facility NWE account information
- Facility name and location
- Facility owner
- Site contact information
- Third-party consultant or contractor, their role, and qualifications
- Detailed facility description
- Detailed measure description with baseline and as-built data
- Analysis methodology
- Cost estimates broken out by design, equipment, and labor.
- Life-cycle economic analysis
- Additional benefits quantified, if possible
- Implementation schedule

Project sites may be inspected by NWE or required to have baseline monitoring prior to contract approval.

When all requirements are met and the project found to have merit as a resource investment for NWE the customer receives a contract with the project cost-sharing proposal. The customer reviews and signs the two original contracts, returns them to NWE where the program manager executes the contracts, returning one original contract to the customer.

When the work is complete, the customer notifies NWE and provides cost documentation. NWE inspects all program projects and may require temporary metering or monitoring to document post-installation energy use. If the final project is not implemented as documented in the contract or savings are expected to be less than originally calculated, the incentive may be adjusted downward.

Following inspection and final approval by NWE, the customer and, if applicable, the E+ Program Contractor, receive payment.

5.2. Impact Evaluation

5.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh and dkt) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh and dkt) and demand (kW) savings and to perform the economic analysis.

5.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review of sampled measures to determine whether the detailed documentation (referred to as project files) for each measure was consistent with program tracking records. The file reviews included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and energy savings (kWh and dkt) were recalculated. We recorded reasons for differences with the program tracking savings.

Since this was a custom program, we based the NWE program savings on measure-specific engineering calculations. We performed a review of the program algorithm for each sampled site. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the as-built conditions observed during the site visit. For measures where the NWE method was not adequate, we recalculated energy (kWh or dkt) and demand (kW) savings using the more reliable techniques.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and were producing energy savings. We collected data as necessary to support a re-estimation of energy (kWh and dkt) and demand (kW) savings, using the calculation method that resulted from the algorithm review, discussed above. For some sampled cases the data collection included one-time and/or short terms measurements of parameters relevant to the energy performance of the installed measures. We calculated evaluation energy (kWh and dkt) and demand (kW) by applying the final calculation method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

5.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

5.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

5.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

5.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

5.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh and dkt) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

5.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 32 sampled cases for this program across the five program years. The results from this review revealed no data entry errors in the program tracking database.

Program Algorithm Review

We reviewed the algorithms used to estimate program savings for the measures installed in the sampled cases. For six of these measures, we determined that the NWE methods were reasonable and accurate. For another three measures, we essentially used the NWE methods; however, we had the advantage of being able to use monitored data to improve the model for the implemented scenarios. For the remaining three measures, we determined that changes to the program methods were appropriate.

- Grocery store vestibule claimed savings was based on a temperature bin model assuming a pre-existing control scenario that would not have been implemented according to project documentation and a proposed scenario that was not fully implemented. We modeled the actual pre-existing and implemented conditions using an ASHRAE-approved method and added natural gas savings that were not considered in the claim.
- A compressed air upgrade project changed when a new production line increased air demand by a factor of three. Rather than replacing an existing compressor, a new VSD compressor was added to the existing system. We evaluated savings for this measure by incorporating a non-VSD compressor to model conditions had the program incentive not been available.
- We estimated savings from a new-construction ground water HVAC cooling system assuming inefficient chillers and simple engineering calculations. We used trended data from the installed system to correlate pump energy to hourly outside air temperatures. We also established a part-load curve for a baseline chiller as a function of outside air temperature and determined the average kW for each hour of the year for the baseline and implemented systems; the difference between them representing savings. We used typical Meteorological Year (TMY) air temperature data to determine the hourly values.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection.

We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited.

For the E+ Business Partners program we successfully visited 14 sites encompassing three different strata. There was one stratum 9 site where the inspector was unable to contact the customer for scheduling the site visit; we replaced this site with a stratum 2 site.

Table 64: Site Recruitment Disposition for E+ Business Partners

	Stratum			Total n	%
	1	2	9		
Recruitment					
Telephone Lab	6	1	0	7	
Special Effort					
Attempts	6	6	4	16	
No Reply	4	2	0	6	38%
Refused	0	0	0	0	0%
Recruited	2	4	4	10	63%
Total Recruited	**8**	**5**	**4**	**17**	
Onsite					
Refused	1	0	1	2	12%
Not Needed	1	0	0	1	6%
Total Completed	**6**	**5**	**3**	**14**	**82%**

Site Inspections

We performed site inspections for a sample of 12 measures that were assigned to the 2010–2011 program years. (We also performed site inspections for two measures that we later discovered should be assigned to the 2012 program year; these two sites were subsequently not included in the evaluation).

We found that the measures were generally implemented in accordance with the proposed projects. However, we often found that post-installation, customer-imposed adjustments to the measures resulted in operational changes. Some of these adjustments increased savings while others reduced savings. Below are observations related to these adjustments:

- In two cases, heat exchangers could not provide the amount of cooling anticipated for the implemented measures
- A 5-kW electric heater was to be installed in a new vestibule to be added to a grocery store. The baseline was assumed to be an air curtain incorporating a 0.75-hp fan and a 24-kW heater with no vestibule. The vestibule was added without the 5-kW heater.
- An air compressor to be replaced with a new VSD air compressor was left in service along with the VSD compressor as a matter of necessity when air demands increased as a result of the addition of a new production line.
- A VSD installed on a wastewater treatment plant blower was to be controlled by the depth in the aeration pond but was found to be manually controlled, set to operate at 60% of full speed continuously.
- Short-term monitoring data of a VSD compressor installed under the E+ Business Partners program indicated air demands increased in comparison to data obtained from monitoring performed prior to NWE approval of the project.

We calculated savings for each sampled measure, by applying the appropriate case-specific evaluation calculation method using the as-built conditions observed during the site visit. In most cases we determined the evaluation savings to be less than the program estimate, with seven cases showing reduced electrical savings and two cases showing reduced gas savings.

A change to the proposed control strategy for one of the measures resulted in greater evaluation savings, while implemented equipment performance was responsible for reduced evaluation savings for three cases. In a fourth case, only electric savings were claimed, however it was determined that the project also resulted in gas savings, The net impacts of these findings resulted in a five percent decrease in electric energy (kWh) savings and a 14 percent increase in gas savings (dkt) across the sampled measures.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 65: File Review and Site Visit Adjustment to Savings for E+ Business Partners

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Business Partners	kWh	18,501,340	18,501,340	17,536,943	17,536,943	1.00	0.95	0.95
Natural Gas									
	E+ Business Partners	dkt	9,206	9,206	10,473	10,473	1.00	1.14	1.14

5.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 66: Savings Adjustments by Calendar Year for E+ Business Partners

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Business Partners	kWh	2007	3,552,120	0.95	-	-	0.95	3,366,963	384
	E+ Business Partners	kWh	2008	4,922,773	0.95	-	-	0.95	4,666,170	533
	E+ Business Partners	kWh	2009	3,594,233	0.95	-	-	0.95	3,406,881	389
	E+ Business Partners	kWh	2010	2,803,257	0.95	-	-	0.95	2,657,135	303
	E+ Business Partners	kWh	2011	3,628,957	0.95	-	-	0.95	3,439,795	393
	E+ Business Partners	kWh	All Years	18,501,340	0.95	-	-	0.95	17,536,943	2,002
Natural Gas Supply - DSM										
	E+ Business Partners	dkt	2009	2,283	1.14	-	-	1.14	2,597	
	E+ Business Partners	dkt	2010	1,709	1.14	-	-	1.14	1,944	
	E+ Business Partners	dkt	2011	5,214	1.14	-	-	1.14	5,932	
	E+ Business Partners	dkt	All Years	9,206	1.14	-	-	1.14	10,473	
Electric										
	E+ Business	kWh	All	18,501,340	0.95	-	-	0.95	17,536,943	2,002

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	Partners		Years							
Natural Gas										
	E+ Business Partners	dkt	All Years	9,206	1.14	-	-	1.14	10,473	

5.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 67: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Business Partners

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Business Partners	kWh	2007	3,366,963	1.09	1.94	1.24	1.20
	E+ Business Partners	kWh	2008	4,666,170	1.36	2.00	1.41	1.50
	E+ Business Partners	kWh	2009	3,406,881	1.03	1.40	1.13	1.13
	E+ Business Partners	kWh	2010	2,657,135	1.00	1.49	1.26	1.10
	E+ Business Partners	kWh	2011	3,439,795	0.94	1.25	1.12	1.03
	E+ Business Partners	kWh	All Years	17,536,943	1.08	1.56	1.23	1.18
Natural Gas Supply - DSM								
	E+ Business Partners	dkt	2009	2,597	2.90	7.48	3.37	3.19
	E+ Business Partners	dkt	2010	1,944	1.00	1.38	1.18	1.10
	E+ Business Partners	dkt	2011	5,932	1.31	1.70	1.43	1.45

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	E+ Business Partners	dkt	All Years	10,473	1.44	2.04	1.62	1.58
Electric								
	E+ Business Partners	kWh	All Years	17,536,943	1.07	1.55	1.23	1.18
Natural Gas								
	E+ Business Partners	dkt	All Years	10,473	1.44	2.04	1.62	1.58

5.3. Process Evaluation

5.3.1. Methodology

We met with all key members of NWE’s program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with eight non-residential organizations who had participated in the E+ Business Partners program, six program contractors, as well as 93 trade allies. Surveyed trade allies include those who reported offering lighting, HVAC, insulation, irrigation, motors, and/or motor rewind products and services to commercial end-users.

5.3.2. Implementation Findings

5.3.2.1. Interview Findings

All projects seeking custom incentives, including lighting projects, go through NorthWestern Energy’s E+ Business Partners Program. Applications to the program are in the form of project proposals. The program accepts proposals from all market segments except single-family residential housing. NorthWestern Energy provides a detailed proposal outline and program guidelines on its website.

Project descriptions in proposals must demonstrate the cost-effectiveness of the proposed conservation and/or load-management measures or group of measures. Each measure or group of associated measures that can function independently must separately pass the utility's cost-effectiveness test.[7] Proposals must also describe the reliability and availability of the proposed equipment, and identify the availability of qualified design services, contractors, and maintenance services to support project implementation and operation.

Measure incentives are funded through the demand-side-management charge and require a total resource cost ratio of ≥ 0.9 for measure eligibility. For such measures, NWE reviews the project design to verify estimates of energy and demand savings, and estimates of costs. NWE determines the level of funding it will invest in proposed measures based on the life expectancy and reliability of the measures, availability of the conservation resource, cost to NWE to administer the project, level of design-assistance funding already provided, projected payback period, project funding available from other sources, and the value of the project to the distribution system. A calculator returns a resource value for the project. Custom incentives are 50% of the calculated resource value unless NWE disagrees with the proposal estimates.

Evaluating projects involves appraising the proposed measure costs and savings, using NWE's economic criteria to determine the life-cycle cost of the efficient alternative compared to the life-cycle cost of the next best alternative. If NWE does not agree with the proposal estimates, it provides notice of the reasons for and the magnitude of the disagreements, and bases its financial participation in the project on its adjusted projections. For example, provided the total-resource-cost test is met, incentives may not have a simple payback to the customer of less than 1.5 years. If a measure has a payback of less than 1.5 years, the customer's incentive is reduced to the point where the payback equals 1.5 years.

NorthWestern Energy also requires a comprehensive facility study unless the proposal demonstrates that such a study is not warranted. The study must consider retrofitting all of the facility's appropriate energy consuming systems, equipment, and envelope. The utility may also fund a portion of the cost of this study. About 5% of the program's projects receive a pre-approval inspection.

Before the project can begin, NorthWestern Energy requires a project contract with the owner. The customer receives a contract with NorthWestern Energy's project cost sharing proposal. The customer reviews and signs duplicate original contracts, returns them to NorthWestern Energy where the program manager executes the contracts, and returns one of the original contracts to the customer. Payments can be made to the owner when the project is complete and operating, or at specified times during project implementation. Building or system commissioning may also be required.

Post installation, NWE inspects all E+ Business Partners projects and makes an adjusted final payment for the work completed as specified in the contract.

This program lacks a tracking database that organizes documented savings by project. Data is tracked inconsistently by project and poses a barrier to evaluation.

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[7] An example of a group of associated measures is a variable frequency drive and its associated controls and variable air volume box.

In addition to NWE staff interviews, we also interviewed program managers (and one principle) with the six firms acting as E+ Program Contractors for NWE’s E+ Business Partners Program; some contacts declined to answer some questions. One interview was conducted in February 2012, the reminder in early September 2012. All firms interviewed have service agreements with NWE, signed in fall 2010 or fall 2011. The purpose of our interview was to learn about their activities in Montana, their expected goals compared to projects completed, the customer outreach methods proving to be most effective, and to learn about their experiences working with NWE and KEMA.

E+ Program Contractors: Staffing and Activities

The E+ Program Contractors promoted and delivered prescriptive and/or custom projects undertaken by commercial and industrial firms and organizations. In addition to KEMA (NWE's primary program implementer), six other firms marketed and completed E+ Business Partner Program projects between 2010 and 2012. Four of the firms interviewed reported having between one and three full-time equivalent (FTE) staff working and residing in Montana. Another contact explained they no longer have any staff residing in Montana, but initially had one Montana employee with .05 FTE. One contractor did not supply this information. In all but one case, the service agreement with NWE represented a small percentage of the company’s core business activities.

Contractors gave mixed reports regarding their level of staff effort on Business Partner projects since beginning their latest agreement with NWE. Two contractors said their level of effort had remained consistent throughout the contract period. One contact reported increased internal staff time devoted to learning about doing business with NWE, including training staff on how to process program paperwork and educating the sales team on NWE programs and opportunities. Alternatively, one respondent explained the type of staff effort has changed since entering the agreement with NWE, noting: “Due to staff transitions and reductions, the level of focus moved away from building new relationships to working with established relationships with regional players that operate in the state of Montana.”

Respondents indicated their service agreement with NWE does not specify or limit the market sectors they can focus on. However, one contact notes they were told that they were selected for their expertise in a particular field. All but one of the E+ Program Contractors agreed that they had initially planned to target specific market sectors and end uses. One contractor reported broad interest in all commercial and agricultural markets. Table 68 summarizes the market segments contractors’ initially planned to target and includes markets where they found the most and least opportunities. Contractors recalled experiencing an initial learning curve when they started working for NorthWestern. All contacts expected to work in a broader range of markets, but modified their focus as they learned more about Montana’s specific market sectors, as well as limitations presented by the economy and competition within those sectors from other service contractors.

Table 68: Targeted Markets and Opportunities for E+ Business Partners

E+ Performance Contractor	Initial Market Plan	Most Opportunities	Least Opportunities
1	Broad interest plus irrigation	No Response	No Response
2	Retail grocery (refrigeration), retail in general, lighting, and commercial new construction.	Irrigation (VSD)	All sectors are basically poor due to economy and competition
3	Primary: Higher Education, K-12, Health Care. Secondary: State agencies, Cities, Counties, and Industrial sectors. (all end uses)	Same – all represent opportunities	Not Applicable
4	Industrial and municipal (compressed air, pumping systems, air handling)	Industrial – custom projects with pneumatic conveying, air handling, pumping end uses.	Small commercial/office buildings and K-12 HVAC projects (difficult to develop)
5	Health Care, Education, and Grocery (VFDs, refrigeration)	Health Care and Grocery (VFDs, refrigeration)	Higher Education; State & local governments (due to competition)
6	Industrial, grocery, and general commercial sectors (hospitals and schools)	Grocery and restaurant sectors	High-energy-consumptive small-commercial markets

5.3.2.2. Best Practices Assessment

Table 69 through Table 72 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 69: Program Planning and Design Best Practices for E+ Business Partners

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic

Practice	NWE Assessment
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions ▪ E+ Program Contractors with experience in both Montana and end uses with efficiency opportunities support the program
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ E+ Program Contractors with experience in both Montana and end uses with efficiency opportunities proactively engage customers to encourage program participation
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually

Table 70: Program Management and Administrative Best Practices for E+ Business Partners

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plan
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	The implementation contractor and E+ Program Contractors facilitate customers' participation (identifying qualifying measures, completing application forms)
Offer assistance in preparing and submitting program applications	The implementation contractor and E+ Program Contractors facilitate customers' participation (identifying qualifying measures, completing application forms)

Practice	NWE Assessment
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE provides incentive checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	Opportunity exists for NWE to ask E+ Program Contractors to periodically report by subsector their perspectives on barriers and effective approaches and messaging
Offer a single point of contact for customers of audit and non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 71: Marketing and Outreach Best Practices for E+ Business Partners

Practice	NWE Assessment
Market energy efficiency options directly to large end-users at the earliest decision-making stages of major equipment or facility modifications	E+ Program Contractors do this
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website

Practice	NWE Assessment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 72: Program Quality Control Best Practices for E+ Business Partners

Practice	NWE Assessment
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct commercial-sector projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

5.3.3. Participant Findings

We surveyed eight participants of NorthWestern Energy's E+ Business Partners program for commercial customers.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding "don't know" or "not applicable") and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

5.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about NWE's energy efficiency programs, the kind of additional information they would like to receive, and provided information about their decisions surrounding program participation.

Most of these commercial business respondents (61%) had visited NWE's website. All of the *non*-visitors reported "no need or reason" when asked why they had not used the website. Among respondents who did use the website, many (83%) looked up utility contact information and/or learned about rebates or audits (65%; Table 73).

Table 73: Website Use, among E+ Business Partners Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=5)	83%
Learn about rebates or audits (n=5)	65%

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=5)	48%
Pay utility bill (n=5)	17%
Money saving tips (n=5)	17%

Most website users (69%) "agreed" or "completely agreed" that the website information was easy to find and helpful (Figure 17).

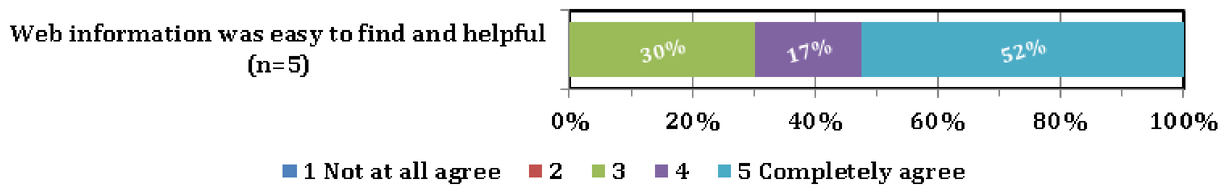

Figure 17: Website Effectiveness, among E+ Business Partners Participants

Nearly all (89%) of these respondents would like additional information on energy efficiency programs and many (61%) would like information on energy-saving educational opportunities (Table 74).

Table 74: Further Information Desired, among E+ Business Partners Participants

(Allowed Multiple)	Weighted Percent
Energy efficiency programs (n=8)	89%
Energy saving educational opportunities (n=8)	61%
Workshops or events on energy efficiency (n=8)	39%
Does not want any (n=8)	11%

Those desiring further information prefer to receive it via email (76%) or by mail (68%). This is one of the few respondent groups that preferred email to mail (Table 75).

Table 75: Information Delivery Preference, among E+ Business Partners Participants

(Allowed Multiple)	Weighted Percent
Email (n=7)	76%
US mail (n=7)	68%
Webinar (n=7)	44%
Phone (n=7)	32%
Workshop (n=7)	12%

Most respondents became aware of the Business Partners program from a building professional, vendor, or contractor (Table 76).

Table 76: Means of Program Awareness, among E+ Business Partners Participants

(Allowed Multiple)	Weighted Percent
Building professional, vendor, or contractor (n=8)	79%
Word of mouth (n=8)	50%
Directly contacted utility (n=8)	29%
Utility publication or advertisement (n=8)	21%
Utility representative appearance (n=8)	18%

No respondents had initial questions or concerns about participating in E+ Business Partners program.

These eight respondents were asked to rate the level of influence various program elements had on their decision to purchase efficient equipment. For most, the rebate played “a major role;” none said it played “no role at all.” For half of these respondents, a salesperson or contractor or the energy audit played a major role (Figure 18).

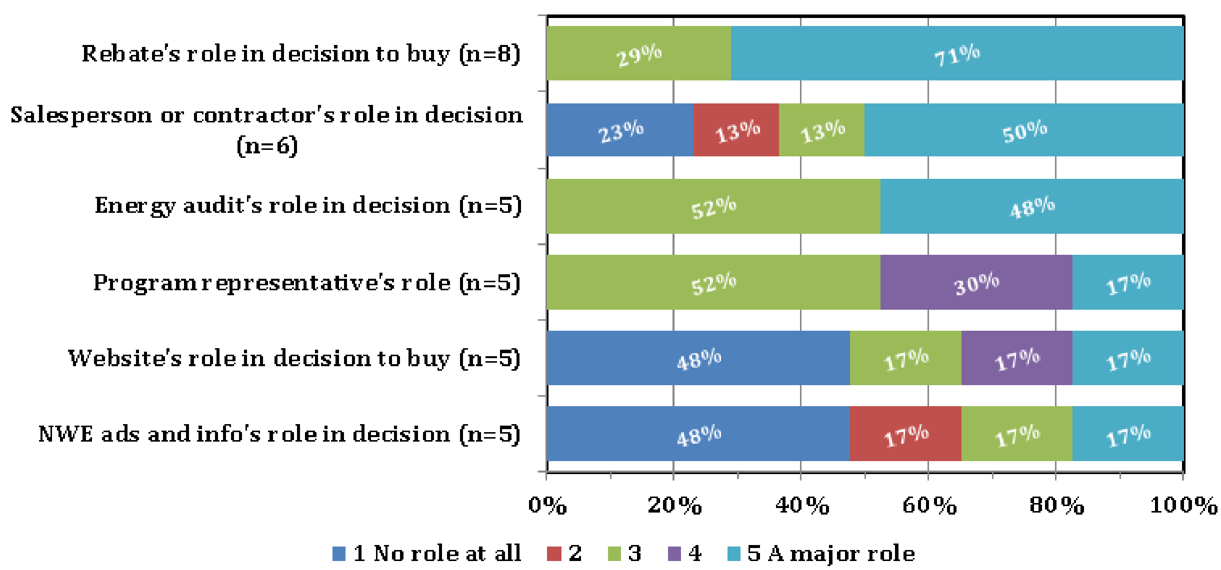

Figure 18: Influences on Purchase Decision, among E+ Business Partners Participants

We also asked E+ Business Partners respondents if any of several typical reasons for participation applied to them. All respondents participated to save energy and money. Other reasons such as program ease of use (89%) and needing the rebate to offset cost (79%) were applicable for a majority of respondents (Table 77).

Table 77: Reasons For Program Participation, among E+ Business Partners Participants

(Allowed Multiple)	Weighted Percent
Save energy and money (n=8)	100%
Easy to use the program (n=8)	89%
Increase facility comfort (n=8)	82%
Rebate needed to offset cost (n=8)	79%
Check specific equipment performance (n=8)	61%
Utility vouched for equipment by rebating (n=8)	53%
Contractor recommendation (n=8)	50%
Wanted to follow audit with action (n=8)	50%
Good experience with other NWE efficiency program (n=6)	50%

5.3.3.2. Program Experience

E+ Business Partners respondents reported on several aspects of program experience, including the application, equipment installation, or inspections processes, and whether they would participate in NWE's efficiency programs again.

Both vendors or contractors and respondents took an active role in initiating discussions about E+ Business Partners projects. Respondents (50%) reported that a vendor/contractor initiated the discussion, but half reported sole or cooperative involvement with project initiation (Table 78).

Table 78: Project Initiator, among E+ Business Partners Participants

	Weighted Percent (n=8)
Associated vendors or contractors	50%
My organization	39%
Discussion between both	11%

One-fifth of these respondents prepared the E+ Business Partners' application form. In all other cases, a program contractor (such as NCAT staff), an associated engineer/contractor, or someone else prepared the program application (Table 79).

Table 79: Proposal Preparation, among E+ Business Partners Participants

	Weighted Percent (n=8)
NCAT staff	29%
Associated engineer/contractor	29%
My organization	21%
Someone else	21%

Business Partners respondents gave high ratings overall to the clarity of information provided on the program elements that applied to them. All elements were found to be “clear” or “very clear” by a majority of those responding (Figure 19).

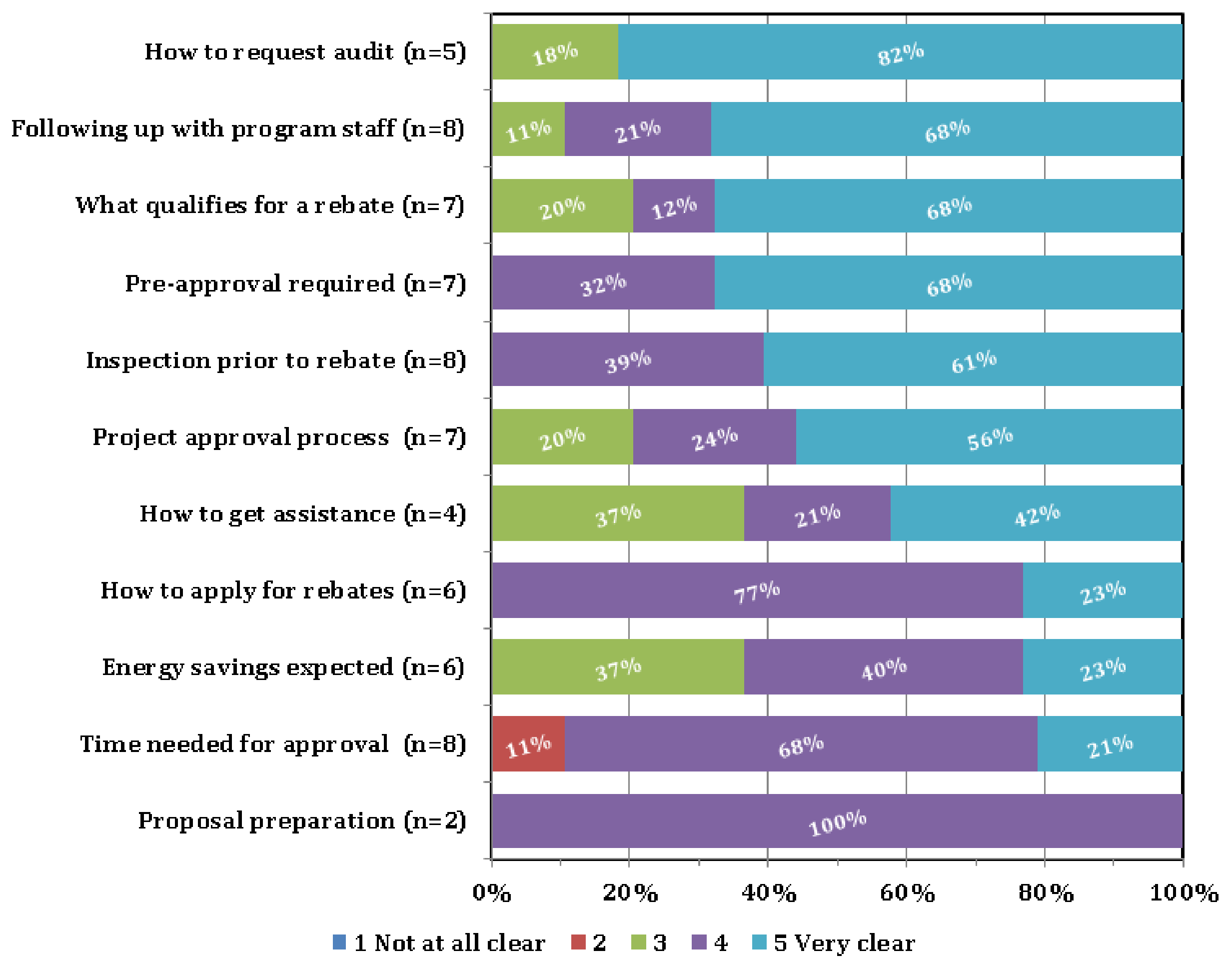

Figure 19: Clarity of Program Information, among E+ Business Partners Participants

Three respondents reported that technical assistance provided by NWE was received in the completion of their project; these three all agreed that these advisory services helped with the project.

Majorities of respondents "agreed" or "completely agreed" with all positive statements about various phases of the program and the performance of installed equipment. However, agreement ratings were lower for "energy savings met or exceeded expectations" (Figure 20).

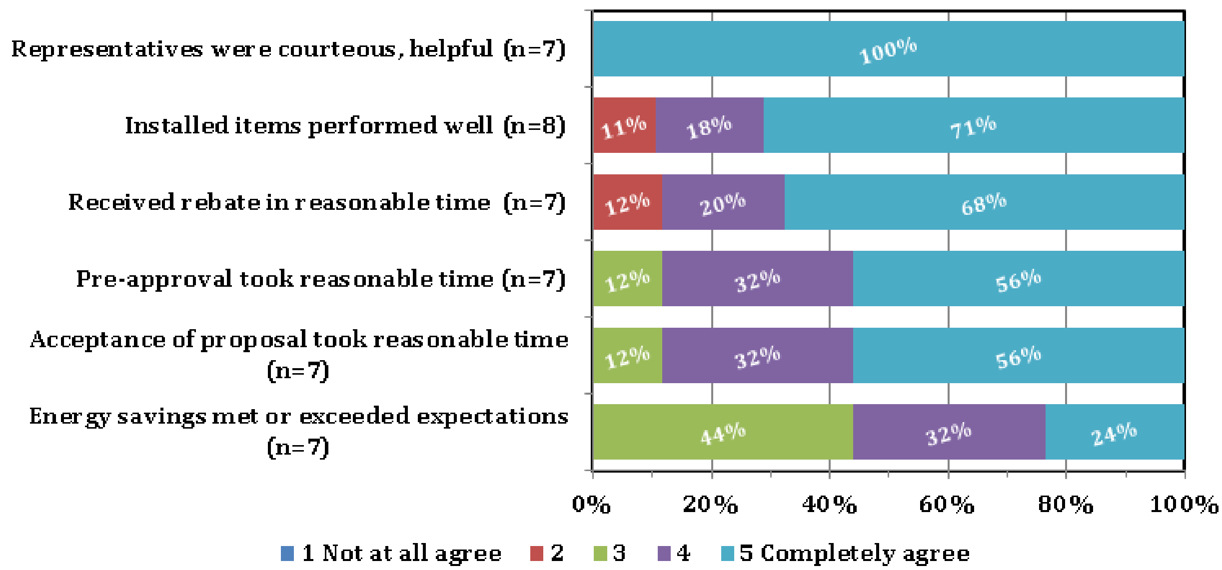

Figure 20: Experience With Installation Process, among E+ Business Partners Participants

After installation, 89% of the respondents recalled having an on-site inspection by a utility representative, and of those, 88% "completely agreed" that the inspector was courteous and efficient.

As an indicator of overall attitudes towards NWE's efficiency activities, we asked participants about their likelihood of future participation in energy efficiency programs. A solid majority (82%) were "very likely" to participate in future NWE energy efficiency programs (Figure 21).

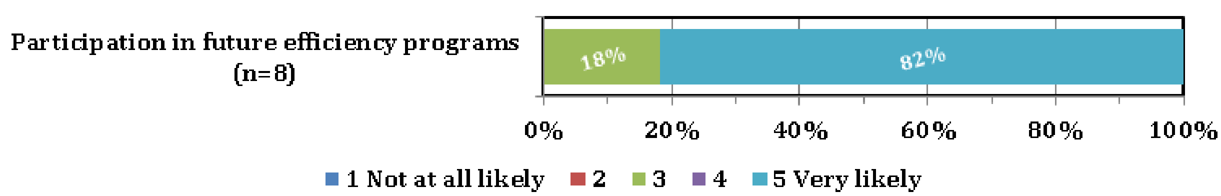

Figure 21: Likelihood of Future Participation, among E+ Business Partners Participants

5.3.4. Trade Ally Findings

We surveyed 93 NWE trade allies who reported providing construction, lighting, and/or insulation services to commercial customers.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

5.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event, from noticing a utility publication or advertisement, or by directly contacting the utility (at least 73% reported each method, see Table 80).

Table 80: Means of General Program Awareness, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=93)	77%
Utility representative appearance (n=91)	74%
Directly contacted utility (n=93)	73%
Utility website (n=92)	50%
Associated vendors and contractors (n=93)	46%
Word of mouth (n=93)	45%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly, or through NWE representatives (Table 81).

Table 81: Specific Requirements Awareness, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Directly contacted utility (n=93)	44%
Utility representative appearance (n=93)	43%
Utility publication (n=93)	26%
Associated vendors and contractors (n=93)	11%
Utility website (n=93)	10%

A majority (70%) of surveyed trade allies have visited the utility website. Among those website users, three-fourths said they used the site to learn about rebates or audits, and a smaller majority had printed rebate forms or contacted NWE (Table 82).

Table 82: Website Use, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=62)	76%
Print rebate forms (n=62)	66%
To contact utility (n=62)	53%
Educational events information (n=62)	35%
Money saving ideas (n=62)	34%
How-to videos (n=62)	10%

Two-thirds (67%) of website users "agreed" or "completely agreed" that the web information was easy to find and helpful (Figure 22).

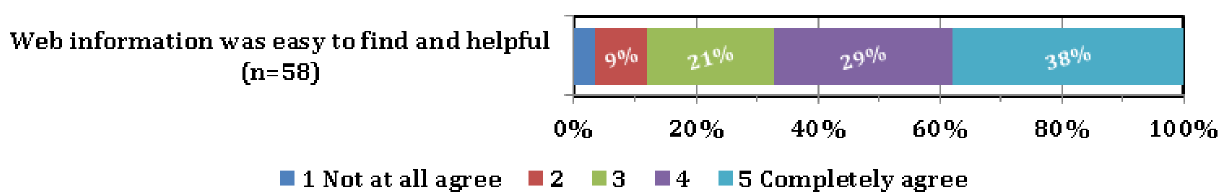

Figure 22: Website Effectiveness, among E+ Business Partners Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority said they had contacted the utility to learn how the rebate program worked (Table 83).

Table 83: Reasons for Contacting NWE, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=93)	62%
Investigate status of an application (n=93)	43%
To resolve a problem (n=93)	43%
Investigate status of a rebate payment (n=93)	33%
None of these (n=93)	24%

About half of surveyed trade allies would like further information on workshops or events, or were interested in more information about energy efficiency programs. Thirty-five percent did not need further information from NWE at the time of the survey (Table 84).

Table 84: Further Information Desired, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=93)	53%
Energy efficiency programs (n=93)	49%
Energy saving educational opportunities (n=93)	47%
None (n=93)	35%

Those desiring further information preferred to receive information by email (34%), mail (32%), and other methods such as trainings and workshops (26%; Table 85).

Table 85: Information Delivery Preference, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Email (n=93)	34%
US mail (n=93)	32%
Trainings, workshops or seminars (n=93)	26%
Webinar (n=93)	17%
Community event (n=93)	16%
Phone (n=93)	11%

5.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

A large majority of surveyed trade allies (81%) sold lighting controls. Trade allies also reported on whether the equipment they normally keep in stock was high-efficiency or Energy Star rated, or if instead they keep unrated/standard items in stock and *order* the high-efficiency items as needed. Just under half (48%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 86 below. More than three-quarters (81%) kept a full range of equipment to offer, and 98% agreed that the “Better” and “Best” equipment is usually more energy-efficient. Well over half (59%) reported they suggest the “Best” equipment to customers first.

Table 86: Equipment Sales Approach, among E+ Business Partners Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option (n=78)	81%

	Percent
Agree that BETTER and BEST equipment options are typically more energy efficient than the GOOD option (n=61)	98%
Best mentioned first (n=59)	59%
Better mentioned first (n=59)	29%
Present all options simultaneously (n=59)	10%
Good mentioned first (n=59)	2%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock (among the 48% of surveyed trade allies who reported that they typically stock efficient equipment). One-third (33%) of these trade allies reported that a high majority (75% or more) of their stock was high-efficiency equipment. Another third categorized less than 26% of their routine stock as high-efficiency. These trade allies also estimated the share of sales made in the past two years that were energy-efficient items. About one-fifth of this group (19%) categorized *all* of the equipment they sold in the past two years as high-efficiency equipment (Figure 23).

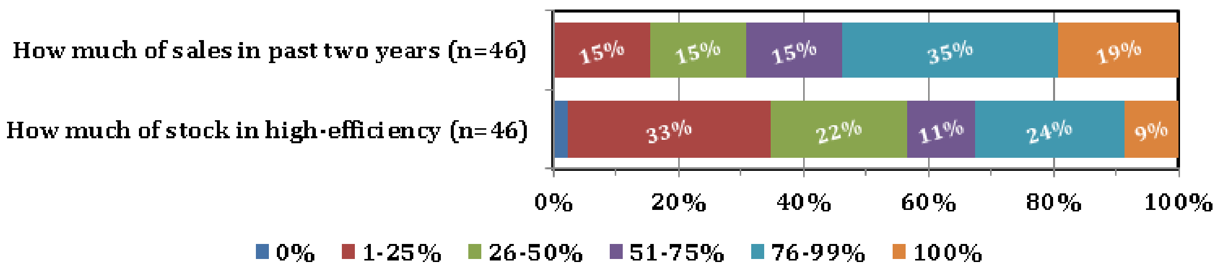

Figure 23: High-Efficiency Equipment Share, among E+ Business Partners Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment and insulation that qualify for rebates. In *insulation* projects, 96% of respondents mention lower energy bills to the customer, 81% mention the rebate, and 78% mention the high quality of the product (Table 87). In energy-saving *equipment* promotion, 87% of respondents stress lower operation costs and 86% the NWE rebate (Table 88).

Table 87: Customer Benefits of Insulation, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=27)	96%
Utility rebate (n=27)	81%
High-quality of product (n=27)	78%
Comfort (n=27)	74%

Table 88: Customer Benefits of Equipment, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=79)	87%
Utility rebate (n=79)	86%
High-quality of product (n=79)	65%
Lower maintenance costs (n=79)	59%

About 15% of these trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these dozen mentioned cost or reliability concerns with the equipment, primarily.

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. One-third (33%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. A higher percentage (42%) of *insulation* installers also recalled qualifying installations when no rebates were sought. Among the reasons reported in the following Table, no single reason stands out as a barrier to rebate applications (Table 89).

Table 89: Circumstances When Rebate Foregone, among E+ Business Partners Trade Allies

(Allowed Multiple)	Percent
Unspecified or unclear (n=21)	25%
Customer did not apply (n=21)	19%
Rebate too small (n=21)	19%
Trade ally unaware of rebate/program (n=21)	14%
Customer ineligible (n=21)	14%
Applying takes too long or difficult (n=21)	14%

5.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (67%) of these trade ally respondents reported that they had trained staff to talk to customers about energy efficient choices. In fact, 51% of these respondents said they "almost always" initiate the discussion about utility rebates for which their customer might qualify (Table 90).

Table 90: Rebate Initiator, among E+ Business Partners Trade Allies

	Percent (n=90)
Almost always trade ally initiated	51%
Mostly trade ally initiated	27%
About half trade ally and half customer	14%
Almost always customer initiated	7%
Other	1%

When a customer is considering insulating their building, respondents suggest the rebate program to the customer 92% of the time, rather than waiting for the customer to show interest in rebates. Likewise, once a customer is considering an actual equipment purchase, 95% of respondents suggest options that qualify for a rebate to the customer.

Trade allies also indicated whether they had any reservations about recommending the program to their customers. Most surveyed trade allies (78%) indicated that nothing about the program raised issues or concerns for them around their customers' participation. Among the 22% of respondents who had initial concerns, the following table suggests concerns about both rebate processes, and perhaps the rebate not applying to customer equipment choices (Table 91).

Table 91: Initial Concerns, among E+ Business Partners Trade Allies

	Percent (n=20)
Unclear processes or qualifications	45%
Too much paperwork	15%
R-value problems	15%
Other	15%
No LED rebate	10%

A notable minority (30%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" most often notified their customers on a quarterly basis (Table 92).

Table 92: Customer Contact Frequency, among E+ Business Partners Trade Allies

	Percent (n=26)
Once a quarter	38%
2 times a year	15%
Once a year	15%

	Percent (n=26)
Once a month	12%
Every day	12%
Varies by customer	8%

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (55%) reported working with the customer in a joint effort to prepare the applications. Another 30% did all or most of the application themselves.

Table 93: Rebate Application Preparer, among E+ Business Partners Trade Allies

	Percent (n=87)
Typically both trade ally and customer	55%
Typically trade ally prepares all or most of the application	30%
Typically the customer prepares all or most of the application	14%
Depends on the rebate	1%

About three-quarters (76%) of the 73 trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process is simple to follow.

The majority (from 59% to 84%) of trade ally respondents rated elements of information they received from NWE on rebates and contacting program staff as "clear" or "very clear" (Figure 24).

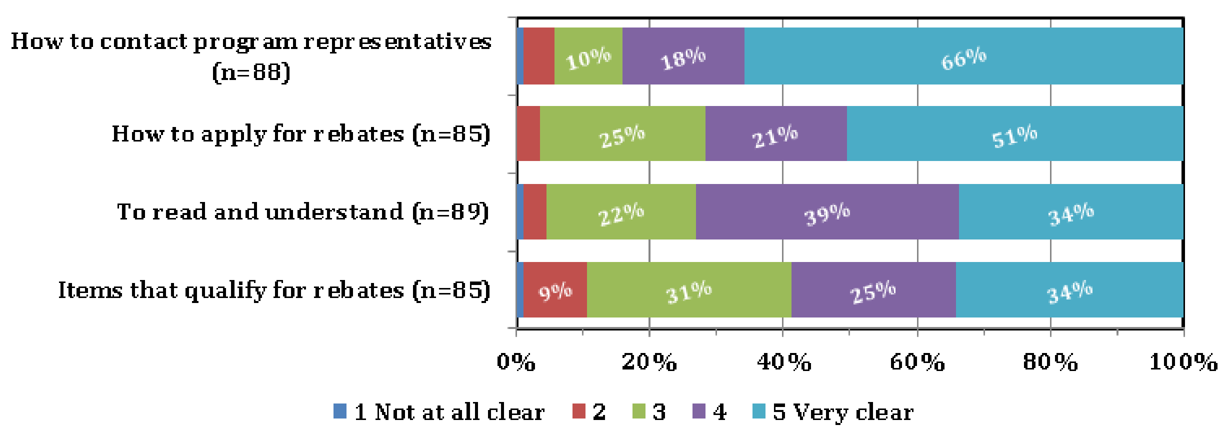

Figure 24: Clarity of Program Information, among E+ Business Partners Trade Allies

Respondents rated their agreement with several positive statements related to staying current with program changes. At least 66% of respondents "agreed" or "completely agreed" with the statements listed in the table below (Figure 25).

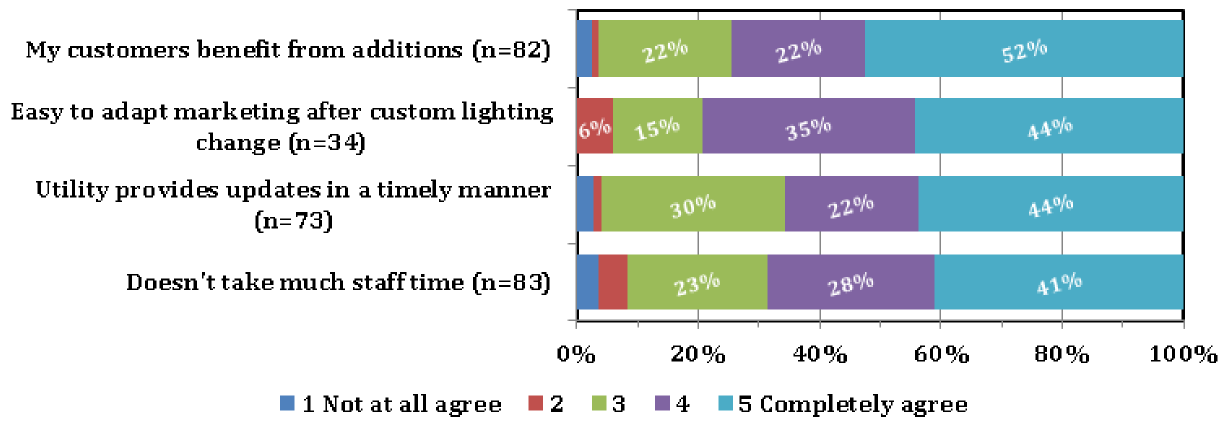

Figure 25: Experience With Program Changes, among E+ Business Partners Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures for NWE programs. LED lighting was most commonly suggested (Table 94). These trade allies indicated they suggested the items primarily because "it's more efficient," and also "customers request the equipment" (Table 95).

Table 94: High Efficiency Equipment Suggested, among E+ Business Partners Trade Allies

	Percent (n=32)
LED lighting	53%
Other heating systems	19%
Other	13%
Heat pumps	9%
On demand water heaters	6%

Table 95: Reasons Equipment Should Be Added, among E+ Business Partners Trade Allies

	Percent (n=31)
It's more efficient	32%
Customers request them	19%
Where industry is going	16%
Rebate will increase sales	13%
Cost	6%
Other	13%

5.3.4.4. Firmographics

A few trade allies (24%) operate at more than 20 Montana locations. More than half (52%) of respondents serve five or fewer locations.

Table 96: Number of Montana Locations, among E+ Business Partners Trade Allies

	Percent (n=90)
1 location	31%
2 to 5 locations	21%
6 to 10 locations	16%
11 to 20 locations	9%
21 to 50 locations	8%
Over 50 locations	16%

Trade allies reported on the maximum number of miles they would travel to serve clients. The percentage of trade allies reporting travel at the lower and upper ends of the range is similar, with 22% traveling less than 100 miles, and 18% traveling more than 400 miles. The majority would travel between 101 and 200 miles to serve a client (Figure 26).

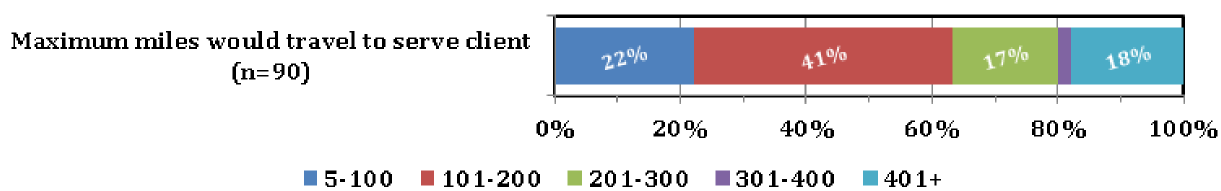

Figure 26: Maximum Miles, among E+ Business Partners Trade Allies

5.4. Recommendations

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Business Partners participants overwhelmingly want to continue to make efficiency upgrades with NWE: nearly all participants (7 of 8) reported wanting more information about NWE's efficiency programs. Contractors and vendors play a key role in recruiting participants: over three-fourths of participants heard about the program through their contractor, and half of respondents reported that their contractor initiated the project and that they received continued support throughout the process. Participants reported positive experiences with program staff, processes, and outcomes, and a vast majority report they are very likely to participate in future programs.

Surveyed commercial trade allies also reported positive experiences with the program and, echoing participant responses, reported they played an important role in suggesting the program to customers: nearly all trade allies reported that they proactively suggested the program to their customers.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in

the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.

- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

6. E+ Irrigation

6.1. Program Description

E+ Irrigation is a custom incentive program that began in 1992 and serves customers in the agricultural sector. The program includes both new and existing irrigation equipment. Electric supply and electric choice (< 1 MW) are eligible. Program incentives are funded through USB.

Customers may develop projects on their own; however, third parties are involved in the majority of program projects. The program relies on consultants and contractors to market, develop, design, and provide savings analyses for projects. These firms fall into two groups:

- E+ Program Contractors who receive training on NWE's programs and procedures, and are paid directly by NWE
- Contractors and consultants unaffiliated with NWE who work directly for NWE customers

Each project is reviewed for cost effectiveness. The net present value of the energy savings are combined with factors such as first-year operations and maintenance savings, increased crop yields, and/or water savings. The net benefit of the project must exceed the cost of the project.

Alternative delivery mechanism

NWE contracts with engineering and contracting firms to be E+ Program Contractors who support customers in project development and implementation of program projects. These contractors are paid by NWE a fixed percentage of the resource savings generated by the project, part at contract signing and the remainder when the project is successfully completed. E+ Program Contractors may offer additional services, such as equipment installation, separately from the scope of their project-development services for the customer. The number of E+ Program Contractors has increased from one in 2007 to six in 2011. The contract period for E+ Program Contractors is two years and they must generate one-quarter Average MegaWatt hour (about 2.2 MWh) of annual savings by the second year to be considered for contract renewal.

Additional Services Offered

NWE may provide technical assistance to customers during the project or refer the customer to one of the E+ Program Contractors.

6.1.1. Energy Savings

Energy savings estimates for irrigation measures are custom incentives derived from a range of engineering methods such as bin calculations and other types of engineering calculations.

6.1.2. History

This is a mature, well established program. Several notable changes occurred over the course of the 2007–2011 program years:

- NWE began contracting with E+ Program Contractors to market, design, and provide measure analyses for customers in 2007.
- In July 2010, to increase customer convenience and reduce program operation costs, irrigation pump VFDs became a prescriptive rebate measure offered through the E+ Commercial Existing Electric Rebate program.

6.1.3. Marketing

NWE and their contract marketing team promote the program to customers and trade allies through the marketing channels established for all non-residential programs:

- Direct mailing in the spring of each year to all irrigation accounts.
- Direct customer marketing by meeting with customers at their business sites, and at conferences and community events
- Attending and presenting at professional and trade association meetings such as those for healthcare, hospitality, architects, engineers, and service organizations
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors
- Targeted advertising in print media
- Co-sponsoring Montana Energy Conferences with the state government and Northwest Energy Efficiency Alliance (NEEA)
- Although NWE's commercial programs do not use preferred contractors as its residential programs do, many contractors participating in the residential preferred contractor program are familiar with the commercial rebate programs and promote them to their commercial customers

Beginning in the fourth quarter of 2011, there was an increase in non-residential marketing activity due to the expansion of the contract marketing team.

6.1.4. Program Steps

Project development times vary and NWE may provide technical assistance to help customers with the process or refer the customer to one of the E+ Program Contractors. The formal project review process begins with the submission of a proposal to NWE for review.

Customers submit detailed project proposals and must demonstrate to NWE that projects and measures are cost effective and the technology reliable. Measures may be presented for consideration individually or bundled. Each measure must individually pass the TRC test to be eligible for funding through the program.

Provided the cost effectiveness test is met, incentives may not have a simple payback to the customer of less than 1.5 years. If a measure has a payback of less than 1.5 years, the customer incentive is reduced to the point where the customer's payback equals 1.5 years.

Project proposals follow a rigorous twelve point format, summarized below.

- Facility NWE account information
- Facility name and location
- Facility owner
- Site contact information
- Third-party consultant or contractor, their role, and qualifications
- Detailed facility description
- Detailed measure description with baseline and as-built data
- Analysis methodology
- Cost estimates broken out by design, equipment, and labor.
- Life-cycle economic analysis
- Additional benefits quantified, if possible
- Implementation schedule

Project sites may be inspected by NWE or required to have baseline monitoring prior to contract approval.

When all requirements are met and the project found to have merit as a resource investment for NWE the customer receives a contract with the project cost-sharing proposal. The customer reviews and signs the two original contracts, returns them to NWE where the program manager executes the contracts, returning one original contract to the customer.

When the work is complete, the customer notifies NWE and provides cost documentation. NWE inspects all projects and may require temporary metering or monitoring to document post-installation energy use. If the final project is not implemented as documented in the contract or savings are expected to be less than originally calculated, the incentive may be adjusted downward.

Following inspection and final approval by NWE, the customer and, if applicable, the E+ Program Contractor, receive payment.

6.2. Impact Evaluation

6.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

6.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and we recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

Since this was a custom program, the NWE program savings were based on measure-specific engineering calculations. We performed a review of the program algorithm for each sampled site. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the as-built conditions observed during the site visit. For measures where the NWE method was not adequate, we recalculated energy (kWh) and demand (kW) savings using the more reliable techniques.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and were producing energy savings. We collected data as necessary to support a re-estimation of energy (kWh) and demand (kW) savings, using the calculation method that resulted from the algorithm review, discussed above. For some sampled cases the data collection included one-time and/or short term measurements of parameters relevant to the energy performance of the installed measures. We calculated evaluation energy (kWh) and demand (kW) by applying the final calculation method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

6.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

6.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

6.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

6.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

6.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

6.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 32 sampled cases for this program across the five program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

Program Algorithm Review

We reviewed the algorithms used by the program to estimate program savings for the measures installed in the sampled cases. The program algorithm was based on a detailed engineering analysis of the proposed irrigation system, using assumed flow rates and operating times, physical parameters of the systems and pump curves. We compared the resulting projected energy consumption (kWh) to average pre-implementation utility-billed energy consumption averaged over multiple years to arrive at the claimed energy savings.

The engineering calculations performed by the program to estimate energy savings for these projects were done well and it is doubtful any better approach could be devised or executed. However, what cannot be included in those calculations are accurate predictions of weather conditions and operator decisions following project implementation. Because both of those unpredictable parameters are captured in recorded weather data and utility billing data, we accounted for their influences on project performance through the use of appropriate data. For this reason, we employed an algorithm different from that used by the program. To estimate actual energy savings, we used crop water usage (CWU) values, which are determined on a daily basis by the Pacific Northwest Cooperative Agricultural Weather Network from meteorological and soil conditions data collected at their AgriMet stations. These stations are located throughout Montana and crop-specific CWU values are posted on the internet each morning for use by irrigators. We used monthly CWU values concurrent with utility kWh billing data from both the pre- and post-implementation periods. We adjusted pre-implementation billing data by the ratio of post-implementation CWU to pre-implementation CWU to reflect the pre-implementation performance of the irrigation system under post-implementation water requirements. We estimated project savings as the difference between the adjusted pre-implementation kWh usage and the post-implementation kWh usage.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Irrigation program we successfully visited 14 sites. The customers in this program were very accommodating when it came to agreeing to and scheduling site visits.

Table 97: Site Recruitment Disposition for E+ Irrigation

	Total n	%
Recruitment		
Telephone Lab	0	
Special Effort		
Attempts	15	
No Reply	0	0%
Refused	1	7%
Recruited	14	93%

	Total n	%
Total Recruited	**14**	
Onsite		
Refused	0	0%
Not Needed	0	0%
Total Completed	**14**	**100%**

Site Inspections

We performed site inspections for a sample of 13 measures that were assigned to the 2010–2011 program years. (We also performed an inspection for one measure that we later discovered should be assigned to the 2012 program year; this site was subsequently not included in the evaluation). We found that the measures were generally implemented as specified in the program documentation provided for each of the projects.

We calculated evaluation savings for each sampled measure by applying the evaluation calculation method to the as-built conditions observed during the site visit. In most cases we determined the evaluation site-specific savings to be less than the program estimate. In four instances, the evaluation site-specific savings were determined to be substantially greater than the program estimate. This was due to the differences in the tracking and evaluation algorithms. The evaluation approach took into account the actual performance of the irrigation systems under actual conditions. Each system was individually metered so there is no contamination of the data from other loads. In addition, the baseline adjustment (through the use of pre- and post-implementation CWU values) also took into account differences in pre- and post-implementation watering conditions that it was not possible to address in the tracking estimates.

In one case, we found the post-implementation energy consumption for the irrigation system to exceed the original system energy consumption. This was due to the system having been sufficiently improved that the irrigator used it more often than was the pre-implementation system.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown are the savings after we applied site visit adjustments and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 98: File Review and Site Visit Adjustment to Savings for E+ Irrigation

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Irrigation	kWh	1,576,697	1,576,697	1,621,603	1,621,603	1.00	1.03	1.03

6.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 99: Savings Adjustments by Calendar Year for E+ Irrigation

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	E+ Irrigation	kWh	2008	411,081	1.03	-	-	1.03	422,789	48
	E+ Irrigation	kWh	2009	591,595	1.03	-	-	1.03	608,444	69
	E+ Irrigation	kWh	2010	426,406	1.03	-	-	1.03	438,550	50
	E+ Irrigation	kWh	2011	147,615	1.03	-	-	1.03	151,819	17
	E+ Irrigation	kWh	All Years	1,576,697	1.03	-	-	1.03	1,621,603	185
Electric										
	E+ Irrigation	kWh	All Years	1,576,697	1.03	-	-	1.03	1,621,603	185

6.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 100: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Irrigation

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	E+ Irrigation	kWh	2008	422,789	0.67	1.41	1.06	0.73
	E+ Irrigation	kWh	2009	608,444	0.59	1.87	1.38	0.64
	E+ Irrigation	kWh	2010	438,550	0.77	1.75	1.39	0.85
	E+ Irrigation	kWh	2011	151,819	0.18	0.63	0.59	0.19
	E+ Irrigation	kWh	All Years	1,621,603	0.51	1.41	1.12	0.56
Electric								
	E+ Irrigation	kWh	All Years	1,621,603	0.51	1.41	1.12	0.56

6.3. Process Evaluation

6.3.1. Methodology

We met with all key members of NWE’s program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

We also interviewed managers at six E+ Program Contractors, although only one firms reported conducting irrigation projects. To understand the process of participation and the experiences of participants, we conducted phone surveys with seven participants and 10 trade allies. Surveyed trade allies include those who reported offering irrigation products and services. We also spoke with a program contractor.

6.3.2. Implementation Findings

6.3.2.1. Interview Findings

All irrigation projects seeking custom incentives go through NWE's E+ Irrigation Program. Applications to the program are in the form of project proposals. NWE provides a detailed proposal outline and program guidelines on its website. Project descriptions in proposals must demonstrate the cost-effectiveness of the proposed conservation and/or load-management measures or group of measures. Each measure or group of associated measures that can function independently must separately pass the utility's cost-effectiveness test.[8] Proposals must also describe the reliability and availability of the proposed equipment, and identify the availability of qualified design services, contractors, and maintenance services to support project implementation and operation.

Irrigation incentives are funded through USB for which a modified cost-effectiveness test is used. This test considers measure cost, and the net present value of operation and maintenance savings, crop yield increases, and water savings over the life of the measure.

Before the project can begin, NWE requires a project contract with the owner. The customer receives a contract with NWE's project cost sharing proposal. The customer reviews and signs duplicate original contracts, returns them to NWE where the program manager executes the contracts, and returns one of the original contracts to the customer. Payments can be made to the owner when the project is complete and operating, or at specified times during project implementation. System commissioning may also be required.

Post installation, NWE inspects all E+ Irrigation projects and makes an adjusted final payment for the work completed as specified in the contract.

This program lacks a tracking database that organizes documented savings by project. Data is tracked inconsistently by project and poses a barrier to evaluation.

Variable frequency drives (VFDs) used to be covered under the irrigation program as a custom project, but there were frequent applications for small VFD custom projects. In July 2010 VFDs became a prescriptive rebate. Staff and performance contractors report that this has been a great time-saving change that reduces a lot of work for both the contractors and the applicants and reduces the application processing time.

We also interviewed program managers (and one principal) with the six firms acting as E+ Program Contractors in support of NWE's E+ Irrigation and E+ Business Partners programs. Only one of these firms indicated involvement in irrigation projects (Table 101). See section 5.3.2 for the complete findings we obtained for E+ Program Contractors.

[8] An example of a group of associated measures is a variable frequency drive and its associated controls and variable air volume box.

Table 101: Targeted Markets and Opportunities for E+ Irrigation

E+ Performance Contractor	Initial Market Plan	Most Opportunities	Least Opportunities
1	Broad interest plus irrigation	No Response	No Response
2	Retail grocery (refrigeration), retail in general, lighting, and commercial new construction.	Irrigation (VFD)	All sectors are basically poor due to economy and competition
3	Primary: Higher Education, K-12, Health Care. Secondary: State agencies, Cities, Counties, and Industrial sectors. (all end uses)	Same – all represent opportunities	Not Applicable
4	Industrial and municipal (compressed air, pumping systems, air handling)	Industrial – custom projects with pneumatic conveying, air handling, pumping end uses.	Small commercial/office buildings and K-12 HVAC projects (difficult to develop)
5	Health Care, Education, and Grocery (VFDs, refrigeration	Health Care and Grocery (VFDs, refrigeration)	Higher Education; State & local governments (due to competition)
6	Industrial, grocery, and general commercial sectors (hospitals and schools)	Grocery and restaurant sectors	High-energy-consumptive small-commercial markets

6.3.2.2. Best Practices Assessment

Table 102 through Table 105 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 102: Program Planning and Design Best Practices for E+ Irrigation

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic

Practice	NWE Assessment
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions ▪ E+ Program Contractors with experience in both Montana and end uses with efficiency opportunities support the program
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ E+ Program Contractors with experience in both Montana and end uses with efficiency opportunities proactively engage customers to encourage program participation
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually

Table 103: Program Management and Administrative Best Practices for E+ Irrigation

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plan
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	The implementation contractor and E+ Program Contractors facilitate customers' participation (identifying qualifying measures, completing application forms)
Offer assistance in preparing and submitting program applications	The implementation contractor and E+ Program Contractors facilitate customers' participation (identifying qualifying measures, completing application forms)

Practice	NWE Assessment
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE provides incentive checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	Opportunity exists for NWE to ask E+ Program Contractors to periodically report by subsector their perspectives on barriers and effective approaches and messaging
Offer a single point of contact for customers of audit and non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 104: Marketing and Outreach Best Practices for E+ Irrigation

Practice	NWE Assessment
Market energy efficiency options directly to large end-users at the earliest decision-making stages of major equipment or facility modifications	E+ Program Contractors do this
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website

Practice	NWE Assessment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 105: Program Quality Control Best Practices for E+ Irrigation

Practice	NWE Assessment
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct commercial-sector projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

6.3.3. Participant Findings

We surveyed seven NWE E+ Irrigation participants.

Interpreting Response Frequencies

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

6.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about energy efficiency from NWE, the kind of additional information they would like to receive, and provided information about their decision to make changes in their irrigation operations.

Two of the six (33%) irrigation respondents who answered the question said they had visited NWE's website. Those two respondents who did use the website went to learn about rebates or audits, money-saving tips, or to pay their utility bill.

All respondents said they would like additional information on workshops, events, and energy-saving educational opportunities (Table 106).

Table 106: Further Information Desired, among E+ Irrigation Participants

(Allowed Multiple)	Percent
Energy saving educational opportunities (n=7)	100%
Workshops or events on energy efficiency (n=7)	100%
Energy efficiency programs (n=7)	71%
Does not want any (n=7)	0%

Those desiring further information prefer to receive information by mail (71%). Smaller proportions of respondents also mentioned various other preferred methods of communication (Table 107).

Table 107: Information Delivery Preference, among E+ Irrigation Participants

(Allowed Multiple)	Percent
Mail (n=7)	71%
Workshop (n=7)	57%
Phone (n=7)	43%
Email (n=7)	43%
Community event (n=7)	29%
Webinar (n=7)	29%
Other (n=7)	14%

All of the E+ Irrigation respondents became aware of the irrigation program from a building professional, vendor, or contractor, Over 40% of respondents also learned of the program through utility publications (Table 108).

Table 108: Means of Program Awareness, among E+ Irrigation Participants

(Allowed Multiple)	Percent
Building professional, vendor, or contractor (n=7)	100%
Utility publication or advertisement (n=7)	43%
Utility representative appearance (n=7)	14%
Directly contacted utility (n=7)	14%
Word of mouth (n=7)	14%
Other (n=7)	14%

When considering whether to participate, 83% of these participants had no initial questions or concerns about participating.

Respondents were asked to rate the influence of various elements on their decision to purchase the energy efficient equipment. Large majorities described the rebate itself and/or the salesperson’s or contractor’s role as a “major influence” on their decision to participate (Figure 27).

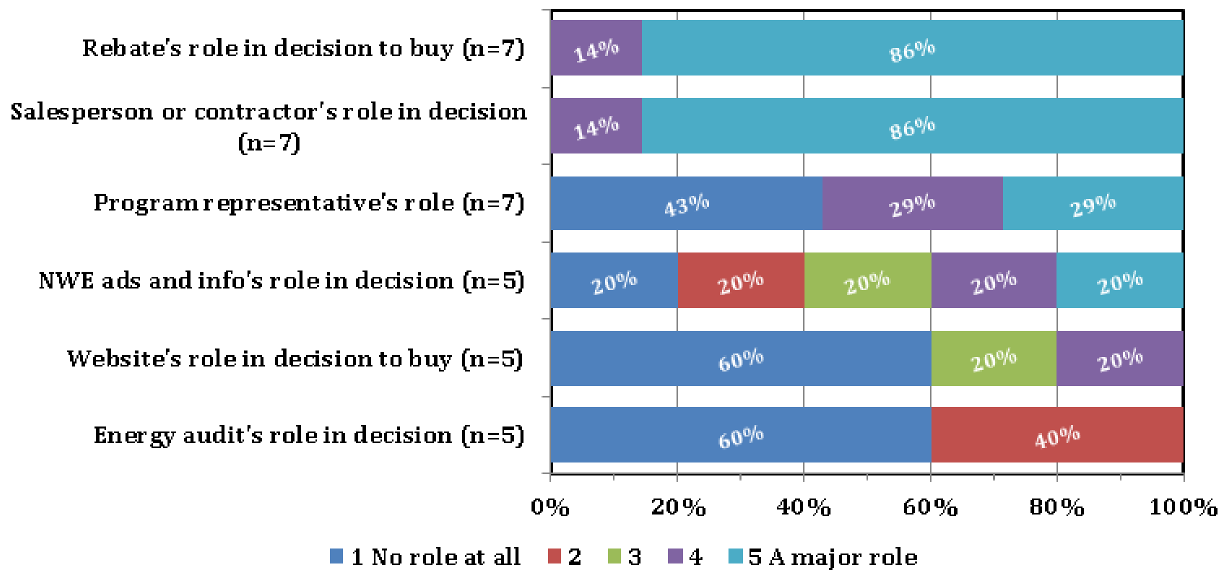

Figure 27: Influences on Purchase Decision, among E+ Irrigation Participants

We asked respondents to indicate which of a list of reasons for participation applied to them. All seven respondents participated to "save energy and money," needed the rebate to offset the cost of the qualifying measure(s), and because of a contractor recommendation (Table 109).

Table 109: Reasons For Program Participation, among E+ Irrigation Participants

(Allowed Multiple)	Percent
Contractor recommendation (n=7)	100%
Rebate needed to offset cost (n=7)	100%
Save energy and money (n=7)	100%
Reduce energy costs (n=3)	100%
Considering upgrades to operations already (n=7)	71%
Easy to use the program (n=6)	67%
Check specific equipment performance (n=7)	57%
Utility vouched for equipment by rebating (n=6)	50%
Wanted to follow audit with action (n=7)	43%
Good experience with other NWE efficiency program (n=7)	29%

6.3.3.2. Program Experience

Respondents reported on their program experience, including application, installation, and inspection processes, as well as whether they would participate in NWE efficiency programs again.

A majority of respondents reported that the discussion about undertaking an irrigation project was initiated by an associated vendor or contractor (Table 110).

Table 110: Project Initiator, among E+ Irrigation Participants

	Percent (n=7)
Associated vendors or contractors	57%
Discussion between both	29%
Participant	14%

Respondents were asked to rate the clarity of program information about phases of the program that applied to them. As seen below, proposal preparation was applicable to only one of our respondents. Majorities rated information provided as "clear" or "very clear." It appears that information on how to follow up with program staff was less than clear, with just 29% rating information on this topic as "clear" or "very clear" (Figure 28).

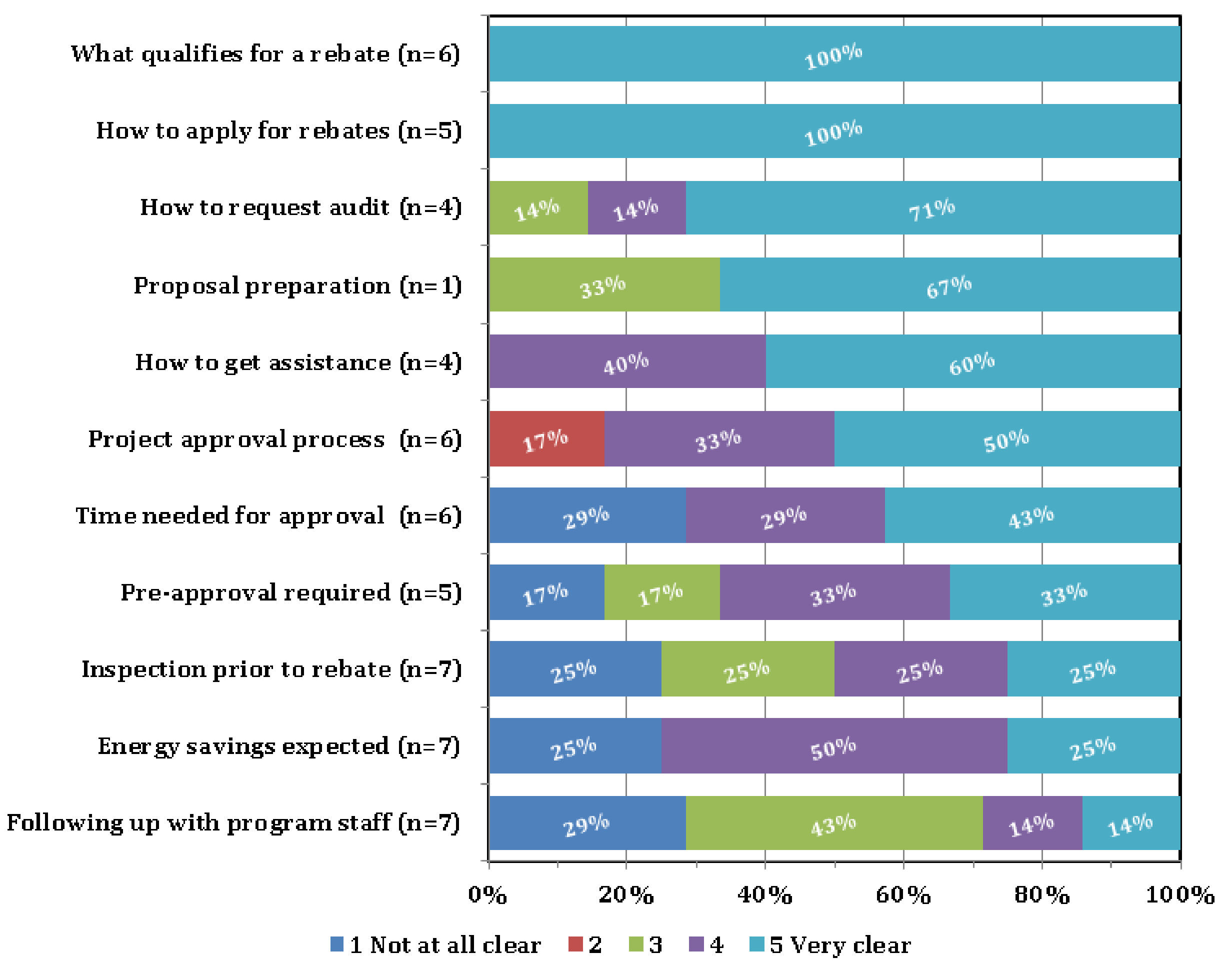

Figure 28: Clarity of Program Information, among E+ Irrigation Participants

Four (57%) of our seven respondents said they had *not* received advice and technical assistance from NWE during project implementation. Among the three (43%) who received utility advice, all "agreed" or "completely agreed" that the advisory services helped them to complete their irrigation project.

Irrigation project proposals are prepared by various actors. Most often (43%) the customer is involved, either solely or in cooperation with National Center for Appropriate Technology (NCAT) staff. When the customer is not involved, proposals were most often prepared by an associated engineers/contractors (29%), NCAT staff, or someone else (14% each; Table 111).

Table 111: Proposal Preparation, among E+ Irrigation Participants

	Percent (n=7)
Associated engineer/contractor	29%
My organization assisted by NCAT staff	29%
Myself	14%
NCAT staff	14%
Someone else	14%

Respondents tended to "agree" and "completely agree" with positive statements about several phases of the irrigation program and the installation of equipment. The highest percentage of respondents "completely agreed" that proposal acceptance and rebate receipt were accomplished in reasonable times, and that the installed items performed well (Figure 29).

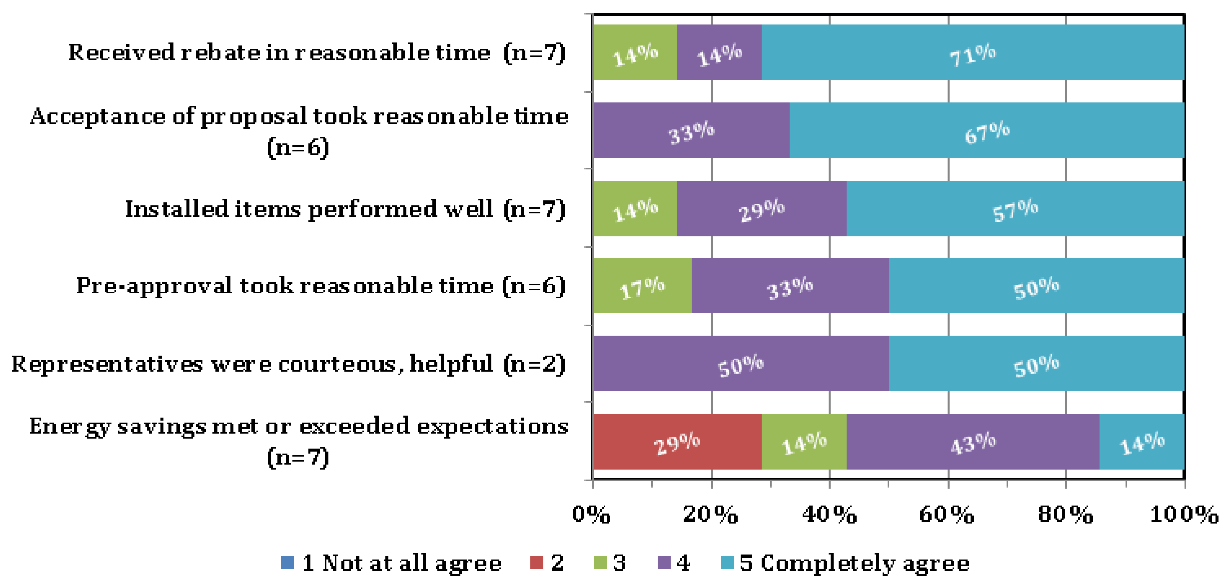

Figure 29: Experience With Installation Process, among E+ Irrigation Participants

All seven of the respondents reported having an on-site inspection by a utility representative, and all “agreed” or “completely agreed” that the inspector was courteous and efficient.

As a general indication of overall satisfaction with NWE’s efficiency activities, the survey asked participants about future participation in efficiency programs. A high percentage (83%) of these program respondents were “likely” or “very likely” to participate in future NWE energy efficiency programs (Figure 30).

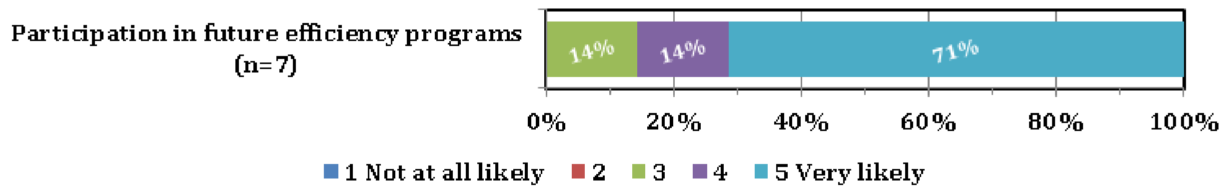

Figure 30: Likelihood of Future Participation, among E+ Irrigation Participants

6.3.4. Trade Ally Findings

We surveyed ten NWE trade allies who reported installing irrigation equipment that qualified for E+ Irrigation program rebates.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

6.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event (89%), or by directly contacting the utility (Table 112).

Table 112: Means of General Program Awareness, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=9)	89%

(Allowed Multiple)	Percent
Directly contacted utility (n=10)	70%
Utility website (n=10)	60%
Associated vendors and contractors (n=10)	50%
Word of mouth (n=10)	50%
Utility publication (n=10)	40%
Other (n=10)	30%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly, and from NWE representatives at meetings or events (Table 113).

Table 113: Specific Requirements Awareness, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=10)	40%
Directly contacted utility (n=10)	40%
Utility publication (n=10)	20%
Utility website (n=10)	10%
Other (n=10)	20%

A majority (80%) of surveyed irrigation trade allies visited the utility website. Among these website users, almost all (88%) said they used the site to learn about rebates or audits, and that many have also printed rebate forms. About half searched the site to find utility contact information (Table 114).

Table 114: Website Use, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=8)	88%
Print rebate forms (n=8)	88%
Money saving ideas (n=8)	50%
To contact utility (n=8)	50%
Educational events information (n=8)	38%

About four of these ten irrigation allies surveyed “completely agreed” that the website information was easy to find and helpful; the majority of respondents were not as positive about the website (Figure 31).

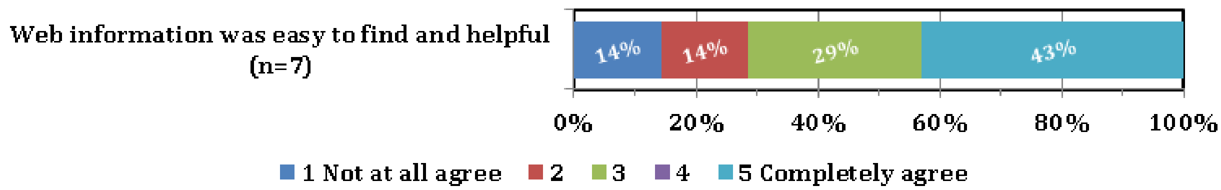

Figure 31: Website Effectiveness, among E+ Irrigation Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. Almost all (90%) said that they had contacted the utility to learn how the rebate program worked, and many investigated the status of applications and payments (Table 115).

Table 115: Reasons for Contacting NWE, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=10)	90%
Investigate status of an application (n=10)	70%
Investigate status of a rebate payment (n=10)	70%
To resolve a problem (n=10)	50%

A majority of irrigation trade allies would like NWE to provide more information and workshops or events on energy efficiency programs and opportunities (Table 116).

Table 116: Further Information Desired, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
Energy saving educational opportunities (n=10)	70%
Workshops or events on energy efficiency (n=10)	70%
Energy efficiency programs (n=10)	60%
None (n=10)	30%

Those desiring further information slightly preferred (43%) to receive information by mail, followed by email and trainings (Table 117).

Table 117: Information Delivery Preference, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
US mail (n=7)	43%
Email (n=7)	29%
Trainings, workshops or seminars (n=7)	29%

(Allowed Multiple)	Percent
Webinar (n=7)	14%

6.3.4.2. Energy-Efficient Equipment Promotion

Trade allies provided general information about their stocking, installation, and promotion of efficient irrigation equipment.

Irrigation trade allies were asked about equipment they typically keep in stock. They reported whether their stock typically includes high-efficiency equipment, or if instead they keep unrated/standard items in stock and *order* the high-efficiency items as needed. Only half of these trade allies were able to answer this question. Two of these five irrigation respondents said their stock did typically include high-efficiency equipment, while the other three made special orders as needed.

Trade allies reported on their sales strategies, listed in Table 118 below. More than two-thirds (70%) kept a full range of equipment to offer, and 100% agreed that the "Better" and "Best" equipment is usually more energy-efficient. Two-thirds of the respondents (67%) reported they suggest the "Best" equipment to customers first.

Table 118: Equipment Sales Approach, among E+ Irrigation Trade Allies

	Percent
Do you typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option to buy? (n=10)	70%
Would you agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' option? (n=7)	100%
Better presented first (n=6)	17%
Best presented first (n=6)	67%
Present all options simultaneously (n=6)	17%

Respondents reported on what benefits they typically mention to customers about the high-efficiency items that qualify for rebates. For irrigation, lower operation costs figured prominently, as did the utility rebate and lower maintenance costs (Table 119).

Table 119: Customer Benefits Mentioned, among E+ Irrigation Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=10)	100%
Utility rebate (n=10)	90%
Lower maintenance costs (n=10)	80%
High-quality of product (n=10)	70%

(Allowed Multiple)	Percent
Other (n=10)	10%

Only one of these irrigation trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. This respondent did so due to cost.

Surveyed trade allies also reported on whether their customers ever install qualifying efficient equipment without pursuing a rebate. One-third (38%) of respondents said they recalled installing rebate-qualifying equipment for which a rebate was not sought. The reasons for installing the efficient equipment without applying for a rebate included that the customer did not apply, that the rebate was too small, or that the trade ally was not aware of the rebate (one mention each.)

6.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (70%) of these trade ally respondents say they had trained organizational staff to talk to customers about energy efficient choices. In addition, 70% of these respondents said they "almost always" mention utility rebates for which their customer might qualify (Table 120).

Table 120: Rebate Initiator, among E+ Irrigation Trade Allies

	Percent (n=10)
Almost always trade ally initiated	70%
Mostly trade ally initiated	20%
About half trade ally and half customer	10%

When a customer is considering irrigation equipment purchases, respondents reported *always* suggesting NWE rebate options to the customer rather than waiting for the customer to show interest in rebates.

Irrigation trade allies reported whether they had initial questions or concerns about recommending the program to their customers. Most surveyed trade allies (60%) indicated that nothing about the program raised issues or concerns for them around their customers' participation. Those four respondents who had initial concerns cited the rebate procedure or the amount of paperwork involved.

A notable minority (30%) of irrigation trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE.

The clarity of information on irrigation measures that qualify for a rebate received poor ratings from respondents: just two trade allies rated this information as clear. However, in general, a majority of these trade ally respondents rated other information they received on rebates and contacting program staff as "clear" or "very clear" (Figure 32).

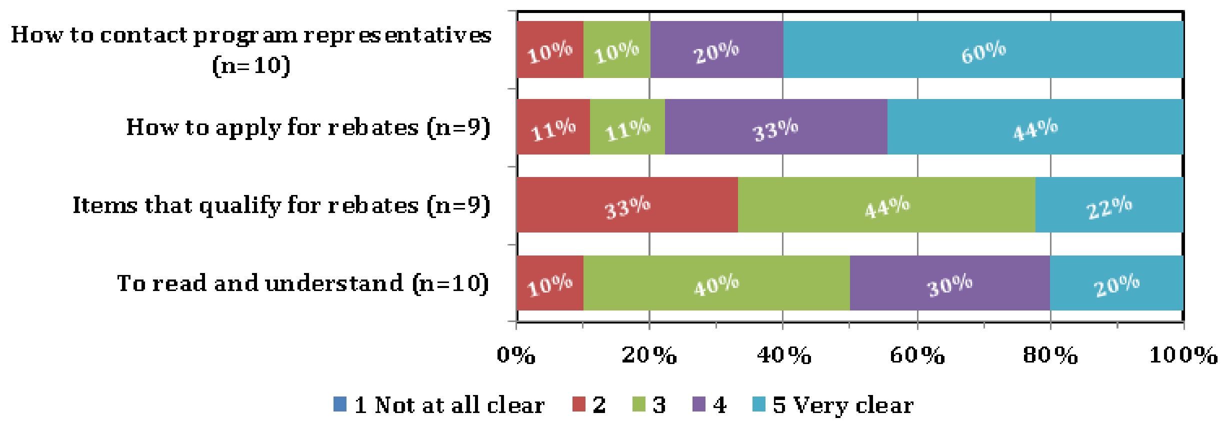

Figure 32: Clarity of Program Information, among E+ Irrigation Trade Allies

Irrigation trade ally respondents reported on their involvement in completing the rebate application. Mostly, these respondents (60%) reported working with the customer in a joint effort to prepare the application. Another 20% completed all or most of the application themselves (Table 121).

Table 121: Rebate Application Preparer, among E+ Irrigation Trade Allies

	Percent (n=10)
Typically both respondent and customer - about half and half effort	60%
Typically respondent prepares all or most of the application	20%
Typically the customer prepares all or most of the application	10%
Depends on the rebate	10%

Nearly two-thirds (63%) of the eight irrigation ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process was simple to follow.

Respondents rated their agreement with several statements related to staying current with program changes. At least 50% of respondents "agreed" or "completely agreed" with the positive descriptions listed in the table below (Figure 33).

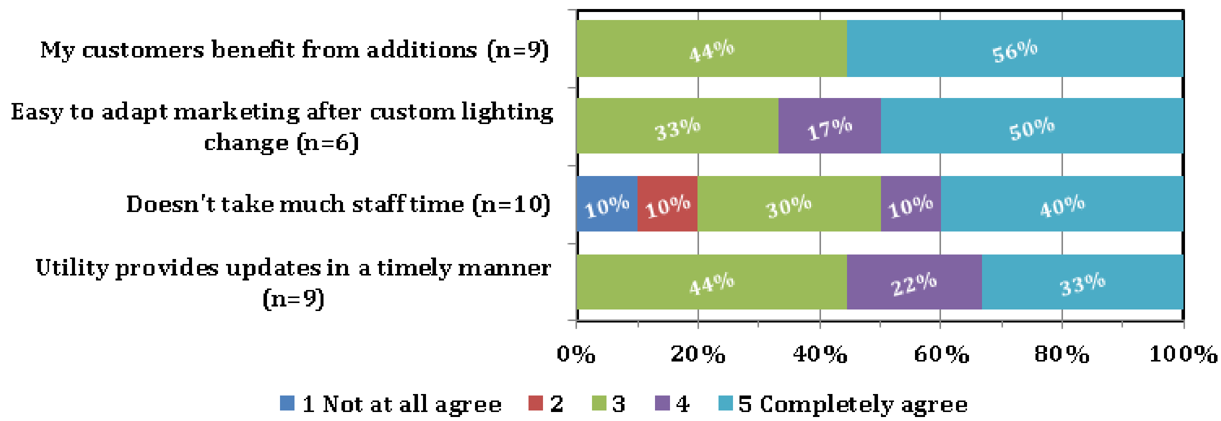

Figure 33: Keeping Up With Program Changes, among E+ Irrigation Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. Two irrigation allies suggested measures, including: adding sprinkler packages (gaskets) for irrigation systems, and a new construction (variable speed drives) program.

Respondents were asked about what challenges they have, if any, promoting irrigation equipment that qualifies for an NWE rebate. Two respondents mentioned customer unwillingness to spend proactively on irrigation, unless it breaks. When we asked respondents about changes to the NWE program that might help promote qualifying measures, a handful (3) mentioned bigger incentives/lower costs, or targeted training on irrigation savings.

6.3.4.4. Firmographics

A third (33%) of these irrigation trade allies provide services at more than 50 Montana locations. However, the majority (56%) of these trade allies' businesses were smaller – operating services from one location (Table 122).

Table 122: Number of Montana Locations Served, among E+ Irrigation Trade Allies

	Percent (n=9)
1 location	56%
Over 50 locations	33%
11 to 20 locations	11%

Trade allies reported on the maximum number of miles they would travel to serve clients. Irrigation allies reported a willingness to travel far, with 40% saying they would travel more than 400 miles. Fewer told us they would travel under 100 miles at a maximum to serve a customer (Figure 34).

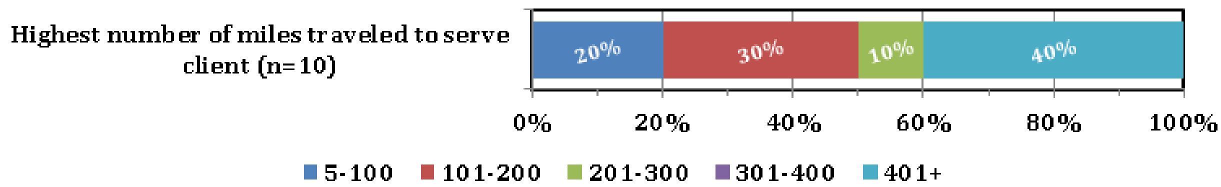

Figure 34: Maximum Miles, among E+ Irrigation Trade Allies

6.4. Recommendations

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices; including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

All surveyed E+ Irrigation participants reported wanting more information about efficiency opportunities and nearly all report they are very likely to participate in NWE's programs in the future. These program participants, more than others, were interested in attending efficiency workshops (four of seven indicated an interest). Contractors and vendors play a key role in recruiting participants: all participants heard about the program through their contractor, and although the rebate was also a key factor, all rated their contractor as a key reason for participating. Although respondents reported generally very positive experiences, a notable minority reported that information about the expected energy savings, the inspection process, and on following up with program staff was not at all clear. (The evaluators note that program application materials clearly state how to reach program staff.) Satisfaction with the amount of energy savings was also mixed.

Echoing participants' comments, surveyed irrigation trade allies reported playing an important role in program outreach: nearly all trade allies reported that they typically suggest the program to their customers. Trade allies reported use of NWE's website was relatively high, but just one contact reported using the website as a means of getting information about program requirements; satisfaction with website content was also lower than trade allies in any other sector, with less than half of trade allies rating the website information easy to find and helpful. Similarly, just one-fifth of trade allies reported that information about the type of equipment that qualifies for rebates was clear. Overall, more so than other programs, many E+ Irrigation trade allies find some elements of the program confusing, and nearly half of trade allies reported that they had, at times, had concerns about their customers' participation in the program.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.

- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

7. DEQ Appliance

7.1. Program Description

The Montana Department of Environmental Quality (DEQ) operated an appliance rebate program for about one year beginning in May 2010. Funding for the rebates were provided through the federal government's American Recovery and Reinvestment Act (ARRA). The DEQ administered the program and NWE provided program support through advertising. The program was funded through USB.

In 2010, Montana residential customers were informed that DEQ rebates were available for specified Energy Star appliances on a first come, first served basis until the ARRA funding was depleted. To apply for a rebate, customers mailed-in an application with a copy of the appliance purchase receipt. The appliances being replaced were required to be taken out of service and recycled. In the application, customers stated how the appliance was recycled. Over 3,000 NWE residential customers qualified for DEQ rebates.

At the time of the DEQ program, NWE did not provide appliance rebates, so there was no program overlap with existing NWE programs.

7.1.1. Energy Savings and Measures

Unit energy savings values were provided by the Department of Energy to the DEQ. Appliances qualifying for the DEQ rebates are listed in the table below.

Table 123: Measures for DEQ Appliance

Appliance	Qualifier
Clothes Washer, MEF[1] 1.8+	Energy Star rating with MEF ≥ 1.8 if purchased in 2010
Clothes Washer, MEF 2.0+	Energy Star rating with MEF ≥ 2.0 if purchased in 2011
Dishwasher	Energy Star rating
Freezer	Energy Star rating
Refrigerator	Energy Star rating

[1] Modified Energy Factor (MEF) - This metric has the same units as the energy factor (EF): ft3/kWh/cycle. MEF is the quotient of the capacity of the clothes container, C, divided by the total clothes washer energy consumption per cycle, with such energy consumption expressed as the sum of the machine electrical energy consumption, M, the hot water energy consumption, E, and the energy required for removal of the remaining moisture in the wash load, D. The higher the value, the more efficient the clothes washer is.

NWE's DEQ program energy savings were derived from the DEQ program participant data which included all participants in Montana, without customer names or addresses. Participant postal codes, appliance type, make and model numbers were used by NWE to determine which participants were NWE electric and/or gas customers and that the appliance met program requirements. NWE cross-referenced customer postal codes with allocation factors to estimate the number of NWE customers participating in the program. The allocation factors are the known percentage of NWE customers per zip code and the percentages of those customers with NWE electric and/or gas service.

7.1.2. History

The program was limited to about one year. One program change occurred in January 2011 with an increase in the modified energy factor (MEF) value from 1.8 to 2.0 required for clothes washers.

7.1.3. Marketing

Marketing activities included development of the DEQ program website, news releases, and newspaper and radio ads.

7.1.4. Program Steps

Program administration was managed by the DEQ and their contractor. Participation requirements were:

- Consumers must apply for their rebates no more than 30 days after purchasing an eligible appliance.
- Applicants submitted a mail-in application and a copy of the purchase receipt.
- Each household was limited to a maximum of two rebates for appliances from separate categories. For example, a rebate for a refrigerator and a rebate for a dishwasher could be claimed, but not two refrigerators or two dishwashers.
- Rebates were limited to Montana residents and the appliances must have been purchased from stores located in Montana.

7.2. Impact Evaluation

7.2.1. Methodology

We performed an impact evaluation of this program to assess the gross energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on verification of measure counts and a review of the UES methods used by NWE to estimate program savings. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross energy (kWh) and demand (kW) savings and perform the economic analysis.

7.2.1.1. Estimation of Gross Savings

NWE provided a detailed workbook that listed each appliance installed and provided the unit energy savings (UES) method used by NWE to estimate program savings for each measure. The program installed four appliance measures, including efficient refrigerators, freezers, dishwashers and clothes washers. We verified the counts of implemented measures, to the extent possible. We also reviewed the unit energy savings for each of the four measures implemented in this program.

Clothes Washers

We re-calculated the UES values based on the actual MEF of units shipped. We derived unit savings on an MEF basis using the Energy Star calculator. We weighted savings for each of the four combinations of gas/electric washer and dryer by NWE saturation of these combinations (NorthWestern Energy 2006). We adjusted counts of units for 2010 using the zip code saturation for electric accounts that NWE applied in 2011. We then applied the counts of units for 2011 in the same manner as NWE.

Dishwashers

We re-calculated the UES values using the Energy Star calculator. We derived weighted UES values based on the NWE gas/electric saturation of DHW. We applied Energy Star electric machine savings to units with gas DHW. We adjusted counts of units for 2010 using the zip code saturation for electric accounts that NWE applied in 2011. We applied counts of units for 2011 in the same manner as NWE.

Refrigerators

We re-calculated the UES values using the Energy Star calculator. We adjusted counts of units for 2010 using the zip code saturation for electric accounts that NWE applied in 2011. We applied counts of units for 2011 in the same manner as NWE.

Freezers

We re-calculated the UES values using the Energy Star calculator. We adjusted counts of units for 2010 using the zip code saturation for electric accounts that NWE applied in 2011. We applied counts of units for 2011 in the same manner as NWE.

For all measures, we applied the final UES values to the verified counts to estimate energy (kWh) and demand (kW) savings from this program.

7.2.1.2. Free Ridership

No customer surveys were possible for this program. Therefore, we were not able to estimate free ridership.

7.2.1.3. Spillover

No customer surveys or site visits were possible for this program. Therefore, we were not able to estimate spillover.

7.2.1.4. Leakage

No customer surveys were possible for this program. Therefore, we were not able to estimate leakage.

7.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

7.2.2. Energy and Demand Impacts

We estimated gross energy (kWh and dkt) and demand (kW) savings for each of the implemented measures. The results of our savings analysis are discussed below.

7.2.2.1. Estimation of Gross Savings

UES review

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value.

For clothes washers, as a result of re-calculating the UES according to the MEF of units actually installed, and the application of the actual saturation of gas and electric DHW and dryers in NWE territory, the electric UES increased from 113 to 252 kWh/year for 2010, and from 48 to 282 kWh/year for 2011 (the low program UES for 2011 resulted from the application of the NEEA incremental savings as if it were the entire savings). The gas UES increased from 0.55 to 0.747 dkt/year for 2010, and from 0.26 to 0.751 dkt/year for 2011.

UES values for each of the other measures increased slightly as a result of our re-calculation of unit savings with the Energy Star residential appliance calculator.

For all measures, the count of units shown in the table differs from the counts used in program calculations due to our applying the zip code allocation share used by NWE in 2011 to 2010.

Table 124: Summary of Evaluation Impacts for DEQ Appliance

Measure	Year	Allocated electric count	Allocated gas count	Program per unit kWh UES	Program per unit dkt UES	Program kWh Savings	Program dkt Savings	Evaluation Per unit kWh UES	Evaluation Per unit dkt UES	Evaluation kWh Savings	Evaluation dkt Savings
Clothes Washers	2010	1735	1622	112.71	0.55	248,293	686	252.0	0.747	437,350	1,211
	2011	368	262	48.26	0.26	17,598	69	281.9	0.751	103,796	197
	Totals					**265,891**	**755**	**-**	**-**	**541,146**	**1,408**
Dishwashers	2010	1277	1194	44	0.137	70,620	125	42.6	0.146	54,353	174
	2011	237	162	44	0.137	10,409	22	42.6	0.146	10,066	24
	Totals					**81,029**	**147**			**64,419**	**198**
Freezers	2010	248		44		14,608	-	50.5		12,548	-
	2011	37		44		1,615	-	50.5		1,854	-
	Totals					**16,223**	**-**			**14,402**	**-**
Refrigerators	2010	1860		95		221,255	-	117.7		218,868	-
	2011	275		95		26,138	-	117.7		32,383	-
	Totals					**247,393**	**-**			**251,251**	**-**
Totals	2010					554,776	811			723,119	1,385
	2011					55,759	91			148,100	220
Grand Totals						**610,535**	**902**			**871,219**	**1,606**

Count Verification

We reviewed the documentation of installed measures in the tracking database that was the basis for the NWE savings claim. The results from the review indicate that the data records were in order and reasonable. The measure count accurately reflected the program accomplishments claimed by NWE.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed to the file review for this program. The table compares the reported savings to those adjusted for changes based on our file review. All results shown are for gross savings.

Table 125: File Review Adjustment to Savings for DEQ Appliance

Funding	Study Name	Units	Savings		Savings Adjustment Rates
			Reported	Final	Final
Electric					
	DEQ Appliance	kWh	612,924	871,219	1.42
Natural Gas					
	DEQ Appliance	dkt	894	1,606	1.80

7.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings.

Table 126: Savings Adjustments by Calendar Year for DEQ Appliance

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	DEQ Appliance	kWh	2010	557,165	1.42	-	-	1.42	791,962	90
	DEQ Appliance	kWh	2011	55,759	1.42	-	-	1.42	79,257	9
	DEQ Appliance	kWh	All Years	612,924	1.42	-	-	1.42	871,219	99
Natural Gas - USB										
	DEQ Appliance	dkt	2010	803	1.80	-	-	1.80	1,442	
	DEQ Appliance	dkt	2011	91	1.80	-	-	1.80	164	
	DEQ Appliance	dkt	All Years	894	1.80	-	-	1.80	1,606	
Electric										
	DEQ Appliance	kWh	All Years	612,924	1.42	-	-	1.42	871,219	99
Natural Gas										
	DEQ Appliance	dkt	All Years	894	1.80	-	-	1.80	1,606	

7.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 127: Net Savings and Benefit/Cost Ratios by Calendar Year for DEQ Appliance

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	DEQ Appliance	kWh	2010	791,962	0.36	8.16	2.47	0.40
	DEQ Appliance	kWh	2011	79,257	0.16	11.20	3.41	0.18
	DEQ Appliance	kWh	All Years	871,219	0.33	8.38	2.54	0.36
Natural Gas - USB								
	DEQ Appliance	dkt	2010	1,442	-0.00	-0.00	5.35	-0.00
	DEQ Appliance	dkt	2011	164	-0.00	-0.00	6.02	-0.00
	DEQ Appliance	dkt	All Years	1,606			5.40	
Electric								
	DEQ Appliance	kWh	All Years	871,219	0.33	8.38	2.54	0.36
Natural Gas								
	DEQ Appliance	dkt	All Years	1,606			5.40	

7.3. Process Evaluation

7.3.1. Methodology

This is a program run by Montana's Department of Environmental Quality (DEQ) and not by NWE directly. While NWE contributed funds to this program, they had limited influence on the program design and implementation. The evaluation is further complicated by the fact that the

DEQ staff that ran the program retired and no one with firsthand accounts of the program remains with the organization to interview. Due to these issues, we were only able to interview NWE staff. We also drew upon a report provided by DEQ.[9]

We did not have access to participants. DEQ did not provide NWE with contact information for the participants and thus we did not survey them.

7.3.2. Implementation Findings

7.3.2.1. Interview Findings

The appliance rebate program was developed in response to ARRA and is a one-time program that ran until available funding was exhausted. There are no plans from Montana's DEQ to renew this program. This program provided rebates for Energy Star branded appliances: refrigerators, freezers, dishwashers, and clothes washers.

The program involved small local hardware stores and big-box appliance outlets in Montana. These retail outlets promoted available rebates alongside NWE's marketing campaign. The program encouraged and supported recycling all old appliances that were replaced in the rebate program.

The program was designed to keep administrative costs to a minimum to maximize benefits passed on to consumers through rebates. However, the ARRA funds were not sufficient to fully fund the program and the DEQ partnered with the utilities to make this an effective program. NWE provided additional funding towards program management and marketing, and other expenses beyond the rebates themselves.

Participants mailed in an application form with purchase information in order to receive the rebate. According to NWE staff, the most common causes of rejecting applications were failure to include proof-of-purchase documentation, lack of consumer signature on the rebate claim to certify compliance with the terms and conditions of the rebate program and submitting more than one application for the same appliance purchase. The rebate processor could generally correct most rejection problems with an email or letter to the consumer explaining why the application was rejected and the correction action needed. The rebate process appears to have been well managed by the rebate processor and the state received a minimum number of complaints from consumers who participated in the program.

Montana required recycling but did not pay consumers an additional rebate for recycling efforts. In many cases consumers had to pay a retailer to haul away and decommission their old appliance. Appliances were collected, in most cases, at the time of delivery of the new Energy Star appliance replacement.

NWE did not have access to participant names and addresses and had to make savings estimates based on appliance information and customers by zip code. Since the program close

[9] State Energy Efficient Appliance Rebate Program Final Program Report – Montana Grant # DE-EE-00001676, Dec 2011

in 2010, NWE has added cost-effective measures that were part of this DEQ program to its prescriptive rebate program. Because these measures were not previously a part of NWE's rebate program, there was no overlap between DEQ's program and NWE's offerings.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

7.3.2.2. Best Practices Assessment

The DEQ Appliance program followed a key best practice in using the Energy Star logo to instill consumer confidence. We did not assess the program for other best practices as it was designed and implemented by the DEQ. We assess NWE's residential rebate programs with respect to best practices.

7.3.3. Participant Findings

We did not conduct participant surveys, as we lacked access to participant data. NWE did not interact directly with participants.

7.3.4. Trade Ally Findings

We did not conduct trade ally surveys for this program. DEQ coordinated retailers' involvement.

7.4. Recommendations

Based on the impact evaluation findings, we offer the following recommendation for improving the program.

- **Evaluated values:** Update UES values for the measures included in this program to the evaluation values, which incorporate the findings from recent research.

8. E+ Commercial Existing Electric Rebate

8.1. Program Description

The non-residential electric prescriptive rebate program was added to NWE's program portfolio in 2011. Prior to that, non-residential electric rebates were limited to lighting and motors and all other electric measures went through the custom incentive program, E+ Business Partners. Eligible customers are non-residential Electric Supply and Electric Choice (< 1 MW) customers. The program is funded as follows: commercial program rebates: DSM, rebates for Small Choice commercial customers: USB, marketing: USB and DSM.

As of 2011, the program covers all non-residential electric rebate measures with the exception of lighting. General measure areas include HVAC, irrigation, appliances, refrigeration, weatherization, motor rebate, motor rewind, and electric water heating. Motor measures were considered to be a separate program until 2011 and, for this evaluation, will be evaluated as a stand-alone program.

This program is associated with E+ Audit Home or Business program as a source of marketing and referrals.

Alternative Delivery Method

Customers may apply for incentives through the E+ Business Partners for cost-effective electric measures where a prescriptive rebate is not offered.

8.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the program in 2011. The effective date in the program literature is listed as 7/1/2010; however, the measures weren't available until April 2011.

Table 128: Measures Offered for E+ Commercial Existing Electric Rebate

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
Automated Exhaust VFD Control – Parking Garage Sensor	$/horsepower (HP)	Fixed rebate per HP	Base case is constant volume continuous duty fan(s)	X	7/1/2010
Automated Ventilation VFD Control (Occupancy Sensors/CO2 Sensors)	$/Sq. Ft.	Per Sq. Ft. of area controlled	Demand controlled ventilation (VFD and CO2 or occupancy sensors)	X	7/1/2010
Direct Digital Control System – Wireless Performance Monitoring	$/Sq. Ft	Per Sq. Ft. of area controlled	Central heating exclusively with electricity	X	7/1/2010
Exhaust Hood Makeup Air	$/Unit	Per unit installed	Central heating exclusively with electricity	X	7/1/2010

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
Hotel Key Card or OS Room Energy Control System	$/Unit	Per room	Heating and cooling exclusively with electricity	X	7/1/2010
Motor Fan System - VFD	$/Unit	Per motor HP		X	7/1/2010
Motor Pump System - VFD	$/Unit	Per motor HP		X	7/1/2010
Optimized VAV Lab Hood Design	$/Unit	Per unit installed	Constant volume to VAV	X	7/1/2010
Programmable Thermostat (electric DX space cooling)	$/Sq. Ft	Per Sq. Ft. of area controlled	Applicable to spaces that have electric DX space cooling	X	7/1/2010
Programmable Thermostat (electric heat pump space heating)	$/ Sq. Ft.	Per Sq. Ft. of area controlled	Applicable to spaces that have electric heat pump space heating	X	7/1/2010
Programmable Thermostat (electric space heating)	$/ Sq. Ft.	Per Sq Fft. of area controlled	Applicable to spaces that have electric space heating	X	7/1/2010
Irrigation Pump VFD	$/HP	Per motor HP	Install VFD on an irrigation pump	X	7/1/2010
Dishwashing – Commercial Chemical System*	$/Unit	Per unit installed	Water heating exclusively with electricity; Energy Star rated low temperature dishwashers only	X	7/1/2010
Energy Star Water Cooler	$/Unit	Per unit installed	Energy Star rated water cooler (hot/cold water); leased equipment does not qualify	X	7/1/2010
Hot Food Holding Cabinet – Commercial	$/Unit	Per unit installed	Energy Star rated commercial hot food holding cabinet	X	7/1/2010
Energy Star Battery Charging System	$/Unit	Per unit installed	Energy Star rated battery charging system	X	7/1/2010
Energy Star Computer*	$/Unit	Per unit installed	Energy Star rated computer, features include enabled sleep mode	X	7/1/2010
Energy Star Copier*	$/Unit	Per unit installed	Energy Star rated copier; leased equipment does not qualify	X	7/1/2010
Energy Star Fax*	$/Unit	Per unit installed	Energy Star rated fax; leased equipment does not qualify	X	7/1/2010
Energy Star Printer*	$/Unit	Per unit installed	Energy Star rated printer; leased equipment does not qualify	X	7/1/2010
Energy Star Scanner*	$/Unit	Per unit installed	Energy Star rated scanner; leased equipment does not qualify	X	7/1/2010
Energy Star Server*	$/Unit	Per unit installed	Energy Star rated server; leased equipment does not qualify	X	7/1/2010
Office Computer	$/Unit	Per managed	Office computer network	X	7/1/2010

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
Network Energy Management Software		computer	energy management software		
PC Power Supply 80+*	$/Unit	Per power supply	Energy Star version 5.0 qualified or better; 80% efficient power supply for PC’s	X	7/1/2010
Server Virtualization (4:1)*	$/Unit	Per unit installed	Using software, remove a minimum of four servers with one physical server	X	7/1/2010
Server Early Retirement*	$/Unit	Per server removed	Removal of inefficient standard server and replace with Energy Star rated qualified server	X	7/1/2010
Anti-Sweat (Humidistat) Controls	$/Unit	Per linear foot of case	Variable temperature controls (humidistat)	X	7/1/2010
Commercial Reach-In Refrigerator	$/Unit	Per cubic foot	Energy Star rated commercial reach-in refrigerator	X	7/1/2010
Compressor VFD retrofit	$/Unit	Per compressor HP	Refrigeration systems only; refrigeration compressor VFD retrofit	X	7/1/2010
Defrost Demand Control – Hot Gas Bypass	$/Unit	Per compressor HP	Refrigerant defrost with hot gas	X	7/1/2010
Refrigerated Display Case	$/Unit	Per linear foot of case	Energy Star rated refrigerated display cases	X	7/1/2010
Floating Head Pressure Control	$/Unit	Per refrigeration ton	Pressure control ≤ 70F with balanced port expansion valves	X	7/1/2010
Night Covers for Display Cases	$/Unit	Per unit installed	Night covers for open refrigerated display case	X	7/1/2010
Reduced Speed or Cycling of Evaporator Fans	$/Unit	Per fan HP	VFD on evaporator fans (evaporator fan control on walk-in)	X	7/1/2010
Refrigeration with Heat Recovery	$/Unit	Per refrigeration ton	Heat recovery from refrigeration system applied to water heating; existing water heating exclusively with electricity	X	7/1/2010
Refrigerator eCube	$/Unit	Per unit installed	One eCube per thermostat	X	7/1/2010
Residential-Size Refrigerator	$/Unit	Per unit installed	Energy Star rated residential-size refrigerator ≥ 7.75 cu. Ft.; replacing standard efficiency unit	X	7/1/2010
Special Glass Doors for Refrigerated Reach-In Case	$/Unit	Per linear foot of glass	Does not require anti-sweat heating	X	7/1/2010
Strip Curtains for Refrigerated Walk-In	$/Unit	Per Sq. Ft. of curtain		X	7/1/2010
Strip Curtains for Freezer Walk-In	$/Unit	Per Sq. Ft. of curtain		X	7/1/2010

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
Refrigerated Vending Machine	$/Unit	per unit installed	Energy Star rated refrigerated vending machine; leased equipment does not qualify	X	7/1/2010
Chiller – Premium Efficiency	$/Unit	Per chiller ton	Must install chiller with ≤ 0.507 kW/ton	X	7/1/2010
Chiller – Advanced Technology	$/Unit	Per chiller ton	Must install chiller with ≤ 0.461 kW/ton	X	7/1/2010
Chiller – High Efficiency	$/Unit	Per chiller ton	Must install chiller with ≤ 0.574 kW/ton	X	7/1/2010
Cooling Tower – Decrease Approach Temperature	$/Unit	Per chiller ton	10 degree to 6 degree F	X	7/1/2010
Cooling Tower – Two Speed Fan Motor	$/Unit	Per chiller ton	Two-speed tower fan motor replaces single-speed fan motor	X	7/1/2010
Cooling Tower – VFD Fan Control	$/Unit	Per chiller ton	Variable speed tower fan motor replace single speed motor		7/1/2010
Cooling Tower – VFD Fan Control	$/Unit	Per chiller ton	Variable speed tower fan motor replace two-speed fan motor	X	7/1/2010
Centrifugal Chiller – VFD Remodel for Existing	$/Unit	Per square foot of area controlled	Install VFD	X	7/1/2010
Pipe Insulation (chiller water piping only) R-6 Minimum Insulation	$/Unit	Per linear foot	Chiller water piping only; R-6 on all accessible pipe with R-0 existing.	X	7/1/2010
Infiltration Control (Caulking, Weather Stripping)	$/Unit	Per window or door square foot	Install caulking and weather stripping (ACH 0.65); heating and/or cooling exclusively with electricity	X	7/1/2010
Supply Duct Insulation(Unheated Spaces Only) R-5 minimum	$/Unit	Per linear foot	R-0 existing, heating exclusively with electricity	X	7/1/2010
Supply Duct Insulation (Unheated Spaces Only) R-8 Minimum	$/Unit	Per linear foot	R-0 existing, heating exclusively with electricity	X	7/1/2010
Exterior Above Grade Wall Insulation ≤ R-11 Existing Insulation, to R-20.5	$/Unit	Per square foot	≤ R-11 existing, heating exclusively with electricity	X	7/1/2010
Drain Water Heat Recovery Water Heater	$/Unit	Per unit installed	Install Power-Pipe or GFX	X	7/1/2010
Faucet Aerator	$/Unit	Per unit installed	Must install ≤ 1.5 GPM aerator (Water Sense labeled only)	X	7/1/2010
Low-Flow Spray Head	$/Unit	Per unit installed	Must install ≤ 1.6 GPM spray head	X	7/1/2010
Low –Flow Showerhead	$/Unit	Per unit installed	Must install ≤ 2.0 GPM showerhead (Water Sense	X	7/1/2010

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
			labeled only)		
Hot Water Pipe Insulation	$/Unit	Per linear foot	Existing pipe must be R-0 existing and install R-4 on all accessible pipe	X	7/1/2010
Water Heater Thermostat Setback	$/Unit	Per unit installed	Thermostat setback ≤ 120 degrees	X	7/1/2010

*Multiple rebates may be available for qualifying measures.

Measure savings are unit energy savings (UES) developed by third party electric resource assessment study (KEMA 2003) (Nexant, Cadmus 2010) based on average annual savings specifically for NWE Montana customers. Each UES must pass a cost/benefit test based on current electric avoided costs, the TRC test.

8.1.2. History

Until 4/1/2011, all of the measures in this program were custom incentives under the E+ Business Partners program.

8.1.3. Marketing

NWE and their contract marketing team promote the program to customers and trade allies through the marketing channels established for all commercial, institutional, industrial, and agricultural sector programs. Those marketing channels include:

- Direct customer marketing through NWE's E+ Energy Appraisal for Small Business Program, the small commercial audit program
- Direct customer marketing by meeting with customers at their business sites, and at conferences and community events
- Attending and presenting at professional and trade association meetings such as those for healthcare, hospitality, architects, engineers, and service organizations
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors
- Targeted advertising in television and print media
- Co-sponsoring Montana Energy Conferences with the state government and Northwest Energy Efficiency Alliance (NEEA)
- Although NWE's commercial programs do not use preferred contractors as its residential programs do, many contractors participating in the residential preferred contractor program are familiar with the commercial rebate programs and promote them to their commercial customers

- Direct customer marketing is done through NWE's E+ Business Appraisal Program (small commercial audit program)

Beginning in the fourth quarter of 2011, there was an increase in non-residential marketing activity due to the expansion of the contract marketing team.

8.1.4. Program Steps

Customers must consult the program guidelines and application form, available on NWE's website, to determine the eligibility of measures for which they wish to apply. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers may immediately solicit bids from contractors or do the work themselves. Customers' rebate submittal packages include a completed application form, their contractor's invoice or materials receipts if self-installed, a recent NWE bill for the site where the installation occurred, and a completed Internal Revenue Service W-9 form. Prior to rebate payment, inspections occur on a random basis at a rate of 25% of the applications for all projects with a rebate of $200 or more. Customers receive their rebate checks in four to six weeks.

8.2. Impact Evaluation

8.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

8.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings (UES) as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the eight measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate UES method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and were producing energy savings. We collected data as necessary to support a re-estimation of energy savings, using the UES method that resulted from the UES review and data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

8.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

8.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

8.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas

service territory. We considered as "leaked" any measures we found that left the relevant service territory.

8.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

8.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

8.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 17 sampled cases for this program across the 2010–2011 program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

UES Review

We reviewed the eight UES measures installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. For three of these measures, we determined that the NWE methods were reasonable. For the remaining measures, we determined that changes to the UES methods were appropriate.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 129: Summary of UES adjustments for E+ Commercial Existing Electric Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Fan System Optimization w/ VSD	All	456	kWh per HP	1231	kWh per HP
Pump System Optimization w/ VSD	All	456	kWh per HP	1825	kWh per HP
Irrigation Pump VFD	All	300	kWh per HP	300	kWh per HP
Cooling Tower-VSD Fan Control	All	137	kWh per chiller ton	137	kWh per chiller ton

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Hotel Key Card Room Energy Control System	All	542	kWh per room	542	kWh per room
Energy Star Computer	All	103	kWh per unit	133	kWh per unit
Energy Star Server	All	42473	kWh per unit	1638	kWh per unit
Server early retirement	All	803	kWh per unit	1465	kWh per unit

Fan System Optimization with VFD. This measure applied to any HVAC system fan that was not already driven by a VFD. According to (Nexant, Cadmus 2010), parameters included in the derivation of savings included the HVAC auxiliary EUI, number of horsepower of fan motors per building, average floor area per building type, and percent savings due to the measure (21%). Average savings were formed as the weighted average (according to building stock survey) of the estimated savings for the six cost-effective facility types. Estimated savings by building type ranged from 247 to 1028 kWh per year.

We surveyed Technical Resource Manuals (TRMs) and other studies describing savings for this measure in northern states. This measure was found in OH, VT, PA, VT, ME, NJ, NY, and MA. Savings were almost universally higher than the NWE value, with savings percentages from 30% - 50%, and kWh savings from 2-4 times the NWE value. We chose to apply values from the MA TRM (Massachusetts Program Administrators 2010) as these were broken out by building type and application. We used the average savings from the supply and return fan measures weighted by the NWE building type mix.

Pump System Optimization with VFD. This measure applied to any HVAC system pump that was not already driven by a VFD. Parameters included in the derivation of savings included the HVAC auxiliary EUI, number of horsepower of HVAC pump motors per building, average floor area per building type, and percent savings due to the measure (6%). NWE found savings to be cost-effective for just one building type – Large Health.

We surveyed Technical Resource Manuals (TRMs) and other studies describing savings for this measure in northern states. This measure was found in OH, VT, PA, VT, ME, NJ, NY, and MA. Savings were almost universally higher than the NWE value, with savings percentages from 30% - 50%, and kWh savings from 2-4 times the NWE value. We chose to apply values from the MA TRM as these were broken out by building type and application. We used the savings from the boiler feedwater, chilled water, and hot water circulating pumps weighted by the NWE building type mix.

Irrigation Pump VFD. We could not find a description of this measure, or a derivation of the savings estimate. The applied savings value was 300 kWh/year per horsepower. The RTF, in an irrigation measure workbook (Regional Technical Forum 2012), provides an estimate of average agricultural irrigation hours for Montana of 1421 hours per year. We estimated the savings percentage due to this measure by assuming the baseline motor was 75% loaded. According to this derivation, savings are 38% of baseline usage.

We could not find an instance in the literature in which this measure was treated as a prescriptive measure. We made no change to the existing NWE value.

Cooling Tower – VFD Fan Control. This measure was described as moving from a two-speed fan to a variable speed fan. Savings were based on the (Nexant, Cadmus 2010) potential study which showed savings of 18% based on "Engineering calc and reviewed/used in previous studies." The savings derivation also relied on baseline cooling EUI, average square feet per building, and the average cooling tons per building.

We found this measure in other studies, but savings were on a per horsepower basis rather than per chiller ton basis. We made no changes to the measure UES.

Hotel Key Card Room Energy Control System. This measure required controls on hotel HVAC and lighting to reduce power consumption during unoccupied periods. Separate estimates of savings were provided for both cooling and heating, and final savings were taken as the average of the two values.

We found this measure in other studies, but could not find any basis to make a change to the NWE values. It is not clear if the heating and cooling values should have been added together rather than averaged, since both values presumably include annual lighting savings. We made no changes to the measure UES.

Energy Star Computer. Savings for this measure were derived from the Energy Star calculator for office equipment. A comment in the rebate table file states, “savings range from 65 to 140 kWh/year per computer, average 102.5 kWh/year per computer.”

We also derived a savings estimate with the Energy Star calculator dated December, 2010, and found savings with default assumptions to be 133 kWh per year. We updated the UES with this value.

Energy Star Server. (Nexant, Cadmus 2010) cited Energy Star as the source for this measure. However, the derived UES also depended on building EUI, average building floor area, server percent of plug load EUI, measure savings percentage, and an assumed number of servers per building. NWE found the measure to be cost-effective in Large Health facilities only. The assumption of one unit per building led to a calculated savings of 42,473 kWh/year.

We found in the Energy Star source noted by Nexant that a server might save 1000 kWh/year. We calculated a value based on values for energy consumption in idle and sleep mode, and assumptions about annual percentage of time spent in idle mode, and derived a value of 1638 kWh/year. The large difference in savings is mostly attributable to the assumption in deriving the program savings of one server per building.

Server Early Retirement. It is not entirely clear how savings were derived for the program UES. The UES depends on a building EUI, average floor area per building, number of units per building, and a measure savings percentage which varies by building. The source cited was the Energy Star server web page cited above. The UES was constant for all building types at 803 kWh/year.

We re-calculated savings using estimated server consumption by year (US EPA 2007). We used the value calculated for a new Energy Star server as the consumption of the efficient unit, and extrapolated from the EPA study a value for a 2008 server as the baseline consumption. Savings increased to 1465 kWh/year.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection.

Customers were recruited for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited.

For the E+ Commercial Existing Electric Rebate program we successfully visited 16 sites encompassing four different strata. The customers in this program were very accommodating when it came to agreeing to and scheduling site visits (0% refusal rate for the customers contacted by the Special Effort recruiting team).

Table 130: Site Recruitment Disposition for E+ Commercial Existing Electric Rebate

	Stratum				Total n	%
	1	2	3	9		
Recruitment						
Telephone Lab	4	1	3	2	10	
Special Effort						
Attempts	2	7	0	4	13	
No Reply	1	3	0	0	4	31%
Refused	0	0	0	0	0	0%
Recruited	1	4	0	4	9	69%
Total Recruited	**5**	**5**	**3**	**6**	**19**	
Onsite						
Refused	0	0	0	0	0	0%
Not Needed	1	1	1	0	3	16%
Total Completed	**4**	**4**	**2**	**6**	**16**	**84%**

Site Inspections

For the 2010–2011 program years we performed 16 site inspections which considered three different measures: Efficient Office Equipment, Variable Speed Control, and Hotel Key Card Room Energy Control System.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit.

For 12 of the sites we visited, we found that all of the sampled measures were installed, operational, and matched the quantity and size claimed by NWE.

- Four of the sites had Irrigation Pump Variable Speed Control as the measure type. The evaluation savings are equal to the claimed savings because the equipment found on-site matches up with the claimed equipment and the evaluation UES values match the claimed UES values.
- Five of the sites have either Fan or Pump Motor Variable Speed Control or Energy Star Computer as the measure type. The evaluation savings are greater than the claimed savings because of the revised UES values.
- Three of the sites have much lower evaluation savings due to the lower evaluation UES values for Energy Star Servers.

At the other four sites, we found reduced counts or reduced sizes of installed equipment as listed below (observed vs. claimed).

- 87 vs. 92 Hotel Key Card Room Energy Control System
- 1-400hp vs. 1-500hp Irrigation Pump Variable Speed Control
- 1-250hp vs. 1-300hp Irrigation Pump Variable Speed Control
- 1 vs. 2 Energy Star Server(s) – Mac Pro Z0MC is not E-star when configured as a server

For the first three bulleted sites above, the evaluation savings are slightly lower than the claimed savings due to the lower quantity or smaller size of the equipment.

For the fourth bulleted site above, evaluation savings are significantly lower than the claimed savings due partially to the lower quantity of equipment but mostly due to the lower evaluation UES value for an Energy Star Server.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 131: File Review and Site Visit Adjustment to Savings for E+ Commercial Existing Electric Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Commercial Existing Electric Rebate	kWh	1,622,309	1,504,470	1,948,434	1,948,434	0.93	1.20	1.20

8.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 132: Savings Adjustments by Calendar Year for E+ Commercial Existing Electric Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Commercial Existing Electric Rebate	kWh	2011	1,622,309	1.20	-	-	1.20	1,948,434	222
	E+ Commercial Existing Electric Rebate	kWh	All Years	1,622,309	1.20	-	-	1.20	1,948,434	222
Electric										
	E+ Commercial Existing Electric Rebate	kWh	All Years	1,622,309	1.20	-	-	1.20	1,948,434	222

8.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 133: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Commercial Existing Electric Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios: Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Commercial Existing Electric Rebate	kWh	2011	1,948,434	4.72	2.55	1.91	5.19
	E+ Commercial Existing Electric Rebate	kWh	All Years	1,948,434	4.72	2.55	1.91	5.19
Electric								
	E+ Commercial Existing Electric Rebate	kWh	All Years	1,948,434	4.72	2.55	1.91	5.19

8.3. Process Evaluation

8.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with 11 participants and 67 trade allies. Surveyed trade allies include those who reported offering lighting, HVAC, and/or insulation products and services to commercial end-users.

8.3.2. Implementation Findings

8.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, “program staff” or “staff”) to implement this program.

To seek a rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE’s website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures such as insulation, air conditioning, and water heating among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

Prior to July 2010, NWE treated variable frequency drives (VFDs) as custom projects. However, because NWE received frequent applications for small VFD projects, in July of 2010 NWE included VFDs among its measures eligible for prescriptive rebates. Staff and contractors involved in custom projects report this has been a great time-saving change, reducing work for both the contractors and the applicants and reducing the application processing time.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor’s invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application. Program staff ensure all approved applications include a current NWE bill or correct NWE account number for the building where the installation occurred and that a completed Internal Revenue Service W-9 form is included.

NWE has linked its master customer lists to the implementation contractor’s databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor’s accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

The implementation contractor has added more marketing staff in recent years and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. In addition, E+ Program Contractors conduct one-on-one and group outreach to promote the program. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

8.3.2.2. Best Practices Assessment

Table 134 through Table 137 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 134: Program Planning and Design Best Practices for E+ Commercial Existing Electric Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions

Practice	NWE Assessment
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 135: Program Management and Administrative Best Practices for E+ Commercial Existing Electric Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact

Practice	NWE Assessment
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 136: Marketing and Outreach Best Practices for E+ Commercial Existing Electric Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website

Practice	NWE Assessment
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 137: Program Quality Control Best Practices for E+ Commercial Existing Electric Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size

Practice	NWE Assessment
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

8.3.3. Participant Findings

We surveyed 11 NWE customers who participated in the E+ Commercial Existing Electric Rebate program during 2010 or 2011.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

For questions pertaining only to a small number of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

8.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about energy efficiency from NWE, the kind of additional information they wanted, as well as providing information about their decision purchase qualifying equipment through the E+ Commercial Existing Electric Rebate program.

Less than half (44%) of the 11 respondents had visited NWE’s website. Among those five respondents who did use the website, three did so to learn about rebates and audits (Table 138). Four of five website users agreed or completely agreed that the website information was easy to find and helpful.

Table 138: Website Use, among E+ Commercial Existing Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Learn about rebates or audits (n=5)	63%
Money saving tips (n=5)	50%
Pay utility bill (n=5)	37%
Utility contact information (n=5)	33%

A large proportion of these program respondents said they would like additional energy efficiency program information and energy-saving educational opportunities (Table 139).

Table 139: Further Information Desired, among E+ Commercial Existing Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Energy efficiency programs (n=11)	84%
Energy saving educational opportunities (n=11)	84%
Workshops or events on energy efficiency (n=11)	59%
Does not want any (n=11)	16%

Those desiring further information prefer to receive information by mail (84%), followed by workshops (57%) and/or email (53%; Table 140).

Table 140: Information Delivery Preference, among E+ Commercial Existing Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
US mail (n=9)	84%
Workshop (n=9)	57%
Email (n=9)	53%
Webinar (n=9)	47%
Phone (n=9)	37%
Other (n=9)	9%

Respondents became aware of the program chiefly through noticing a utility publication or advertisement (72%) or in communication with a building professional, associated vendor or contractor (72%; Table 141).

Table 141: Means of Program Awareness, among E+ Commercial Existing Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=11)	72%
Building professional, vendor, or contractor (n=11)	72%
Directly contacted utility (n=11)	47%
Utility representative appearance (n=11)	36%
Word of mouth (n=11)	30%

When considering whether to participate, 92% of the participants had no initial questions or concerns about participating.

Respondents rated the influence of various program components on their decision to install the efficient equipment. Large majorities rated salesperson or contractor's role or the rebate itself as highly influential on their decision to participate (91% and 85%, respectively, reported "4" or "5" ratings; Figure 35).

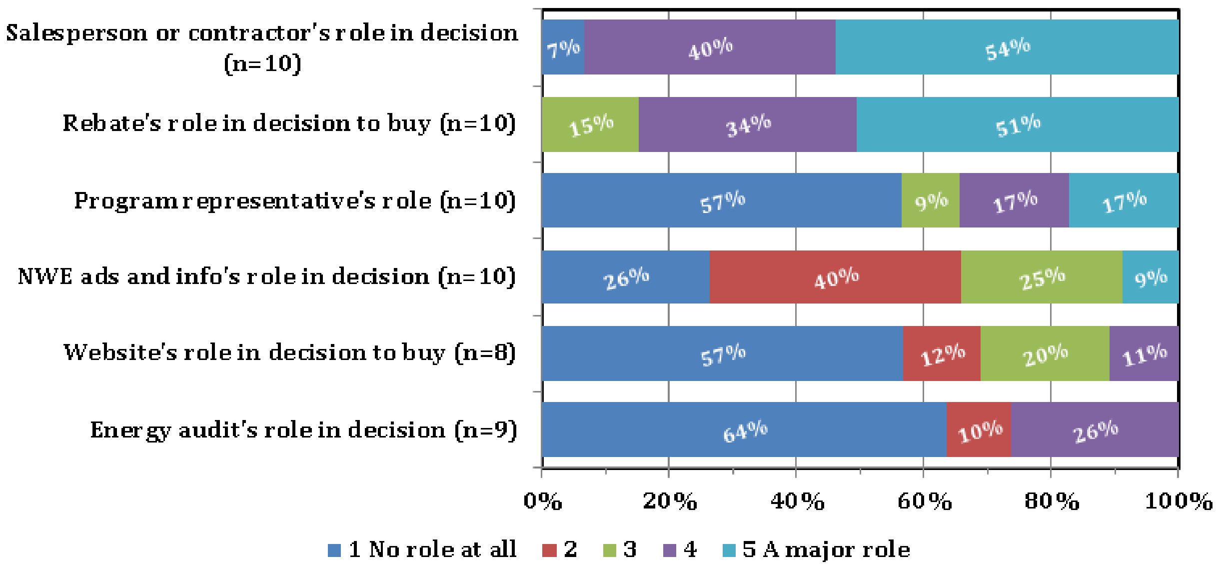

Figure 35: Influences on Upgrade Decision, among E+ Commercial Existing Electric Rebate Participants

We also asked respondents if a list of typical reasons for program participation had applied to them. A large majority were interested in "saving energy and money" and/or offsetting the cost of measures (91% and 84%, respectively). Smaller majorities mentioned one or more other reasons: checking equipment performance, a good experience with other NWE efficiency programs, contractor recommendation, and/or the program was easy to use (Table 142).

Table 142: Reasons For Program Participation, among E+ Commercial Existing Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Save energy and money (n=11)	91%
Rebate needed to offset cost (n=11)	84%
Check specific equipment performance (n=11)	78%
Good experience with other NWE efficiency program (n=11)	70%
Contractor recommendation (n=11)	64%
Easy to use the program (n=11)	61%
Increase facility comfort (n=11)	47%
Wanted to follow audit with action (n=11)	45%
Utility vouched for equipment by rebating (n=11)	42%

8.3.3.2. Program Experience

Respondents reported on several aspects of their program experience, including rebate application, measure installation, and inspection processes, as well as whether they would participate in NWE efficiency programs again.

Most of the time (53%) the rebated project was initiated by a discussion between *both* the respondent's organization and the associated vendor or contractor (Table 143).

Table 143: Project Initiator, among E+ Commercial Existing Electric Rebate Participants

	Weighted Percent (n=11)
Discussion between both	53%
My organization	16%
Associated vendors or contractors	16%
Other	14%

After the project discussion was initiated, about half of the time the rebate application was prepared by the participants' vendor or contractor; roughly half of respondents reported that their organization had played a role in completing the application (Table 144).

Table 144: Rebate Application Preparation, among E+ Commercial Existing Electric Rebate Participants

	Weighted Percent (n=11)
Associated vendor or contractor	48%
My organization	39%
My organization assisted by vendor/contractor	13%

Respondents gave mixed ratings of the clarity of rebate and program information provided by NWE (Figure 36). Less than half of respondents reported that information about what qualifies for a rebate, and how to follow up with program staff was clear.

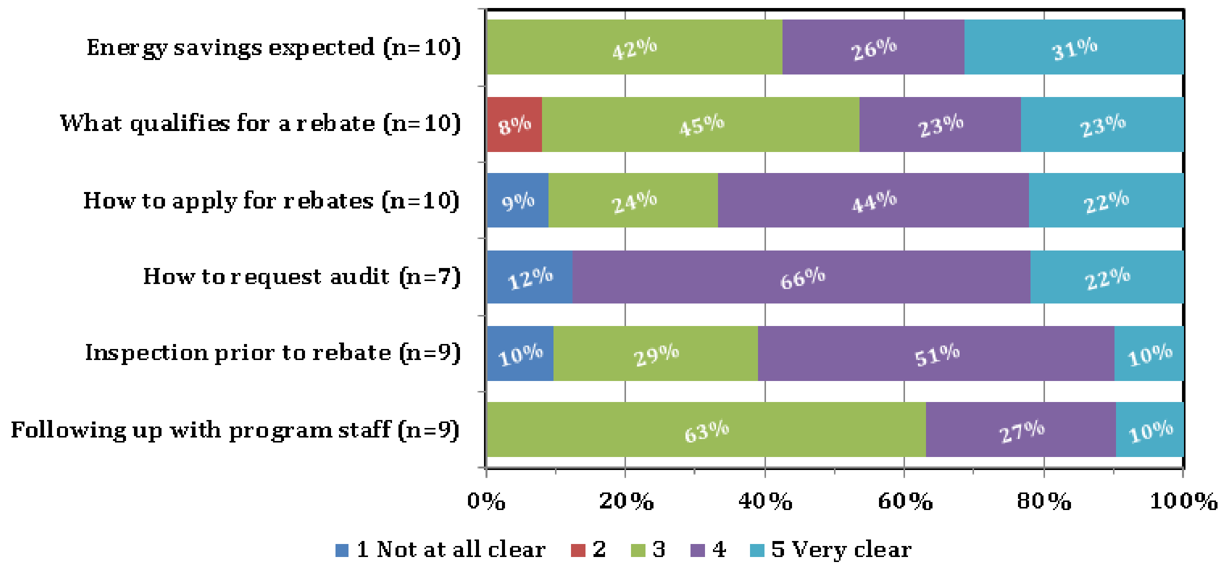

Figure 36: Clarity of Program Information, among E+ Commercial Existing Electric Rebate Participants

Respondents tended to "agree" and "completely agree" with positive statements about several phases of the rebate program and the installation of equipment. All agreed that program representatives were courteous/helpful, the installed items performed well, and the rebate was received in reasonable time (Figure 37).

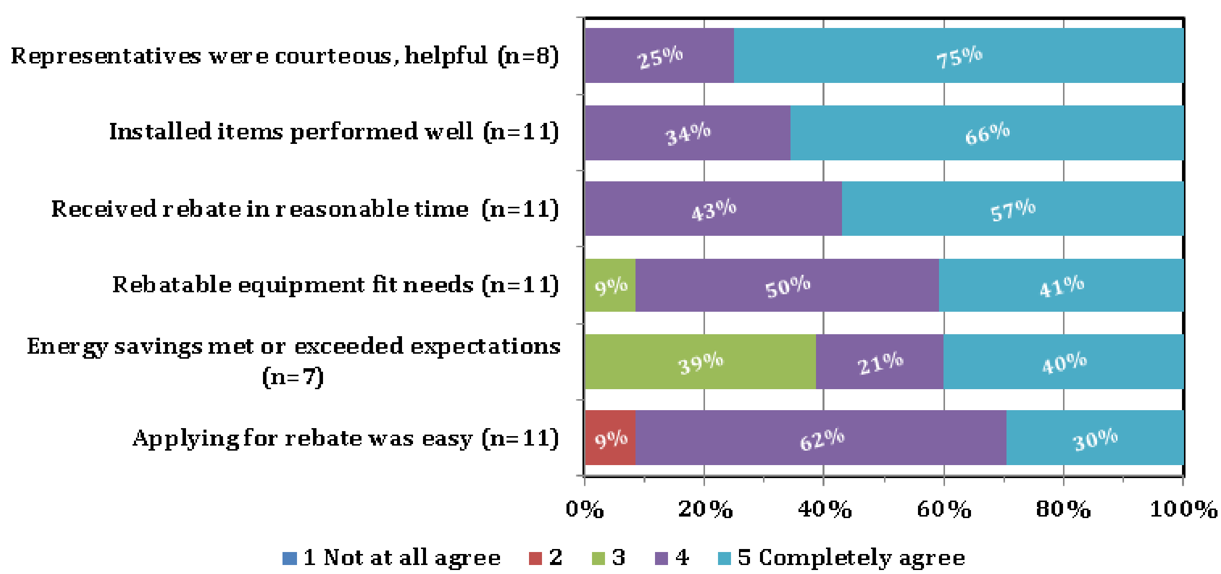

Figure 37: Experience With Installation Process, among E+ Commercial Existing Electric Rebate Participants

After installation, half of the respondents reported having an on-site inspection by a utility representative; most of these inspected respondents “completely agreed” that the inspector was courteous and efficient.

As a general indicator of overall attitudes towards NWE’s energy efficiency activities, we asked participants about their likelihood of future efficiency program participation. All respondents were “likely” or “very likely” to participate in future NWE energy efficiency programs.

8.3.4. Trade Ally Findings

We surveyed 67 NWE trade allies who reported installing electric rebate-qualifying items and/or insulation in existing commercial buildings.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

8.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event, from noticing a utility publication or advertisement, or by directly contacting the utility (69% or greater in each case; Table 145).

Table 145: Means of General Program Awareness, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=67)	76%
Directly contacted utility (n=67)	70%
Utility representative appearance (n=65)	69%
Utility website (n=66)	44%
Word of mouth (n=67)	43%
Associated vendors and contractors (n=67)	42%
Other (n=67)	7%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly or through NWE representatives (Table 146).

Table 146: Specific Requirements Awareness, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Directly contacted utility (n=67)	45%
Utility representative appearance (n=67)	43%
Utility publication (n=67)	27%
Associated vendors and contractors (n=67)	9%
Utility website (n=67)	7%
Other (n=67)	10%

A majority (67%) of surveyed trade allies visited the utility website. Among those website users, approximately three-quarters (78%) said they used the site to learn about rebates or audits, and a smaller majority had printed rebate forms or searched to contact the utility (Table 147).

Table 147: Website Use, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=45)	78%
Print rebate forms (n=45)	62%
To contact utility (n=45)	60%
Money saving ideas (n=45)	36%
Educational events information (n=45)	36%
How-to videos (n=45)	7%
Other (n=45)	4%

Sixty percent of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful (Figure 38).

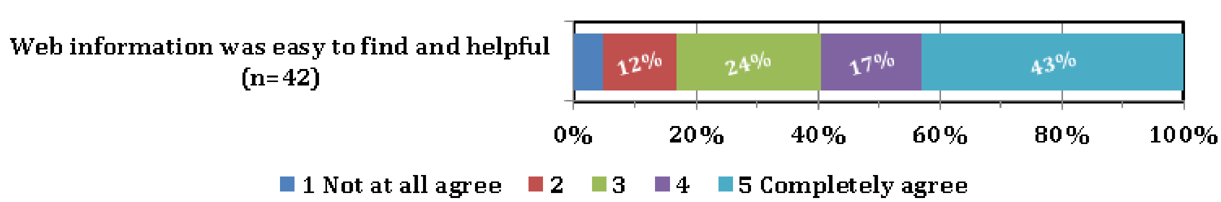

Figure 38: Website Effectiveness, among E+ Commercial Existing Electric Rebate Trade Allies

Over half of surveyed trade allies would like further information on workshops or events (61%), or were interested in information on energy-saving educational opportunities (54%) or energy efficiency programs (57%). Thirty percent did not want further information from NWE at the time of the survey (Table 148).

Table 148: Further Information Desired, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=67)	61%
Energy efficiency programs (n=67)	57%
Energy saving educational opportunities (n=67)	54%
None (n=67)	30%

Those desiring further information slightly preferred to receive information using email (49%), mail (49%), and other methods such as trainings and workshops (36%; Table 149).

Table 149: Information Delivery Preference, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
US mail (n=47)	49%
Email (n=47)	49%
Trainings, workshops or seminars (n=47)	36%
Webinar (n=47)	26%
Community event (n=47)	23%
Phone (n=47)	15%

8.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

A large majority of surveyed trade allies (82%) sold controls. Trade allies were asked if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if they typically kept unrated and standard items in stock and ordered in the high-efficiency items when needed. Just under half (49%) of the respondents said their stock typically includes high-energy efficiency equipment, while the other half ordered items as needed for rebates.

Trade allies reported on their sales strategies, listed in Table 150 below. More than three-quarters (82%) kept a full range of equipment to offer, and 98% agreed that the “Better” and

"Best" equipment is usually more energy-efficient. Well over half (61%) reported they suggest the "Best" equipment to customers first.

Table 150: Equipment Sales Approach, among E+ Commercial Existing Electric Rebate Trade Allies

Approach	Percent
Typically sells a range of equipment that gives customers a GOOD, BETTER or BEST option (n=55)	82%
Agree BETTER and BEST equipment options are typically more energy- efficient (n=43)	98%
Good mentioned first to customer	2%
Better mentioned first	25%
Best mentioned first	61%
Present all options simultaneously	11%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. About half (49%) of these trade allies reported that between 51% and 100% of their stock was high-efficiency. A subset of trade allies who reported stocking efficient equipment offered estimates on the share of sales made in the past two years that were energy-efficient. Nearly three-quarters of this group estimated that the majority (between 76% and 100%) of equipment sold in the past two years could be categorized as high-efficiency (Figure 39).

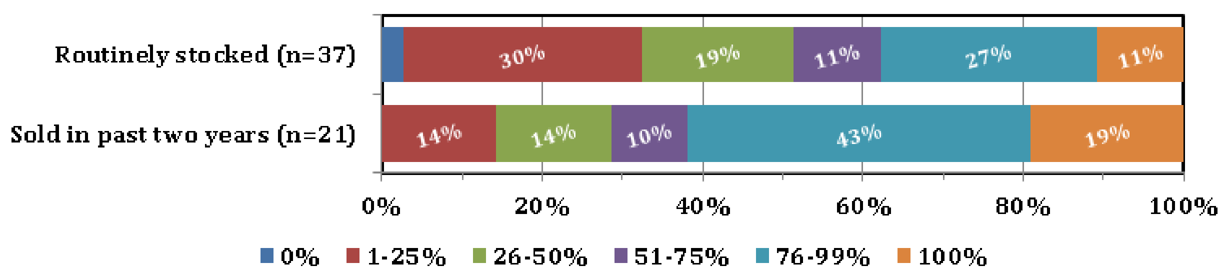

Figure 39: High-Efficiency Equipment Share, among E+ Commercial Existing Electric Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency items that qualify for rebates. In *insulation* sales, 96% of respondents mentioned lower energy bills to the customer, 81% mentioned the rebate, and 78% mentioned the high quality of the product (Table 151). In energy-saving *equipment* promotions, 89% of respondents stressed lower operation costs and the NWE rebates (Table 152).

Table 151: Customer Benefits of Insulation, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=27)	96%
Utility rebate (n=27)	81%
High-quality of product (n=27)	78%
Comfort (n=27)	74%
Other (n=27)	15%

Table 152: Customer Benefits of Equipment, among E+ Commercial Existing Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=56)	89%
Utility rebate (n=56)	89%
High-quality of product (n=56)	68%
Lower maintenance costs (n=56)	55%
Other (n=56)	9%

About 20% of these trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these eleven mentioned cost or reliability concerns with the equipment, primarily.

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. More than a third of respondents (36%) said they recalled installing rebate-qualifying items in cases when they knew customers did not pursue rebates. About the same fraction (42%) of *insulation* installers also recalled qualifying circumstances when rebates were not applied for. No single reason stands out as a barrier to rebate applications (Table 153), although sometimes the trade ally reported that they had been unaware of the rebate offer at the time.

Table 153: Circumstances When Rebate Foregone, among E+ Commercial Existing Electric Rebate Trade Allies

Circumstance	Percent
Customer did not apply (n=17)	24%
Trade ally unaware of rebate/program (n=17)	18%
Customer ineligible (n=17)	12%
Applying takes too long (n=17)	12%

Circumstance	Percent
Rebate too small (n=17)	12%
Application process too difficult (n=17)	6%
Other (n=17)	24%

8.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (67%) of trade ally respondents say they had trained staff to talk to customers about energy efficient choices. In fact, 48% of these respondents said they "almost always" initiate the discussion about utility rebates for which their customer might qualify (Table 154).

Table 154: Rebate Initiator, among E+ Commercial Existing Electric Rebate Trade Allies

	Percent (n=67)
Almost always trade ally initiated	48%
Mostly trade ally initiated	31%
About half trade ally and half customer	13%
Almost always customer initiated	7%

When a customer is considering insulating their building, respondents suggested the rebate program to the customer 92% of the time, rather than wait for the customer to show interest. Likewise, once a customer is considering an actual equipment purchase, 95% of respondents suggest options that qualify for a rebate to the customer.

A few trade allies also indicated whether they had any reservations about recommending the program to their customers. Most surveyed trade allies (81%) indicated that nothing about the program raised issues or concerns around customer participation. Among the thirteen (19%) of respondents who had initial concerns, concerns mentioned included rebate processes, confusing program requirements, and insulation requirements (Table 155).

Table 155: Initial Concerns, among E+ Commercial Existing Electric Rebate Trade Allies

	Percent (n=13)
Rebate process difficult	31%
Confusing requirements	23%
R-value problems	23%
Other	23%

Just a few (22%) trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. How often these “regular communicators” notify their customers varied widely from daily to once a year (Table 156).

Table 156: Customer Contact Frequency, among E+ Commercial Existing Electric Rebate Trade Allies

Frequency	Percent (n=15)
Once a month	20%
2 times a year	20%
Once a year	20%
Every day	20%
Once a quarter	7%
Varies by customer	13%

The majority (from 58% to 84%) of trade ally respondents rated elements of information they received on rebates and contacting program staff as “clear” or “very clear” (Figure 40).

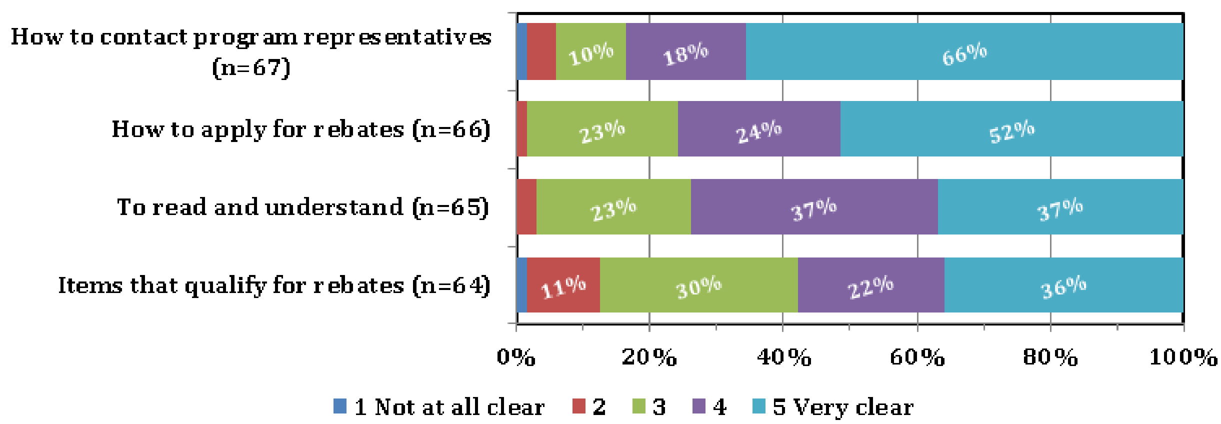

Figure 40: Clarity of Program Information, among E+ Commercial Existing Electric Rebate Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Over half of electric equipment and insulation trade allies (61%) reported working jointly with the customer to prepare the application. Another 28% completed all or most of the application themselves.

Table 157: Rebate Application Preparer, among E+ Commercial Existing Electric Rebate Trade Allies

	Percent (n=67)
Typically both respondent and customer - half and half effort	61%
Typically respondent prepares all or most of the application	28%
Typically the customer prepares all or most of the application	9%
Depends on the rebate	1%

About three-quarters (78%) of the 59 lighting trade ally respondents who typically helped complete the rebate application “agreed” or “completely agreed” that the process was simple to follow.

Respondents rated their agreement with several positive statements related to staying current with program changes. At least 65% of respondents “agreed” or “completely agreed” with four positive statements listed in the table below (Figure 41).

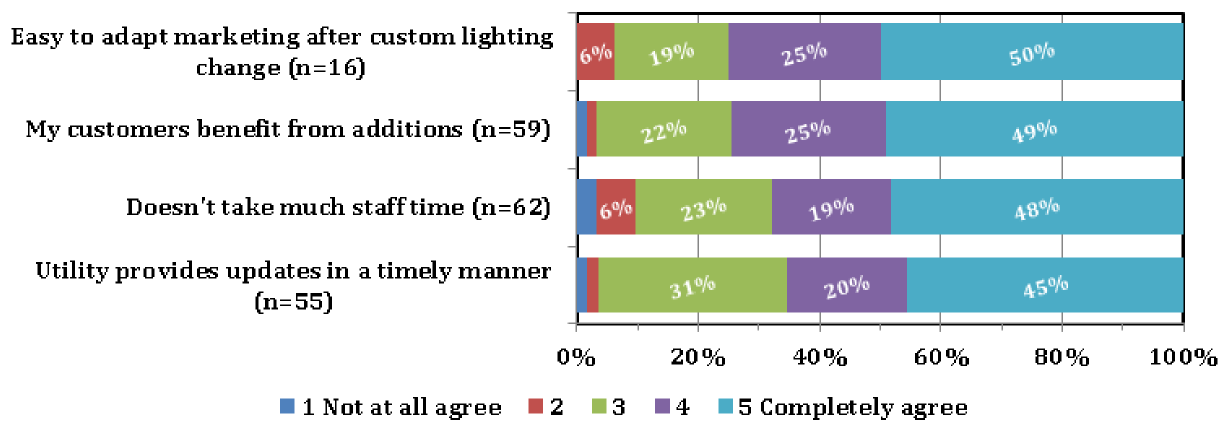

Figure 41: Keeping Up With Program Changes, among E+ Commercial Existing Electric Rebate Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. Other heating systems and LED lighting were commonly suggested (Table 158). These trade allies indicated they suggested the items because “it’s more efficient” and “customers request the equipment” (Table 159).

Table 158: High Efficiency Equipment Suggested, among E+ Commercial Existing Electric Rebate Trade Allies

	Percent (n=18)
Other heating systems	33%
LED lighting	28%

	Percent (n=18)
Heat pumps	17%
On demand water heaters	11%
Other	11%

Table 159: Reasons Equipment Should Be Added, among E+ Commercial Existing Electric Rebate Trade Allies

	Percent (n=17)
Its more efficient	41%
Customers request them	24%
Cost	12%
Where industry is going	6%
Rebate will increase sales	6%
Other	12%

Surveyors collected some general comments from a few trade allies. Themes that appeared generally revolved around communications with NWE (a need for more frequent updates), or program processes (for example, too much paperwork, frequent inspections, and the view that NWE should increase program marketing including their relationship with trade allies.)

8.3.4.4. Firmographics

A few trade allies (19%) operate at more than 20 Montana locations. More than half (61%) of respondents serve five or fewer locations.

Table 160: Number of Montana Locations, among E+ Commercial Existing Electric Rebate Trade Allies

	Percent (n=64)
1 location	36%
2 to 5 locations	25%
6 to 10 locations	11%
11 to 20 locations	9%
21 to 50 locations	5%
Over 50 locations	14%

The maximum number of miles trade allies reported traveling to serve clients was distributed fairly evenly at the lower and upper ends of the range, with about one-fifth traveling less than

100 miles (22%), and 18% traveling more than 400 miles. The majority would travel between 101 and 200 miles to serve a client (Figure 42).

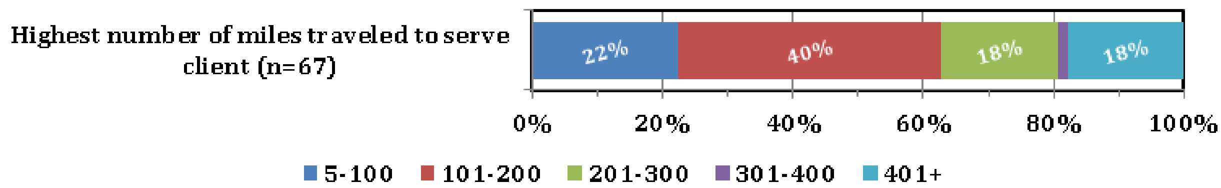

Figure 42: Maximum Miles, among E+ Commercial Existing Electric Rebate Trade Allies

8.4. Recommendations

8.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Customer cost data:** The tracking database for this program does not include customer costs for each record in the savings claim. This lack of complete data for this important evaluation item complicates and increases the cost of the evaluation. Quality control measures should be instituted to ensure this information is included for all tracking records.
- **Updated values:** Update UES values for the measures included in this program. For all measures, the UES should be based on a direct calculation (e.g., the Energy Star calculator) rather than the potential assessment methodology. For the fan and pump VFD measures, adopt the evaluation UES values, or review the available literature to determine an appropriate value. For the Irrigation VFD measure, consider it a custom measure because its application is too complex to be considered as a UES measure. For the Cooling Tower VFD measure, perform a literature review to determine an appropriate savings value. In addition, the UES value for the office equipment measures should be updated on annually because of the fast pace of technology development.

8.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices; including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

A large majority of surveyed E+ Commercial Existing Electric participants reported wanting more information about efficiency programs and general efficiency opportunities, and many expressed interest in attending workshops on efficiency. Many participants had participated in other programs previously: two-thirds of participants reported that their good experience in prior NWE efficiency programs played a role in their decision to participate in this program. Although their program experiences and outcomes were positive overall, surveyed participants' ratings of the clarity of the information on what equipment qualifies for a rebate, and how to follow up with program staff were somewhat low, with less than half of participants rating this information as clear. (The evaluators note that program application materials clearly state how to reach program staff.) At the same time, though, few participants reported that this information was unclear: many gave neutral ratings. Overall, these ratings suggest that this program is a low-touch program, and these participants were able to navigate program processes successfully without much information from program staff.

Surveyed commercial trade allies gave generally positive feedback about the program, but a few (13%) reported that information about the type of equipment qualifying for rebates was unclear. Although half of trade allies report using the website as a resource for general program information, very few use it as a resource for specific program requirements, instead relying on direct program staff contact.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.

- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback**: Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

9. E+ Commercial Existing Gas Rebate

9.1. Program Description

The E+ Commercial Existing Gas Rebate program is a DSM funded prescriptive rebate program that began in 2009. The program offers measures for high efficiency HVAC, service water heating, and refrigeration heat recovery. All NWE non-residential gas supply customers are eligible to participate in the program.

Alternative Delivery Method

Customers may apply for incentives through the E+ Business Partners program for cost-effective gas measures where a prescriptive rebate is not offered.

9.1.1. Energy Savings and Measures

Table 161 below lists all measures offered by the program. The "X" in the Program Year columns indicates the measure was offered by the program in all or part of that program year.

Table 161: Measures Offered for E+ Commercial Existing Gas Rebate

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
High Efficiency Furnace/Boiler	$/Unit	Kbtu/Hr	AFUE ≥ 90% or 90% TE replaces a standard AFUE ≤ 78%	X	X	X	1/1/2009	-
High Efficiency Water Heater	$/Unit	Kbtu/Hr	EF ≥ 62% or ≥ 90% TE replaces a standard EF ≤ 0.594	X	X	X	1/1/2009	
Stack Heat Exchanger	$/Unit	Kbtu/Hr		X	X	X	1/1/2009	
Natural Gas Infrared Griddle	$/Unit	Kbtu/Hr	Replaces a standard gas-fired griddle	X	X	-	1/1/2009	11/30/2010
Natural Gas Infrared Fryer	$/Unit	Kbtu/Hr	Replaces a standard gas-fired fryer	X	X	X	1/1/2009	
Refrigeration Heat Recovery	$/Unit	OA - CFM		X	X	-	1/1/2009	11/30/2010
Boiler Tune-Up	$/Unit	Fixed rebate per unit	For tunable boilers, once every two years maximum; prescribed checklist required for rebate	X	X	X	1/1/2009	
DHW Circulation Pump Time Clock	$/Unit	Fixed rebate per unit	Seven day time clock	X	X	X	1/1/2009	
Energy	$/Unit	Fixed rebate per	Commissioning	X	X	X	1/1/2009	

Measure	Rebate Type	Unit of Measurement	Qualifier	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
Management System (EMS) Optimization		unit	report required for rebate					
Water Heater Tank Insulation	$/Unit	Fixed rebate per unit	R-11 minimum, R-0 previously	X	X	X	1/1/2009	
Boiler Pipe insulation	$/Unit	Linear foot of insulation	First 10 feet of pipe or pipe in unheated spaces; install R-4 minimum	X	X	X	1/1/2009	
Service Hot Water Pipe Insulation	$/Unit	Linear foot of insulation	First 10 feet of pipe or pipe in unheated spaces; install R-4 minimum	X	X	X	1/1/2009	
Heating Duct Sealing and Insulation	$/Unit	Square foot of insulation	For ducting in unheated spaces; install R-8 minimum	X	X	X	1/1/2009	
Ceiling Insulation	$/Unit	Square foot of insulation	Install R-38 minimum insulation where previous insulation was ≤ R-11	X	X	X	1/1/2009	
Exterior Wall Insulation (above grade)	$/Unit	Square foot of insulation	Install R-21 minimum insulation where previous insulation was ≤ R-9	X	X	X	1/1/2009	
High Efficiency Windows	$/Unit	Square foot of window	Multiple glazed, low emissivity windows U = ≤ 0.35 to replace standard U = ≥ 0.40	X	X	X	1/1/2009	
Programmable Thermostat	$/Unit	Square foot of controllable area		X	X	-	1/1/2009	11/30/2010

[1] Effective measure date in the program if it was after the start of the program in 1/1/2009.

[2] The date the program stopped offering the measure. Customer projects with discontinued measures already in progress could extend past that date.

9.1.2. Measure Savings

The program estimates measure savings based on unit energy savings (UES) values taken from a third party gas resource assessment study (KEMA 2008 (b)) based on average annual savings. These studies estimated UES values specifically for NWE Montana customers. The program only offers measures that are cost-effective, based on current gas avoided costs. The program used the TRC test to determine cost-effectiveness.

Measure baseline data come from the 2003 International Energy Efficiency Code and ASHRAE 90.1-2001.

9.1.3. History

From the beginning of the program in 2009, the program has had few minor changes, please see Energy Savings and Measures.

9.1.4. Marketing

NWE and their contract marketing team at KEMA engage in a number of marketing activities to promote the program to design professionals, contractors, developers, and owners. Beginning in the fourth quarter of 2011, there was an increase in non-residential marketing activity due to the expansion of the contract marketing team. Marketing activities for this program include:

- Preferred contractors and other trade allies are briefed annually by NWE about the program. Although NWE’s commercial programs do not use preferred contractors as the residential programs do, many residential preferred contractors are familiar with the commercial rebate programs and promote them to their commercial customers.
- Presentations at architectural, engineering, and construction industry conferences and tradeshows
- Presentations at professional and trade association meetings for healthcare, hospitality, architects, engineers, and service organizations
- Event and program advertising through media news releases, email promotions, and spot advertising in newspapers and other publications
- Co-sponsoring regional energy conferences with trade allies and local governments
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors

The mix of marketing activities varies from year to year to match program needs and as other opportunities in the community occur.

9.1.5. Program Steps

Customers consult the program guidelines and application forms, available on NWE’s website, to determine which measures the program offers that may apply to their project. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers’ rebate submittal packages include a completed application form, their contractor’s invoice (or materials receipts if self-installed), a recent NWE bill for the site where the installation occurred, and a completed Internal Revenue Service W-9 form.

9.2. Impact Evaluation

9.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (dkt) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (dkt) savings and perform the economic analysis.

9.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (dkt). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the seven measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods (dkt) that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate unit energy savings method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and produced energy savings. We collected data as necessary to support a re-estimation of energy (dkt) savings, using the UES method that resulted from the UES review, discussed above. Our site data collection included installation verification and the collection of data necessary to support an estimate of the inputs to the UES method. We calculated evaluation energy savings (dkt) by applying the final UES method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

9.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

9.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

9.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

9.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

9.2.2. Energy and Demand Impacts

We estimated gross and net savings (dkt) for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

9.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 39 sampled cases for this program across the five program years. Our review revealed no data entry errors in the program tracking database associated with energy savings.

UES review

We reviewed the seven UES measures installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. For three of these measures, we determined that the NWE methods were reasonable; although in two of these cases we applied the NWE UES values on a building type basis (building type was collected as part of the site visit process). For the remaining four measures, we determined that changes to the UES methods were appropriate.

NWE calculated a weighted average UES based on the expected savings per building type. Savings for a given building type were weighted by the square footage fraction of the building type in NWE territory among all commercial buildings. For each building type, a TRC benefit-to-cost ratio was calculated. Those building types for which the TRC ratio was less than 1 were not included in the overall weighted average UES, although all facilities were eligible to receive an incentive for the measure. This process can be justified on the basis that facilities were most likely to install the measure where it was cost-effective, and that therefore the rebate population most likely resembled the cost-effective population rather than the overall building stock population. However, savings estimates varied greatly depending on building type. For the measures with the highest savings, we applied the UES on a building type basis.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 162: Summary of UES adjustments for E+ Commercial Existing Gas Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
High Efficiency Heating System	Hosp & Health	0.291	dkt per kBtuh	0.526	dkt per kBtuh
High Efficiency Heating System	Office	0.291	dkt per kBtuh	0.396	dkt per kBtuh
High Efficiency Heating System	Grocery	0.291	dkt per kBtuh	0.321	dkt per kBtuh
High Efficiency Heating System	University	0.291	dkt per kBtuh	0.292	dkt per kBtuh
High Efficiency Heating System	Warehouse	0.291	dkt per kBtuh	0.266	dkt per kBtuh
High Efficiency Heating System	Hotel	0.291	dkt per kBtuh	0.227	dkt per kBtuh
High Efficiency Heating System	Misc	0.291	dkt per kBtuh	0.149	dkt per kBtuh
High Efficiency Heating System	Retail	0.291	dkt per kBtuh	0.119	dkt per kBtuh

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
High Efficiency Heating System	Restaurant	0.291	dkt per kBtuh	0.091	dkt per kBtuh
High Efficiency Heating System	School	0.291	dkt per kBtuh	0.052	dkt per kBtuh
Boiler Tune-Up	All	72.214	dkt per tune-up	0.036	dkt per kBtuh
Insulation (ceiling)	Office	0.017	dkt per Sq. Ft.	0.027	dkt per Sq. Ft.
Insulation (ceiling)	Restaurant	0.017	dkt per Sq. Ft.	0.019	dkt per Sq. Ft.
Insulation (ceiling)	University	0.017	dkt per Sq. Ft.	0.017	dkt per Sq. Ft.
Insulation (ceiling)	Grocery	0.017	dkt per Sq. Ft.	0.010	dkt per Sq. Ft.
Insulation (ceiling)	Misc	0.017	dkt per Sq. Ft.	0.009	dkt per Sq. Ft.
Insulation (ceiling)	Warehouse	0.017	dkt per Sq. Ft.	0.008	dkt per Sq. Ft.
Insulation (ceiling)	School	0.017	dkt per Sq. Ft.	0.005	dkt per Sq. Ft.
Insulation (ceiling)	Retail	0.017	dkt per Sq. Ft.	0.004	dkt per Sq. Ft.
High Efficiency Water Heater	Restaurant	0.133	dkt per kbtuh	0.157	dkt per kbtuh
High Efficiency Water Heater	Grocery	0.133	dkt per kbtuh	0.088	dkt per kbtuh
High Efficiency Water Heater	Warehouse	0.133	dkt per kbtuh	0.071	dkt per kbtuh
High Efficiency Water Heater	Hotel	0.133	dkt per kbtuh	0.063	dkt per kbtuh
High Efficiency Water Heater	Hosp & Health	0.133	dkt per kbtuh	0.061	dkt per kbtuh
High Efficiency Water Heater	Office	0.133	dkt per kbtuh	0.057	dkt per kbtuh
High Efficiency Water Heater	Misc	0.133	dkt per kbtuh	0.033	dkt per kbtuh
High Efficiency Water Heater	University	0.133	dkt per kbtuh	0.016	dkt per kbtuh
High Efficiency Water Heater	School	0.133	dkt per kbtuh	0.014	dkt per kbtuh
High Efficiency Water Heater	Retail	0.133	dkt per kbtuh	0.010	dkt per kbtuh
High Efficiency Windows (Multiple Glazed, Low Emissivity)	All	0.189	dkt per Sq. Ft.	0.011	dkt per Sq. Ft.
Clock / Programmable Thermostat	All	0.003	dkt per Sq. Ft.	0.002	dkt per Sq. Ft.
Circulation Pump Timeclock	All	42.884	dkt per unit	42.884	dkt per unit

High Efficiency Heating System. This measure included both furnaces and boilers. The efficient unit had to be condensing, with a minimum efficiency of 90%. The baseline unit was assumed to be 78% efficient. NWE derived savings from the 2008 gas efficiency potential study (KEMA 2008 (b)). This study included estimates of average energy use index (EUI) for space heating, in therms per square foot, for commercial buildings. The source for the EUI is not entirely clear. The report only states that the usage per square foot (EUI) was derived from "California Commercial End-Use Survey combined with Montana data." The study also reported average heating capacity density, in kBtu per hour per square foot, for each building type. Combining these parameters with a percentage savings based on the efficiency improvement enabled the calculation of a UES (dkt per kBtuh) for each building type.

All other sources that we examined calculated savings for this measure based on effective full-load hours (EFLH). The KEMA reported parameters allowed the derivation of the implicit EFLH for NWE. We compared the implicit EFLH with those reported by other sources. We found the NWE values to be reasonable.

The federal minimum efficiency for this type of system has been 80% since 1992. We developed new UES values by building type, using the existing methodology, but with the baseline efficiency set to 80% rather than 78%. It was not clear whether the capacity per unit area (in kBtuh per ft^2) referred to input or output capacity. We assumed input rating, which was consistent with the EUI parameter.

Insulation (ceiling). The measure required baseline insulation to have an R-value less than R-11. The installed insulation had to be greater than R-30. Savings were derived in the 2008 gas potential efficiency study (KEMA 2008 (b)) with the source reported as, "Quantec DOE-2 analysis for Iowa adjusted to MT conditions."

We could not find this measure in other states. Without a sufficient basis to change the savings value, we made no change to the UES, but applied it on a building type basis.

Boiler Tune-up. NWE derived savings from the 2008 gas efficiency potential study (KEMA 2008 (b)). The report cited "Southern California Gas Potential Study," with the statement, "Boiler tune-up by a properly trained technician can save 2-10%." NWE savings were estimated as 2% of the annual space heating usage for commercial buildings. We could not find the Southern California study. Savings were reported as the weighted average across all building types that pass the TRC test.

Average program savings for this measure were approximately 70 dkt/year. At 2000 effective full load hours (EFLH) per year, this implies a boiler size of 1750 kBtuh. Prescriptive measures of this type are typically limited to around 300 kBtuh. Savings were derived by combining the space heating EUI with assumptions about boiler capacity per square foot and average building size. Calculations based on EFLH would be more straightforward and avoid potential errors introduced with the extra assumptions.

We examined other programs that include this measure. The Minnesota TRM (Minnesota Department of Commerce 2012) estimated savings to be 2% of annual usage. Wisconsin (Wisconsin PUC 2010) used 1.6%, citing one report which found 1% and another study that found 1.6%. We found that the Wisconsin value was the best supported, and estimated savings as 1.6% of usage. In addition, we assigned savings as per kBtuh of boiler capacity rather than on a per boiler basis, since the size of the boiler can vary greatly.

High Efficiency Water Heater. The measure required the baseline unit to have an Energy Factor (EF) of 0.594 or less (or a thermal efficiency of less than 80%), and the efficient unit to be condensing with an EF greater than 0.62 (thermal efficiency greater than 90%). Savings were derived (KEMA 2008 (b)) by combining average water heating EUI, average water heating installed capacity per square foot, and a savings percentage derived from the efficiency gain.

We compared the EUIs assumed by NWE with those reported in other sources, and found them to be in line with other studies. The derivation of this UES would be clearer if it was expressed in terms of EFLH rather than capacity per square foot, but we did not change the existing values. We applied the NWE UES values on a building type basis.

High Efficiency Windows. The baseline for this measure was defined as building energy code for new windows, which was a U-factor of 0.40. The measure required a U-factor less than or equal to 0.35. The savings estimate derived in KEMA (2008) stated only, "KEMA Analysis based on savings estimates developed by DEER/California utilities." Savings were derived by combining the average space heating EUI with a measure savings percentage. The savings percentage due to installation of the measure was stated as 37% for offices, and 3% for health care facilities.

We could not find another source that included this measure. A basic engineering analysis, using Equation 44, found savings an order of magnitude lower than the value derived from the KEMA assumptions. Because we could not find a justification for the potential study based UES, and because 37% is too large a savings for this measure, we used the updated value derived from the engineering formula. Measure savings would have been much greater if the measure were defined as an early replacement of single-pane windows.

$$Svgs = \left(U_{Base} - U_{Measure}\right) \times \frac{HDD \times 24 \times Area}{\eta} \tag{44}$$

where:

U_{Base} = Baseline U-factor

$U_{Measure}$ = Measure U-factor

HDD = Montana average Heating Degree Days

$Area$ = Window area

η = Heating system efficiency

Programmable Thermostat. The baseline for this measure was a manual thermostat. The savings estimate was reported in KEMA (2008) as derived from "KEMA engineering judgment based on the California commercial study." Savings were derived as 5% of the average baseline space heating EUI, and were reported as savings per square foot of controlled space.

We examined other programs and could not find support for a 5% savings value. New York uses a savings fraction of 3.6%, citing (GDS Associates 2002). The Massachusetts TRM (Massachusetts Program Administrators 2010) reports a flat value which nearly matches 3.6% of the NWE EUI. We opted to use a savings percentage of 3.6% based on its support by other programs and studies.

Circulation Pump Timeclock. The baseline was defined as an uncontrolled system; the measure required a 7-day time clock controlling commercial building domestic hot water. KEMA (2008) reported the savings as based on DEER 2005 (Itron 2005), with savings in a large office of 3.2 therms per 1000 ft^2, and in a small office of 0.87 therms per 1000 square feet. The savings percentage in DEER is constant at 6% across building types.

NWE savings by building type varied from 0.72% to 6.52%, and from 8.1 therms per unit to 1341 therms per unit. No explanation was provided for the differences in savings percentage. We compared the DEER derived savings (therms per ft^2) with the NWE values. Differences were not large for the NWE building types. Because only a small number of these measures were installed, and the difficulty of applying DEER building types to NWE, we did not change the NWE savings values.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Commercial Existing Gas Rebate program, we successfully visited 23 sites encompassing five different strata. The customers in this program were very accommodating when it came to agreeing to and scheduling site visits (0% refusal rate for the customers contacted by the Special Effort recruiting team).

Table 163: Site Recruitment Disposition for E+ Commercial Existing Gas Rebate

	Stratum					Total n	%
	1	2	3	4	9		
Recruitment							
Telephone Lab	8	7	8	3	0	26	
Special Effort							
Attempts	0	0	0	1	4	5	
No Reply	0	0	0	0	0	0	0.0%
Refused	0	0	0	0	0	0	0.0%
Recruited	0	0	0	1	4	5	100.0%
Total Recruited	**8**	**7**	**8**	**4**	**4**	**31**	
Onsite							
Refused	0	0	0	0	0	0	0.0%
Not Needed	5	3	0	0	0	8	25.8%
Total Completed	**3**	**4**	**8**	**4**	**4**	**23**	**74.2%**

Site Inspections

For the 2010–2011 program years, we performed 23 site inspections which considered five different measures: Boiler Tune-Up, Ceiling Insulation, Efficient Heating System, High Efficiency Water Heater, and High Efficiency Windows. (One of the Ceiling Insulation sites that we inspected was subsequently not used in the evaluation because we met the stratum 3 quota without it).

Across the 23 sites we visited, we found that nearly all of the sampled measures were installed, operational, and matched the quantity and size claimed by NWE. The only exception was at one site where the affected area of installed ceiling insulation was only 66% of the claimed area.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit. For all but one of the sites, we determined the evaluation site-specific savings to be less than the claimed savings. The reduction in savings is due to the UES methods.

For the Boiler Tune-Up measure, the claimed savings is a constant 72.2 dkt per boiler tune-up; whereas the evaluation savings, 0.036 dkt per kBtuh, is a function of the rated input energy of the boiler. This change in the UES method reduced savings by 91%.

For the Ceiling Insulation, Efficient Heating System, and High Efficiency Water Heater measures, NWE had developed UES values that varied by building type but only applied a value that was averaged across all building types. The evaluation applied the NWE UES values by building type, rather than using the average. For most of the building types in this sample, the evaluation building-specific UES is less than the average UES used in the claimed savings (see UES Review section above).

The one case where the evaluation savings is higher than the claimed savings is for an Efficient Heating System installed in an office building. The quantity and rated input energy of the four furnaces found at the site match those tracked by NWE; however, the evaluation UES used specifically for an office space is higher than the claimed UES. Office and Hospital/Health buildings are the two buildings types where the building-specific UES is higher than the average UES.

For the High Efficiency Windows measure-type, the evaluation UES value is less than the claimed UES value (see UES Review above). Although the areas of the windows inspected during the site visits matched the areas documented by NWE, the evaluation savings are considerably less.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 164: File Review and Site Visit Adjustment to Savings for E+ Commercial Existing Gas Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Natural Gas									
	E+ Commercial Existing Gas Rebate	dkt	40,023	39,750	17,751	17,620	0.99	0.44	0.44

9.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 165: Savings Adjustments by Calendar Year for E+ Commercial Existing Gas Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Natural Gas Supply - DSM										
	E+ Commercial Existing Gas Rebate	dkt	2009	5,571	0.44	-	-	0.44	2,453	
	E+ Commercial Existing Gas Rebate	dkt	2010	17,303	0.44	-	-	0.44	7,618	
	E+ Commercial Existing Gas Rebate	dkt	2011	17,148	0.44	-	-	0.44	7,549	
	E+ Commercial Existing Gas Rebate	dkt	All Years	40,023	0.44	-	-	0.44	17,620	
Natural Gas										
	E+ Commercial Existing Gas Rebate	dkt	All Years	40,023	0.44	-	-	0.44	17,620	

9.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 166: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Commercial Existing Gas Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Natural Gas Supply - DSM								
	E+ Commercial Existing Gas Rebate	dkt	2009	2,453	0.92	1.91	1.42	1.01
	E+ Commercial Existing Gas Rebate	dkt	2010	7,618	0.98	1.90	1.49	1.08
	E+ Commercial Existing Gas Rebate	dkt	2011	7,549	0.74	0.96	0.85	0.81
	E+ Commercial Existing Gas Rebate	dkt	All Years	17,620	0.87	1.39	1.16	0.95
Natural Gas								
	E+ Commercial Existing Gas Rebate	dkt	All Years	17,620	0.87	1.39	1.16	0.95

9.3. Process Evaluation

9.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with 40 participants and 67 trade allies. Surveyed trade allies include those who reported offering lighting, HVAC, and/or insulation products and services to commercial end-users.

9.3.2. Implementation Findings

9.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE's website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures such as insulation and water heating among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor's invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application. Program staff ensure all approved applications include a current NWE bill or accurate NWE account number for the building where the installation occurred. A completed Internal Revenue Service W-9 form must be included. For energy-management-system optimization in a commercial facility of a gas customer, a commissioning report must accompany the rebate application as well.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

The implementation contractor has added more marketing staff in recent years and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. In addition, E+ Program Contractors conduct one-on-one and group outreach to promote the program. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

9.3.2.2. Best Practices Assessment

Table 167 through Table 170 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 167: Program Planning and Design Best Practices for E+ Commercial Existing Gas Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 168: Program Management and Administrative Best Practices for E+ Commercial Existing Gas Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact

Practice	NWE Assessment
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 169: Marketing and Outreach Best Practices for E+ Commercial Existing Gas Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 170: Program Quality Control Best Practices for E+ Commercial Existing Gas Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

9.3.3. Participant Findings

We conducted phone surveys with 40 customers who received rebates for making efficiency upgrades to their existing buildings through NWE’s E+ Commercial Existing Gas Rebate Program.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

9.3.3.1. Information Access, Awareness, and Decision Making

These commercial participants became aware of the NWE’s rebate offer for qualifying gas measures chiefly through a building professional, vendor, or contractor (69%) and/or a NWE advertisement or publication about the program (62%). Additionally, 28% learned about the program by contacting the utility directly (Table 171).

Table 171: Means of Program Awareness, among E+ Commercial Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Building professional, vendor, or contractor (n=40)	69%
Utility publication or advertisement (n=40)	62%
Directly contacted utility (n=40)	28%
Utility representative appearance (n=40)	15%
Word of mouth (n=40)	11%

About half of these commercial respondents had been to the utility website. The reasons for non-use were fairly evenly split among categories concerning access and feelings toward the Internet (Table 172).

Table 172: Reasons Website Not Used, among E+ Commercial Existing Gas Rebate Participants

Reason	Weighted Percent (n=16)
No need or no reason	31%
Don't have access	27%
Don't like to use it much	22%
Other	21%

Among the 22 respondents in this group who had been to the website, most (79%) reported visiting to learn about rebates or audits. Another 42% wanted utility contact information. Just 12% mentioned to pay their utility bill online (Table 173).

Table 173: Website Use, among E+ Commercial Existing Gas Rebate Participants

Reason (Allowed Multiple)	Weighted Percent
Learn about rebates or audits (n=22)	79%
Utility contact information (n=22)	42%
Money saving tips (n=22)	38%
Energy saving educational opportunities (n=22)	13%
Pay utility bill (n=22)	12%

About 65% of these commercial program participants "agree" or "completely agree" that the web information they were looking for was easy to find and helpful (Figure 43).

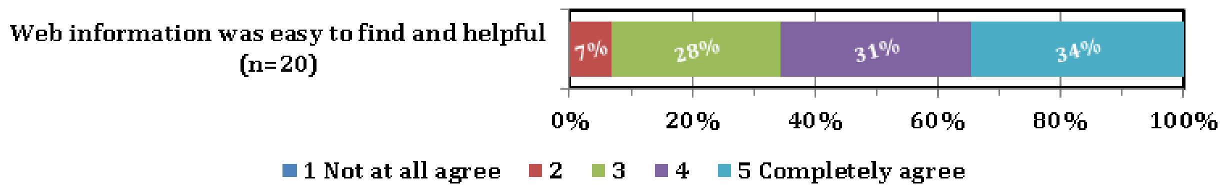

Figure 43: Website Effectiveness, among E+ Commercial Existing Gas Rebate Participants

About two-thirds of E+ Commercial Existing Gas Rebate respondents would like more information on energy efficiency programs (65%) and/or energy-saving educational opportunities (63%; Table 174).

Table 174: Further Information Desired, among E+ Commercial Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Energy efficiency programs (n=40)	65%
Energy saving educational opportunities (n=40)	63%
Does not want any (n=40)	28%
Workshops or events on energy efficiency (n=40)	26%

Those desiring further information prefer to receive information by mail (78%) and email (71%; Table 175).

Table 175: Information Delivery Preference, among E+ Commercial Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
US mail (n=29)	78%
Email (n=29)	71%
Community event (n=29)	22%
Workshop (n=29)	19%
Webinar (n=29)	17%
Phone (n=29)	12%

We asked respondents about the reasons they decided to purchase this efficient equipment. The rebate offers, as well as salespeople or installation contractors, played the largest roles in respondents' decisions to make this efficiency purchase. Rebates were a "major" factor for 41% and sales/contractors for 40% of the respondents (Figure 44).

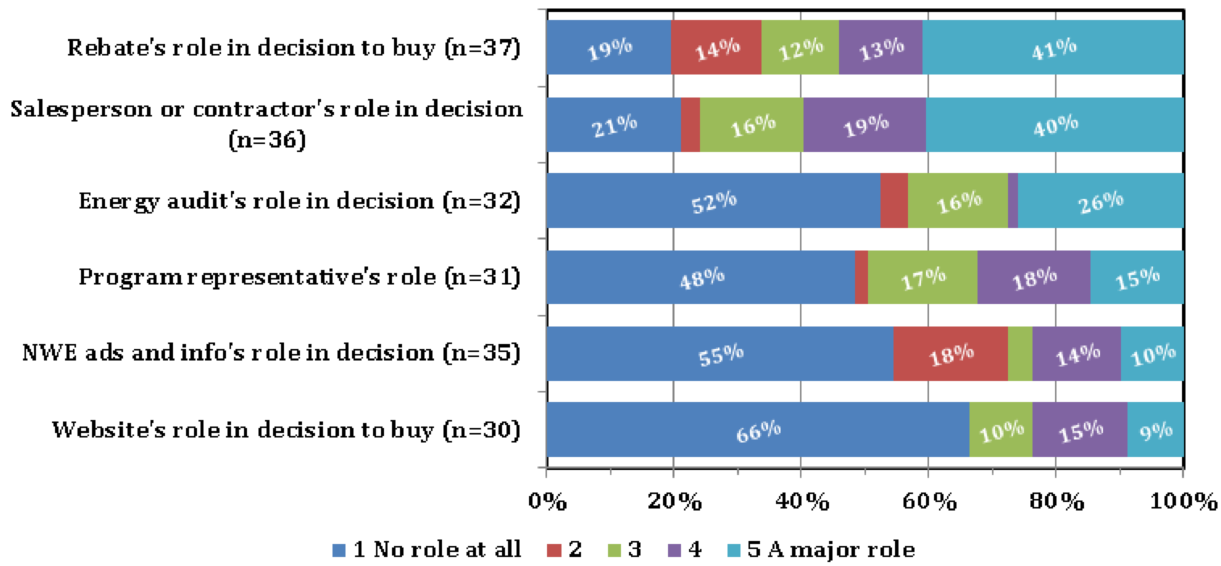

Figure 44: Program Role in Purchase Decision, among E+ Commercial Existing Gas Rebate Participants

Respondents also reported the reasons they decided to participate in the program. We read a list of possible reasons for participating in the E+ Commercial Existing Gas Rebate program. Strong majorities said "yes" to almost every reason as a factor in their initial decision to apply for a rebate. The lowest percentage (49%), still almost half, wanted to follow an energy audit with action (Table 176).

Table 176: Reasons For Participation, among E+ Commercial Existing Gas Rebate Participants

Reason (Allowed Multiple)	Weighted Percent
Save energy and money (n=40)	97%
Increase facility comfort (n=40)	83%
Contractor recommendation (n=40)	77%
Good experience with other NWE efficiency program (n=39)	69%
Easy to use the program (n=40)	65%
Rebate needed to offset cost (n=39)	64%
Check specific equipment performance (n=39)	63%
Utility vouched for equipment by rebating (n=40)	59%
Wanted to follow audit with action (n=39)	49%

While the majority of respondents (83%) had no issues or concerns when first considering program participation, about 17% did have initial questions. The most often mentioned concern was that it would be too confusing to participate (Table 177).

Table 177: Initial Questions or Concerns, among E+ Commercial Existing Gas Rebate Participants

Concern (Allowed Multiple)	Weighted Percent
Confusing to participate (n=7)	63%
Takes too much time (n=7)	28%
Too difficult to participate (n=7)	21%
Hard to do new things (n=7)	21%
Approvals from everyone hard (n=7)	9%
Incentive not enough (n=7)	0%
Not sure it would be worth it (n=7)	0%

9.3.3.2. Program Experience

Surveyed participants reported on their program experience and rated the installation process in the E+ Commercial Existing Gas Rebate program, then reflected on their views about future participation in NWE efficiency programs.

Over one-half (56%) respondents reported that the program–associated vendor or contractor was the initiator of the discussion about the project (Table 178).

Table 178: Project Initiator, among E+ Commercial Existing Gas Rebate Participants

Who initiated discussion of the project?	Weighted Percent (n=40)
Associated vendors or contractors	56%
My organization	30%
Discussion between both	15%

Just over half of the time, (52%), the customer prepared the rebate application themselves, while 23% of the time the associated contractor or vendor did (Table 179).

Table 179: Rebate Application Preparer, among E+ Commercial Existing Gas Rebate Participants

Application Preparer	Weighted Percent (n=39)
Someone in my organization	52%
My organization, assisted by vendor or contractor	25%
Vendor or contractor	23%

Three-quarters of these respondents rated information on how to apply for rebates and how the inspection process prior to rebate works as clear ("4" and "5" ratings). Less clear were four other elements of program information (Figure 45).

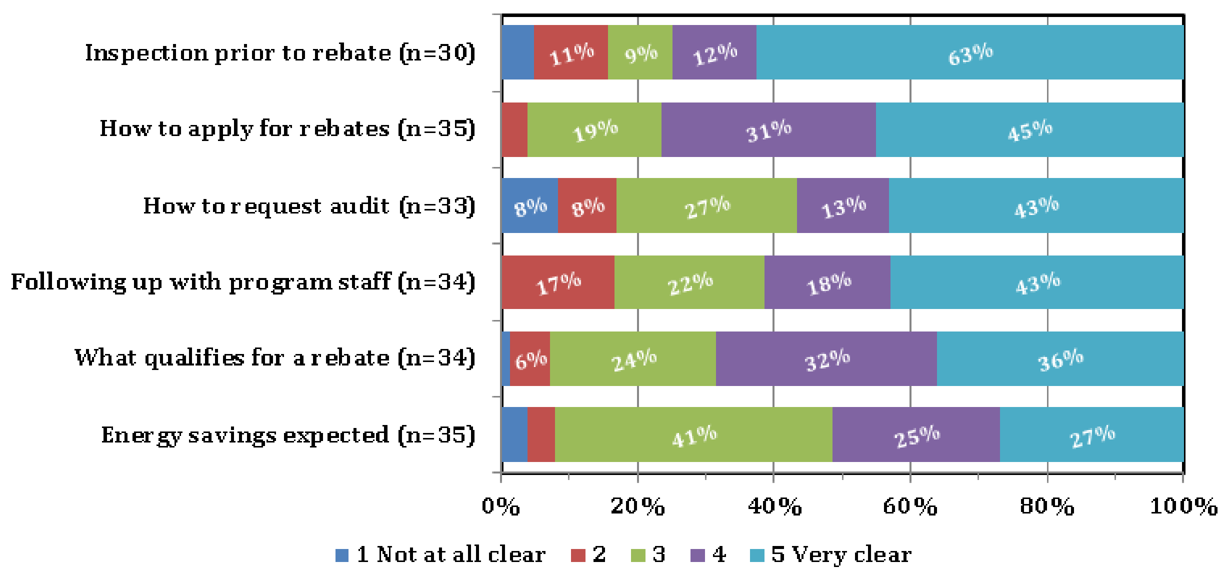

Figure 45: Clarity of Program Information, among E+ Commercial Existing Gas Rebate Participants

Majorities of commercial respondents in this gas rebate program "completely agreed" with five positive descriptions of the stages participants experience during the process of installation. Only in the area of whether the item met energy-saving expectations did less than one-half (43%) "completely agree" (Figure 46).

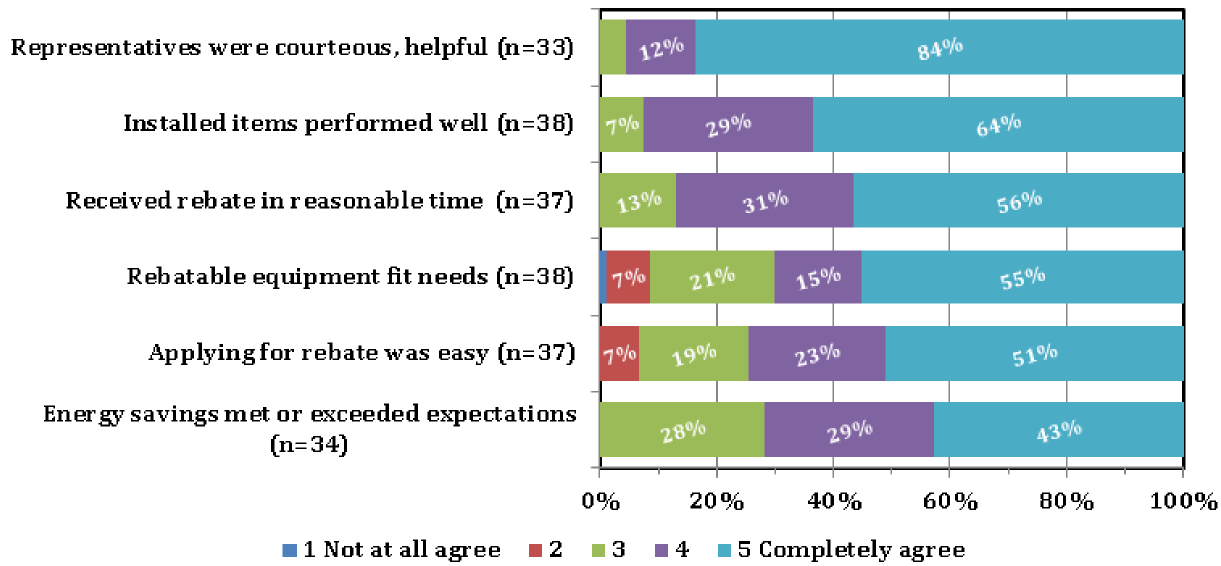

Figure 46: Experience of Installation, among E+ Commercial Existing Gas Rebate Participants

Just over one-half (53%) of respondents reported that their rebated equipment had been inspected by a program representative. Nearly all (97%) of these respondents who had an on-site inspection "completely agreed" that the inspector was courteous and efficient.

As a general indicator of overall satisfaction with NWE's efficiency activities, the survey asked participants about future participation. Over three-fourths of respondents (82%) would be likely to participate in future NWE efficiency programs (Figure 47).

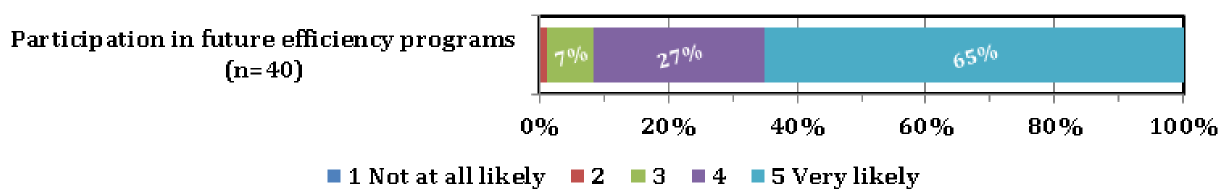

Figure 47: Likelihood of Future Participation, among E+ Commercial Existing Gas Rebate Participants

9.3.4. Trade Ally Findings

We surveyed 67 NWE trade allies who reported installing gas rebate-qualifying items and/or insulation in existing commercial buildings.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example).

Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

9.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event, from noticing a utility publication or advertisement, or by directly contacting the utility (69% or greater in each case; Table 180).

Table 180: Means of General Program Awareness, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=67)	76%
Directly contacted utility (n=67)	70%
Utility representative appearance (n=65)	69%
Utility website (n=66)	44%
Word of mouth (n=67)	43%
Associated vendors and contractors (n=67)	42%
Other (n=67)	7%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly or through NWE representatives (Table 181).

Table 181: Specific Requirements Awareness, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Directly contacted utility (n=67)	45%
Utility representative appearance (n=67)	43%
Utility publication (n=67)	27%
Associated vendors and contractors (n=67)	9%
Utility website (n=67)	7%
Other (n=67)	10%

A majority (67%) of surveyed trade allies visited the utility website. Among those website users, approximately three-quarters (78%) said they used the site to learn about rebates or audits, and a smaller majority had printed rebate forms or searched to contact the utility (Table 182).

Table 182: Website Use, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=45)	78%
Print rebate forms (n=45)	62%
To contact utility (n=45)	60%
Money saving ideas (n=45)	36%
Educational events information (n=45)	36%
How-to videos (n=45)	7%
Other (n=45)	4%

Sixty percent of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful (Figure 48).

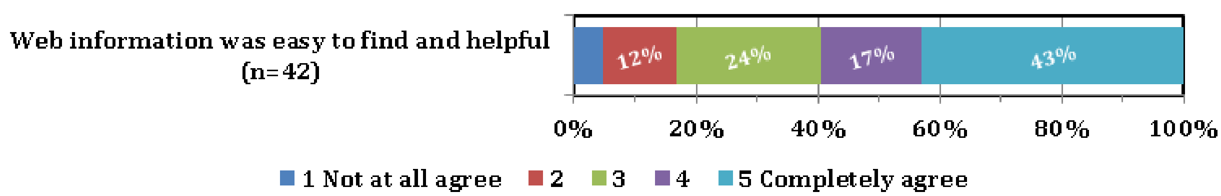

Figure 48: Website Effectiveness, among E+ Commercial Existing Gas Rebate Trade Allies

Over half of surveyed trade allies would like further information on workshops or events (61%), or were interested in information on energy-saving educational opportunities (54%) or energy efficiency programs (57%). Thirty percent did not want further information from NWE at the time of the survey (Table 183).

Table 183: Further Information Desired, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=67)	61%
Energy efficiency programs (n=67)	57%
Energy saving educational opportunities (n=67)	54%
None (n=67)	30%

Those desiring further information slightly preferred to receive information using email (49%), mail (49%), and other methods such as trainings and workshops (36%; Table 184).

Table 184: Information Delivery Preference, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
US mail (n=47)	49%
Email (n=47)	49%
Trainings, workshops or seminars (n=47)	36%
Webinar (n=47)	26%
Community event (n=47)	23%
Phone (n=47)	15%

9.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

A large majority of surveyed trade allies (82%) sold controls. Trade allies were asked if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if they typically kept unrated and standard items in stock and ordered in the high-efficiency items when needed. Just under half (49%) of the respondents said their stock typically includes high-energy efficiency equipment, while the other half ordered items as needed for rebates.

Trade allies reported on their sales strategies, listed in Table 185 below. More than three-quarters (82%) kept a full range of equipment to offer, and 98% agreed that the “Better” and “Best” equipment is usually more energy-efficient. Well over half (61%) reported they suggest the “Best” equipment to customers first.

Table 185: Equipment Sales Approach, among E+ Commercial Existing Gas Rebate Trade Allies

Approach	Percent
Typically sells a range of equipment that gives customers a GOOD, BETTER or BEST option (n=55)	82%
Agree BETTER and BEST equipment options are typically more energy- efficient (n=43)	98%
Good mentioned first to customer	2%
Better mentioned first	25%
Best mentioned first	61%
Present all options simultaneously	11%

Figure 49 illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. About half (49%) of these trade allies reported that between 51% and 100% of their stock was high-efficiency. A subset of trade allies who reported stocking efficient equipment offered estimates on the share of sales made in the past two years that were energy-efficient. Nearly three-quarters of this group estimated that the majority (between 76% and 100%) of equipment sold in the past two years could be categorized as high-efficiency.

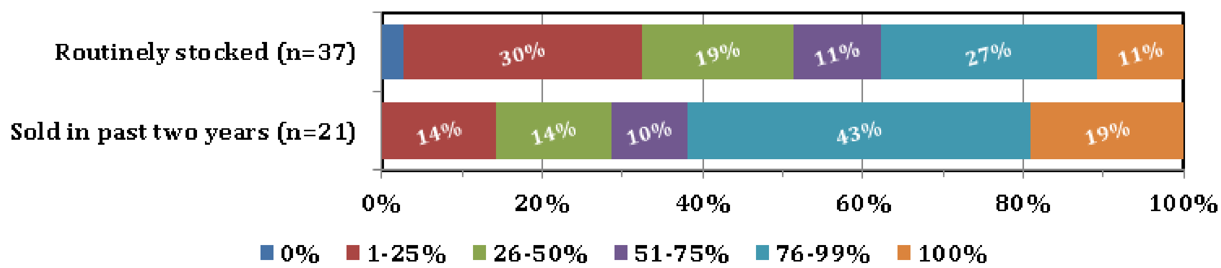

Figure 49: High-Efficiency Equipment Share, among E+ Commercial Existing Gas Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency items that qualify for rebates. In *insulation* sales, 96% of respondents mentioned lower energy bills to the customer, 81% mentioned the rebate, and 78% mentioned the high quality of the product (Table 186). In energy-saving *equipment* promotions, 89% of respondents stressed lower operation costs and the NWE rebates (Table 187).

Table 186: Customer Benefits of Insulation, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=27)	96%
Utility rebate (n=27)	81%
High-quality of product (n=27)	78%
Comfort (n=27)	74%
Other (n=27)	15%

Table 187: Customer Benefits of Equipment, among E+ Commercial Existing Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=56)	89%
Utility rebate (n=56)	89%
High-quality of product (n=56)	68%
Lower maintenance costs (n=56)	55%
Other (n=56)	9%

About 20% of these trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these eleven mentioned cost or reliability concerns with the equipment, primarily.

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. More than a third of respondents (36%) said they recalled installing rebate-qualifying items in cases when they knew customers did not pursue rebates. About the same fraction (42%) of *insulation* installers also recalled qualifying circumstances when rebates were not applied for. No single reason stands out as a barrier to rebate applications (Table 188), although sometimes the trade ally reported that they had been unaware of the rebate offer at the time.

Table 188: Circumstances When Rebate Foregone, among E+ Commercial Existing Gas Rebate Trade Allies

Circumstance	Percent
Customer did not apply (n=17)	24%
Trade ally unaware of rebate/program (n=17)	18%
Customer ineligible (n=17)	12%
Applying takes too long (n=17)	12%
Rebate too small (n=17)	12%
Application process too difficult (n=17)	6%
Other (n=17)	24%

9.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (67%) of trade ally respondents say they had trained staff to talk to customers about energy efficient choices. In fact, 48% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 189).

Table 189: Rebate Initiator, among E+ Commercial Existing Gas Rebate Trade Allies

	Percent (n=67)
Almost always trade ally initiated	48%
Mostly trade ally initiated	31%
About half trade ally and half customer	13%
Almost always customer initiated	7%

When a customer is considering insulating their building, respondents suggested the rebate program to the customer 92% of the time, rather than wait for the customer to show interest. Likewise, once a customer is considering an actual equipment purchase, 95% of respondents suggest options that qualify for a rebate to the customer.

A few trade allies also indicated whether they had any reservations about recommending the program to their customers. Most surveyed trade allies (81%) indicated that nothing about the program raised issues or concerns around customer participation. Among the thirteen (19%) of respondents who had initial concerns, concerns mentioned included rebate processes, confusing program requirements, and insulation requirements (Table 190).

Table 190: Initial Concerns, among E+ Commercial Existing Gas Rebate Trade Allies

	Percent (n=13)
Rebate process difficult	31%
Confusing requirements	23%
R-value problems	23%
Other	23%

Just a few (22%) trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. How often these “regular communicators” notify their customers varied widely from daily to once a year (Table 191).

Table 191: Customer Contact Frequency, among E+ Commercial Existing Gas Rebate Trade Allies

Frequency	Percent (n=15)
Once a month	20%
2 times a year	20%
Once a year	20%
Every day	20%
Once a quarter	7%
Varies by customer	13%

The majority (from 58% to 84%) of trade ally respondents rated elements of information they received on rebates and contacting program staff as "clear" or "very clear" (Figure 50).

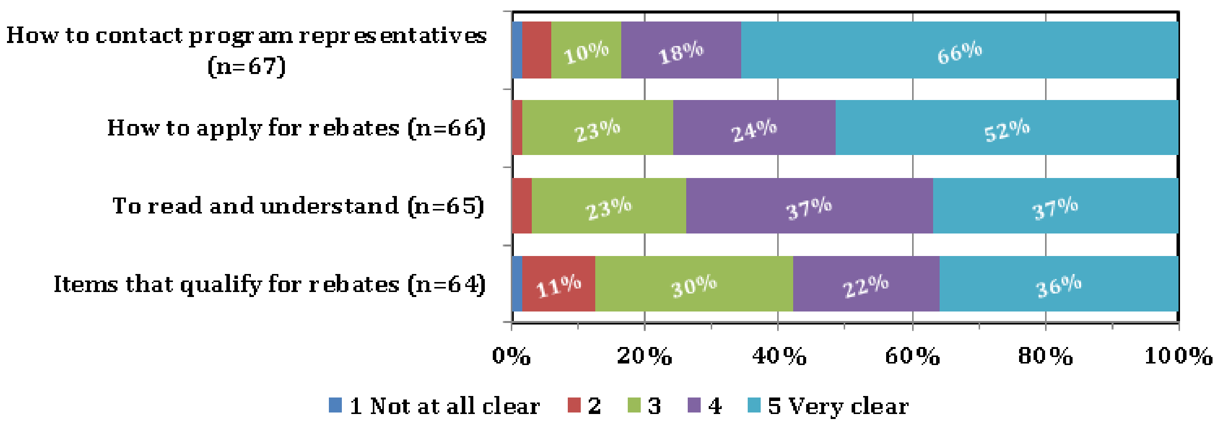

Figure 50: Clarity of Program Information, among E+ Commercial Existing Gas Rebate Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Over half of gas equipment and insulation trade allies (61%) reported working jointly with the customer to prepare the application. Another 28% completed all or most of the application themselves.

Table 192: Rebate Application Preparer, among E+ Commercial Existing Gas Rebate Trade Allies

	Percent (n=67)
Typically both respondent and customer - half and half effort	61%
Typically respondent prepares all or most of the application	28%
Typically the customer prepares all or most of the application	9%
Depends on the rebate	1%

About three-quarters (78%) of the 59 lighting trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process was simple to follow.

Respondents rated their agreement with several positive statements related to staying current with program changes. At least 65% of respondents "agreed" or "completely agreed" with four positive statements listed in the table below (Figure 51).

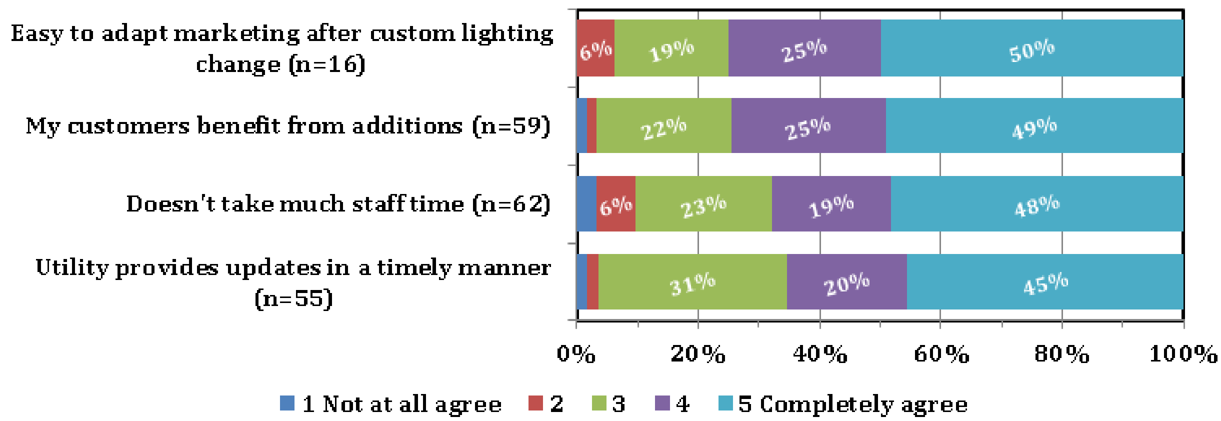

Figure 51: Keeping Up With Program Changes, among E+ Commercial Existing Gas Rebate Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. Other heating systems and LED lighting were commonly suggested (Table 193). These trade allies indicated they suggested the items because "it's more efficient" and "customers request the equipment" (Table 194).

Table 193: High Efficiency Equipment Suggested, among E+ Commercial Existing Gas Rebate Trade Allies

	Percent (n=18)
Other heating systems	33%
LED lighting	28%
Heat pumps	17%
On demand water heaters	11%
Other	11%

Table 194: Reasons Equipment Should Be Added, among E+ Commercial Existing Gas Rebate Trade Allies

	Percent (n=17)
Its more efficient	41%

	Percent (n=17)
Customers request them	24%
Cost	12%
Where industry is going	6%
Rebate will increase sales	6%
Other	12%

Surveyors collected some general comments from a few trade allies. Themes that appeared generally revolved around communications with NWE (a need for more frequent updates), or program processes (for example, too much paperwork, frequent inspections, and the view that NWE should increase program marketing including their relationship with trade allies.)

9.3.4.4. Firmographics

A few trade allies (19%) operate at more than 20 Montana locations. More than half (61%) of respondents serve five or fewer locations.

Table 195: Number of Montana Locations, among E+ Commercial Existing Gas Rebate Trade Allies

	Percent (n=64)
1 location	36%
2 to 5 locations	25%
6 to 10 locations	11%
11 to 20 locations	9%
21 to 50 locations	5%
Over 50 locations	14%

The maximum number of miles trade allies reported traveling to serve clients was distributed fairly evenly at the lower and upper ends of the range, with about one-fifth traveling less than 100 miles (22%), and 18% traveling more than 400 miles. The majority would travel between 101 and 200 miles to serve a client (Figure 52).

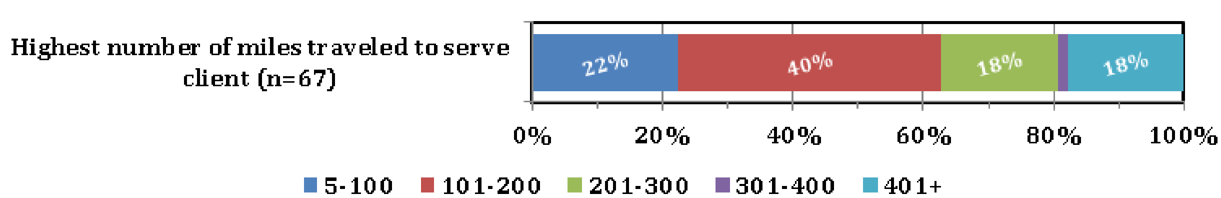

Figure 52: Maximum Miles, among E+ Commercial Existing Gas Rebate Trade Allies

9.4. Recommendations

9.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Updated values:** Update UES values for the measures included in this program. The UES savings for several of these measures have a large range across the applicable building classification, so it is important that the UES values be applied on a facility-type basis to improve the accuracy of the savings estimates. These measures include efficient heating system, efficient water heating, ceiling insulation, and DHW pump clock. Continuing the current method of applying a single average value will result in widely varying realization rates during the evaluation. For the efficient heating system and efficient water heater measures, the savings should be based on equivalent full load hours rather than the estimated capacity per square foot. This will make the calculation more direct and transparent, and reduce sources of error. For the boiler tune-up, thermostats and efficient windows measures, the evaluation UES values should be adopted. Also consider expanding the efficient windows measure to include the retrofit of single pane windows.

9.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Two-thirds of surveyed E+ Commercial Existing Gas participants reported wanting more information about efficiency programs and general efficiency opportunities, but expressed a lower desire than participants in some other programs for high-touch information like workshops or community events. Many participants had participated in other efficiency programs previously: two-thirds of participants reported that their good experience in prior NWE efficiency programs played a role in their decision to participate in this program. While many participants reported that contractors played an important role in their decision to participate, over half of participants completed rebate application materials without assistance from a contractor. While overall reports of participation experience were positive, nearly a fifth of participants rated as unclear information about the inspection, how to request an audit, and how to follow up with program staff. (The evaluators note that program application materials clearly state how to reach program staff.)

Surveyed commercial trade allies gave generally positive feedback about the program, but a few (13%) reported that information about the type of equipment qualifying for rebates was unclear. Although half of trade allies report using the website as a resource for general program information, very few use it as a resource for specific program requirements, instead relying on direct program staff contact.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.

- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans**: Consider written process plans (detailed implementation activities and roles and responsibilities).

10. E+ Commercial Lighting

10.1. Program Description

The E+ Commercial Lighting program is comprised of two components, the Commercial Lighting Rebate and the Commercial CFL Direct Install.

E+ Commercial Lighting

The E+ Commercial Lighting targets NWE's commercial, industrial, and institutional customers. The program provides prescriptive rebates for customers replacing obsolete lighting equipment with more efficient technologies and the installation of lighting controls. The program component was offered to customers beginning in the early 1990s. The program component is available to all non-residential supply customers and Choice customers < 1 MW. Supply customers are funded through DSM and Choice customers through USB.

Lighting equipment must generally operate a minimum of 1,000 hours per year to qualify, and projects must qualify for a rebate of $50 or more to be eligible. Projects are required to be finished by a completion date to ensure project funds are assigned only to projects that are actively underway. The Installed Measures table below outlines the incentive structure for the program component.

There are three methods for funding general lighting retrofits. They include:

- Dollars per unit, for example, $8 for a two-lamp T8 ballast, plus $1 per T8 lamp,
- Dollars per Watt based on pre- and post-installation Wattage savings, and
- Dollars per square foot based on the reduction of lighting power density, which is the reduction of installed Watts per square foot of retrofit area measured against the energy code baseline (the entire building must be brought up to code). Rebates are based on a four-step scale from meeting the code to 15%, 20%, and 25% increments below the code baseline.

Equipment such as exterior photocells, occupancy controls, and daylighting controls have a funding mechanism based on a per unit basis, controlled Wattage, and controlled floor area.

Customers submit projects directly to NWE or through their vendor or contractor.

Separately, NWE has entered into contracts with a small number of firms known as E+ Program Contractors to assist customers with efficiency projects. E+ Program Contractors include lighting-design professionals such as architects, engineers, or lighting designers. At the customer's request, a customer may work with an E+ Program Contractor to develop a lighting design plan before going out to bid with a project. At the successful conclusion of a project, the contractors receive compensation from NWE based on the customer's energy savings. The E+ Program Contractors may offer additional services to the customer separately from their NWE program participation. The number of E+ Program contractors has increased from one in 2007 to six at the end of 2011.

CFL Direct Install

The CFL Direct Install occurs at the time of the Small Business Electric Appraisal. The program component has been in operation since 2005 and is funded through DSM supply rates. Customers identify incandescent lighting to the audit team that is operating for three hours or more per day and select fixtures for conversion to CFLs. Customers may receive up to 20 free CFLs or 10% of the qualifying fixtures, whichever is greater. Auditors replace the selected incandescent lighting with 13 to 24 Watt Energy Star rated CFLs appropriate to the lumen output of lamps being replaced. The customer approves each installation before the CFL is left in place and are provided customer education on the appropriate use and selection of CFLs and the E+ Commercial Lighting Rebates program for the purchase of additional CFL products.

10.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the commercial lighting program component for program years 2007–2011. Measures marked with an "X" in the Program Year columns indicate the measure was offered by the program in all or part of that program year.

Table 196: Measures Offered for E+ Commercial Lighting

Equipment Description	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date	End Date[1]
One or Two Lamp Fixture 1/1, 2/1 (Lamp/Ballast)	$/Unit	Fully electronic ballast	X	X	X	X	X		
Three Lamp Fixture 3/1, 3/2 (Lamp/Ballast)	$/Unit	Fully electronic ballast	X	X	X	X	X		
Four Lamp Fixture 4/1, 4/2 (Lamp/Ballast)	$/Unit	Fully electronic ballast	X	X	X	X	X		
T-8 lamp 4 foot	$/Unit	N/A	X	X	X	X	X		
T-8 lamp 8 foot	$/Unit	N/A	X	X	X	X	X		
T-8 HO lamp 8 foot	$/Unit	N/A	X	X	X	X	X		
MV, HPSV, or MH to T5 HO or T8	$/Watt	On approved design	X	X	X	X	X		
Other Approved Lighting Retrofits	$/Watt	On approved design,	X	X	X	X	X		
Compact Fluorescent Lamp Integral (screw-in) or Modular Hardwired Fixture or Lamp	$/Unit	Energy Star rating; replaces an incandescent lamp of no more than 4 times the CFL wattage	X	X	X	X	X		
High Efficiency Lighting	$/FT²	Meet the 2009 IECC LPD and control					X	7/1/2010	

Equipment Description	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date	End Date[1]
Fixtures/Design – Level I		requirements.							
High Efficiency Lighting Fixtures/Design – Level II	$/FT²	LPD above code requirements by 15%. Lighting design required.					X	7/1/2010	
High Efficiency Lighting Fixtures/Design – Level III	$/FT²	LPD above code requirements by 20%. Lighting design required.					X	7/1/2010	
High Efficiency Lighting Fixtures/Design – Level IV	$/FT²	LPD above code requirements by 25%. Lighting design required.					X	7/1/2010	
Photocell	$/Unit	Exterior lighting control only	X	X	X	X	X		
Time Clock Controls	$/Watt						X	7/1/2010	
Occupancy Sensor or Sweep Controls	$/Watt	Rebate varies depending on wattage controlled.	X	X	X	X	X		
Daylighting Controls	$/FT²	Must be within 15 feet of daylighting source					X	7/1/2010	

[1] The date the program stopped offering the measure. Customer projects with discontinued measures already in progress could extend past that date

Measure savings are calculated as the difference between baseline and installed wattage on a per fixture basis, multiplied by hours of operation. Values in standard wattage tables can be overridden with data from fixture-specific cut sheets. For lighting control equipment, customers or contractors estimate the percentage of off time, or may use NWE default percentages. Regardless, the utility has the final call on all energy savings' calculation inputs.

Measure savings for the CFL Direct Install component are calculated by subtracting pre from post fixture wattage, then multiplying by the deemed annual hours of operation. The auditors record the watts of the incandescent lamps removed and the wattage of the replacement CFLs. A deemed savings of three hours per day is used.

10.1.2. History

The commercial lighting component measures and rebates are reviewed and adjusted on an annual basis based on total resource cost and other metrics. At the annual review, measures must be cost-effective to remain in or be added to the program.

10.1.3. Marketing

The program markets to customers through a variety of methods:

- Advertising in television, radio, print media, web, and earned media
- Direct customer marketing by meeting with customers at their business sites, and at conferences and community events
- Attending and presenting at professional and trade association meetings such as those for healthcare, hospitality, architects, engineers, and service organizations
- The team markets to lighting design professionals at architectural and engineering firms, lighting designers, electrical firms, retailers, distributors, and individual customers.
- Program marketing relies on trade allies, lighting contractors, distributors, and others in the lighting businesses who promote products and services to utility customers.
- Direct customer marketing for the commercial lighting component is done through the Small Business Electric Appraisal (small commercial audit program), and
- Co-sponsoring Montana energy conferences with the state government and NEEA

10.1.4. Program Steps

E+ Commercial Lighting

All lighting projects require NWE pre-approval. To begin the application and pre-approval process, customers must submit an application form along with a copy of their lighting-project bid that includes an itemized project description, itemized purchase costs, and vendor or contractor information, and a copy of the customer's NWE electric bill. Program staff review the information on the application. If there is missing information, program staff contacts the customer or contractor to gather needed information. If program staff identifies problematic items such as lumen reductions or de-lamping, the customer or the contractor is called. If there are no concerns, the information is entered into the database and the project is pre-approved.

Upon pre-approval of a project, program staff notifies the applicant and sends duplicate original project agreements for the applicant's signature. Before beginning project installation, the applicant must sign both copies, return them to the implementation contractor, and receive a fully executed copy of the agreement back. The returned agreement is accompanied by a commitment letter with notice to proceed, an estimated project completion date, and notice that a given rebate amount has been reserved for the project. Projects that receive a notice to proceed are not subject to program changes that occur before the specified project completion date.

From this point, the rebate application and payment process is similar to the processes for other prescriptive rebates. Specifically, upon project completion, the applicant must notify NWE in writing, and include a copy of the final project invoice and a completed Internal Revenue Service W-9 form. As with all prescriptive projects, a post-installation inspection may occur (25% of projects with a rebate amount of $500 or more), and a rebate check will be mailed to the customer within four to six weeks.

CFL Direct Install

The energy audit team installs CFLs at the time of the Small Business Electric Appraisal audit.

10.2. Impact Evaluation

10.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

10.2.1.1. Estimation of Gross Savings

We applied the same gross savings methodology to both components of this program. We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

This program used simplified, measure-specific, engineering calculations to estimate NWE program savings. We performed a review of the program algorithms for each sampled site. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the as-built conditions observed during the site visit. For measures where the NWE method was not adequate, we recalculated energy (kWh) and demand (kW) savings using the more reliable techniques.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and were producing energy savings. We collected data as necessary to support a re-estimation of energy (kWh) and demand (kW) savings, using the calculation method that resulted from the algorithm review, discussed above. For some sampled cases the data collection included one-time and/or short terms measurements of parameters relevant to the energy performance of the installed measures. We calculated evaluation energy (kWh) and demand (kW) by applying the final calculation method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

10.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

10.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

10.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

10.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

10.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

10.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 48 sampled cases for the E+ Commercial Lighting component and 50 sampled cases for the Commercial CFL Direct Install component of this program across the five program years. The results from this review revealed very few data entry errors in the program tracking database, with no entry errors associated with energy savings for the commercial lighting component and only six errors for the direct install component. The data entry errors that were found included:

- Changes in CFL counts
- Changes in baseline lamp wattages

We re-calculated annual energy (kWh) and demand (kW) savings after corrections were made to the data entry errors listed above. For five cases savings increased after the corrections were made. For one case savings decreased due to a reduction in the baseline lamp Wattage as provided in the audit site worksheets. The net change was to increase savings for direct install component.

Program Algorithm Review

We reviewed the algorithms used to estimate program savings for the measures installed in the sampled cases. For all of the measures, we determined that the NWE algorithms were reasonable. However, for the Commercial CFL Direct Install component, we determined that the algorithm was not implemented properly by the program. The program always used a constant three on hours per day, even though the actual on hours were collected and recorded during the audit. This assumption produced an overly conservative estimate of program energy (kWh) and demand (kW) savings.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Commercial Lighting program we successfully visited 62 sites encompassing six different strata. The Special Effort recruiting team found it difficult to contact Direct Install costumers in stratum 1, which lead to an overall high (64%) rate of “No Reply” for this program.

Table 197: Site Recruitment Disposition for E+ Commercial Lighting

	Stratum						Total n	%
	1	2	3	4	5	9		
Recruitment								
Telephone Lab	24	22	12	8	0	2	68	
Special Effort								
Attempts	45	1	0	0	7	3	56	
No Reply	32	0	0	0	4	0	36	64%
Refused	7	0	0	0	0	0	7	13%
Recruited	6	1	0	0	3	3	13	23%
Total Recruited	**30**	**23**	**12**	**8**	**3**	**5**	**81**	
Onsite	0	0				0		
Refused	1	0	0	0	1	0	2	2%
Not Needed	5	5	6	1	0	0	17	21%
Total Completed	**24**	**18**	**6**	**7**	**2**	**5**	**62**	**77%**

Site Inspections

We performed site inspections for a sample of 29 E+ Commercial Lighting Program measures and 33 measures installed under the Commercial CFL Direct Install component of the program, all of which were assigned to the 2010–2011 program years. (We did not include one of the sites we visited in our evaluation because we later determined that our inspection had not been thorough enough to verify the measure).

We found that the measures were generally installed as documented by the program, although some level of variation was observed for ten of the commercial lighting sites and nearly all of the direct install sites. There were two cases in which the direct install measures were not found.

We calculated savings for each sampled measure by applying the evaluation calculation method to the as-built conditions observed during the site visit. We found that half of the commercial lighting cases were performing as estimated for the tracking estimate, while we found five to have greater energy savings (kWh) and nine to have reduced savings. For the direct install component of the claimed savings, we found three measures to be performing in accordance with the program estimates of savings, while we found 25 of the measures to have greater savings and five to have reduced savings.

For the commercial lighting component of the program, we found the most frequent variance from the proposed measures to be a change in operating hours, with increased savings for six cases and reduced savings for five. The next most frequent variance was in fixture counts, which resulted in three cases with increased savings and five cases with reduced savings. In two instances, we reduced energy savings (kWh) because the installed lighting fixtures were less efficient than the fixtures that were assumed for the program savings estimate.

For the direct install component, we found the most frequent variance to be an increase in operating hours, brought about by the program assumption that the CFLs would operate three hours per day. We applied the actual operating hours to estimate the evaluation savings, resulting in an increase in savings for 22 of the measures and a reduction for three, which led to a significant overall increase in savings. Differences in CFL Wattages also increased savings for seven cases and reduced savings in six cases, for a net increase in savings. Differences between program and evaluation CFL counts resulted in a net decrease in savings, based on eight measures with fewer CFLs and one with more.

We found multiple differences between program and evaluation parameters affecting the savings calculations for single measures in five cases for the commercial lighting component and 17 cases for the direct install component.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 198: File Review and Site Visit Adjustment to Savings for E+ Commercial Lighting

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	Commercial CFL Direct Install	kWh	417,950	433,214	747,326	402,763	1.04	1.79	0.96
	Commercial Lighting Rebate	kWh	49,964,315	49,964,315	48,017,230	48,148,804	1.00	0.96	0.96

10.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rates reflects our findings from file reviews and site visits. Free ridership and spillover rate are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 199: Savings Adjustments by Calendar Year for E+ Commercial Lighting

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Commercial Lighting	kWh	2007	3,187,425	0.96	-	-	0.96	3,071,606	351
	E+ Commercial Lighting	kWh	2008	4,879,569	0.96	-	-	0.96	4,702,264	537
	E+ Commercial Lighting	kWh	2009	16,686,817	0.96	-	-	0.96	16,080,482	1,836
	E+ Commercial Lighting	kWh	2010	14,541,249	0.96	-	-	0.96	14,012,876	1,600
	E+ Commercial Lighting	kWh	2011	9,910,434	0.96	-	-	0.96	9,550,327	1,090
	E+ Commercial Lighting	kWh	All Years	49,205,493	0.96	-	-	0.96	47,417,555	5,413
Electric - USB										
	E+ Commercial Lighting	kWh	2007	171,127	0.96	-	-	0.96	164,909	19
	E+ Commercial Lighting	kWh	2008	30,751	0.96	-	-	0.96	29,633	3
	E+ Commercial Lighting	kWh	2009	7,950	0.96	-	-	0.96	7,661	1
	E+ Commercial Lighting	kWh	2010	570,521	0.96	-	-	0.96	549,790	63
	E+ Commercial Lighting	kWh	2011	396,424	0.96	-	-	0.96	382,020	44
	E+ Commercial	kWh	All	1,176,772	0.96	-	-	0.96	1,134,013	129

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	Lighting		Years							
Electric										
	E+ Commercial Lighting	kWh	All Years	50,382,265	0.96	-	-	0.96	48,551,567	5,542

10.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 200: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Commercial Lighting

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Commercial Lighting	kWh	2007	3,071,606	1.58	5.89	1.74	1.74
	E+ Commercial Lighting	kWh	2008	4,702,264	0.99	6.98	2.34	1.09
	E+ Commercial Lighting	kWh	2009	16,080,482	1.15	3.27	1.84	1.26
	E+ Commercial Lighting	kWh	2010	14,012,876	0.95	3.08	1.95	1.04
	E+ Commercial Lighting	kWh	2011	9,550,327	0.78	2.31	1.78	0.86
	E+ Commercial Lighting	kWh	All Years	47,417,555	0.98	3.13	1.89	1.08
Electric - USB								
	E+ Commercial Lighting	kWh	2007	164,909	0.95	3.93	1.62	1.05
	E+ Commercial Lighting	kWh	2008	29,633	1.75	2.51	1.53	1.93
	E+ Commercial Lighting	kWh	2009	7,661	0.28	0.31	0.29	0.31
	E+ Commercial Lighting	kWh	2010	549,790	1.47	2.92	1.94	1.62

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	E+ Commercial Lighting	kWh	2011	382,020	0.42	1.02	0.91	0.47
	E+ Commercial Lighting	kWh	All Years	1,134,013	0.74	1.69	1.30	0.81
Electric								
	E+ Commercial Lighting	kWh	All Years	48,551,567	0.97	3.07	1.87	1.07

10.3. Process Evaluation

10.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with participants of the two components of the E+ Commercial Lighting program (56 Commercial Lighting Rebate participants and 42 Commercial CFL Direct Install participants) and 42 trade allies who reported offering lighting products and services to commercial end-users.

10.3.2. Implementation Findings

10.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program, which includes both prescriptive rebates and direct install components.

To seek a prescriptive rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE's website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures, including lighting among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

The prescriptive rebate application process for non-residential lighting projects differs from the prescriptive rebate process for other commercial end uses in that non-residential lighting projects require written pre-approval. To begin the application and pre-approval process, customers must submit an application form along with a copy of their lighting-project bid that includes an itemized project description, itemized purchase costs, and vendor or contractor information, and a copy of the customer's NWE electric bill or the accurate NWE account number. Program staff review the information on the application. If there is missing information, staff contacts the customer or contractor for the missing information. If staff identify items of concern such as lumen reductions or de-lamping where the customer may reinstall new lamps, the customer or the contractor is called. If there are no concerns, staff enter the information into the database and the project is pre-approved.

Upon pre-approval of a project, program staff notify the applicant and sends duplicate original project agreements for the applicant's signature. Before beginning project installation, the applicant must sign both copies, return them to the implementation contractor, and receive a fully executed copy of the agreement back from the implementation contractor. The returned agreement is accompanied by a commitment letter with notice to proceed, an estimated project completion date, and notice that a given rebate amount has been reserved for the project. Projects that receive a notice to proceed are not subject to program changes that occur before the specified project completion date.

From this point, the rebate application and payment process is similar to the processes for other prescriptive rebates. Specifically, upon project completion, the applicant must notify program staff in writing, and include a copy of the final project invoice and a completed Internal Revenue Service W-9 form. If self-installed, the application must include receipts for materials and documentation of any other costs. As with all prescriptive projects, post-installation inspections conducted by program staff occurs on a random basis (25% of projects with a rebate amount of $500 or more), and the implementation contractor mails a rebate check to the customer within four to six weeks.

In 2008, NWE established the NorthWestern Energy Lighting Trade Ally Network (LTAN) to support its E+ Commercial Lighting program. A contractor specializing in developing and fostering LTANs to support efficiency programs in the four-state region (as well other states) assists NWE in its LTAN activities. The contractor provides annual training to commercial lighting contractors active in NWE's service territory, provides lighting contractor support on request, and helps NWE to provide *Lighting Network News*, a quarterly newsletter. Each newsletter states the purpose and function of the LTAN: "To help lighting contractors, distributors, and other industry representatives discover ways to dramatically increase the number of completed commercial and industrial energy efficient lighting retrofit projects. The network provides assistance from energy experts in marketing, technology, analysis and lighting and controls energy efficient applications."

NWE provides the LTAN annual trainings at no cost to participants. The trainings cover such topics as new technologies, integrating controls into lighting project proposals, and NWE's portfolio of non-residential E+ programs.

The two-and-one-half page newsletters, designed to quickly get useful information in the hands of lighting contractors:

- Showcases E+ Commercial Lighting projects and participating lighting contractors,
- Offers tips for conducting lighting audits and identifying efficiency opportunities,
- Provides notices of upcoming efficiency conferences and trainings,
- Discusses lighting standards and industry developments,
- And communicates program changes and activity, among other topics.

In addition to actively involving lighting contractors, NWE increased customer outreach in recent years. The implementation contractor added more marketing staff and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. E+ Program Contractors conduct one-on-one and group outreach to promote the program. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation. NWE placed emphasis on advertising to end users and trade allies the changes in the prescriptive lighting program to include measures that were previously covered in the custom program.

Direct Install

The direct install portion of the commercial lighting program is delivered through audits in the Small Business Electric Appraisal program. Auditors may install up to 20 CFLs or up to 10% of fixtures. The auditor identifies high use locations to ensure that the installed lighting generates the most savings. The auditors leave behind rebate information to encourage customers to replace their remaining inefficient lights.

10.3.2.2. Best Practices Assessment

Table 201 through Table 204 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 201: Program Planning and Design Best Practices for E+ Commercial Lighting

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 202: Program Management and Administrative Best Practices for E+ Commercial Lighting

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact

Practice	NWE Assessment
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 203: Marketing and Outreach Best Practices for E+ Commercial Lighting

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 204: Program Quality Control Best Practices for E+ Commercial Lighting

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

10.3.3. Participant Findings

As part of our process evaluation of the E+ Commercial Lighting program, we conducted phone surveys with participants of both the Commercial Lighting Rebate and the Commercial CFL Direct Install components of this program.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the questions (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

10.3.3.1. Commercial Lighting Rebate

We surveyed 56 NWE customers who participated in the Commercial Lighting Rebate component of the E+ Commercial Lighting program in 2010 or 2011.

Survey respondents provided general feedback about how they learned about NWE's energy efficiency programs, the kind of additional information they wanted, as well as providing information about their decision to purchase qualifying equipment through the program.

Less than half (39%) of respondents had visited NWE's website. The non-visitors primarily reported "no need or reason" (50%; Table 205).

Table 205: Reasons Website Not Used, among Commercial Lighting Rebate Participants

	Weighted Percent (n=27)
No need or no reason	50%
Don't have access	23%
Other	8%
Don't like to use it much	8%
Never thought to	6%
No time	5%

Among respondents who did use the website, over half did so to look up utility contact information (62%) or learn about rebates and audits (52%; Table 206).

Table 206: Website Use, among Commercial Lighting Rebate Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=21)	62%
Learn about rebates or audits (n=21)	52%
Money saving tips (n=21)	47%
Pay utility bill (n=21)	36%
Other reasons (n=21)	22%
Energy saving educational opportunities (n=21)	6%

Most website users (82%) agreed or completely agreed that the website information was easy to find and helpful (Figure 53).

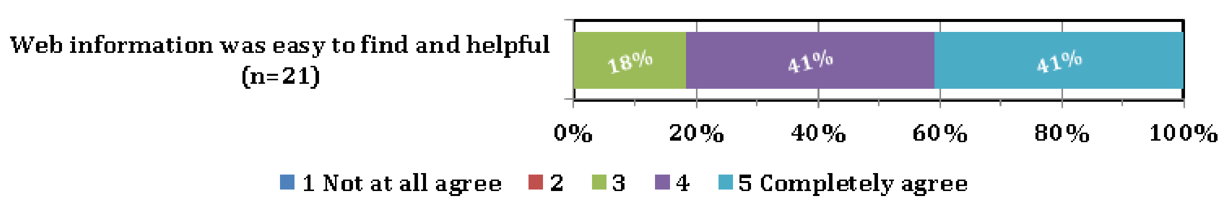

Figure 53: Website Effectiveness, among Commercial Lighting Rebate Participants

About two-thirds of respondents would like additional information on energy efficiency programs (64%) and energy-saving educational opportunities (67%; Table 207).

Table 207: Further Information Desired, among Commercial Lighting Rebate Participants

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=56)	67%
Energy efficiency programs (n=56)	64%
Workshops or events on energy efficiency (n=56)	40%
Does not want any (n=56)	25%

Those desiring further information prefer to receive information by mail (71%) or by email (54%). Fewer of these respondents were interested in attending informational workshops, webinars, or community events (Table 208).

Table 208: Information Delivery Preference, among Commercial Lighting Rebate Participants

(Allowed Multiple)	Weighted Percent
US mail (n=40)	71%
Email (n=40)	54%
Workshop (n=40)	35%
Webinar (n=40)	30%
Community event (n=40)	21%
Phone (n=40)	17%
Other (n=40)	3%

Most respondents became aware of the lighting rebate program from two sources: 67% in communication with a building professional, vendor or contractor, and 55% by noticing a utility publication or advertisement (Table 209).

Table 209: Means of Program Awareness, among Commercial Lighting Rebate Participants

(Allowed Multiple)	Weighted Percent
Building professional, vendor, or contractor (n=56)	67%
Utility publication or advertisement (n=55)	55%
Directly contacted utility (n=56)	31%
Word of mouth (n=56)	30%
Utility representative appearance (n=56)	26%
Other (n=56)	4%

When considering whether to participate, a large majority (92%) had no initial questions or concerns about participating. Those few (5) respondents who had concerns were primarily concerned about participation taking too much time.

Respondents were asked to rate the level of influence various program-components had on their decision to complete the equipment upgrade. The rebate played "a major role" for 78%, and only 2% said it played "no role at all." The salesperson or contractor played a sizable role for 65% of respondents reporting an influence rating of "4" or "5" (Figure 54).

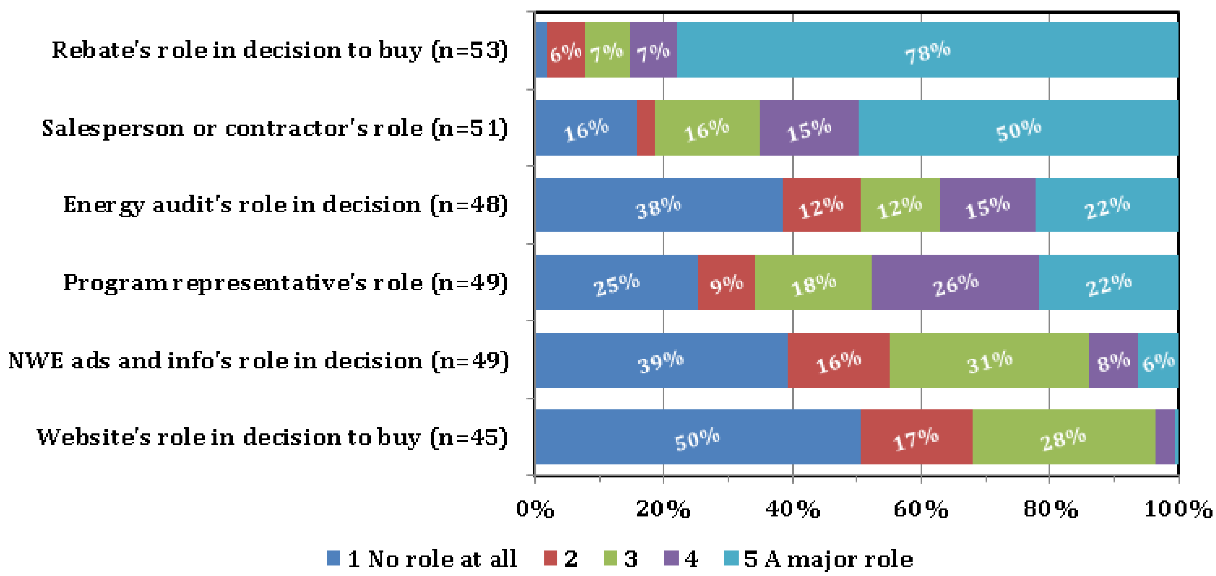

Figure 54: Influences on Upgrade Decision, among Commercial Lighting Rebate Participants

We asked E+ Commercial Lighting Rebate respondents if a list of typical reasons for participation applied to them. A large majority (93%) participated to save energy and money. The rebate was needed to offset the cost for 73% of these respondents. More than two-thirds reported other reasons for participating: contractor recommendation, the program was easy to use, the utility was "vouching" for the equipment, and/or to increase comfort at their facility (Table 210).

Table 210: Reasons For Program Participation, among Commercial Lighting Rebate Participants

(Allowed Multiple)	Weighted Percent
Save energy and money (n=56)	93%
Rebate needed to offset cost (n=55)	73%
Contractor recommendation (n=55)	71%
Utility vouched for equipment by rebating (n=55)	69%
Easy to use the program (n=55)	69%
Increase facility comfort (n=54)	68%

(Allowed Multiple)	Weighted Percent
Check specific equipment performance (n=55)	56%
Wanted to follow audit with action (n=54)	44%
Good experience with other NWE efficiency program (n=53)	34%

Program Experience

Respondents reported on several aspects of program experience, including the rebate application, measure installation and inspection, and whether they would participate in NWE's efficiency programs again.

A discussion about the lighting rebate project was initiated in roughly equal measure by all three possible initiators: the respondent's organization, associated vendors and contractors, or a combination of the two (Table 211).

Table 211: Project Initiator, among Commercial Lighting Rebate Participants

	Weighted Percent (n=54)
Discussion between both	32%
Associated vendors or contractors	27%
My organization	25%
Other	16%

After the project discussion was initiated, most organizations (72%) took an active role in preparing the rebate application either taking sole responsibility (48%) or with assistance from a vendor or contractor (24%; Table 212).

Table 212: Rebate Application Preparation, among Commercial Lighting Rebate Participants

	Weighted Percent (n=55)
My organization	48%
My organization assisted by vendor/contractor	24%
Associated vendor or contractor	23%
Someone else	5%

Commercial Lighting Rebate respondents gave high ratings to the clarity of rebate and program information provided by NWE, with 70% or more rating each element of information as "clear" or "very clear" (Figure 55).

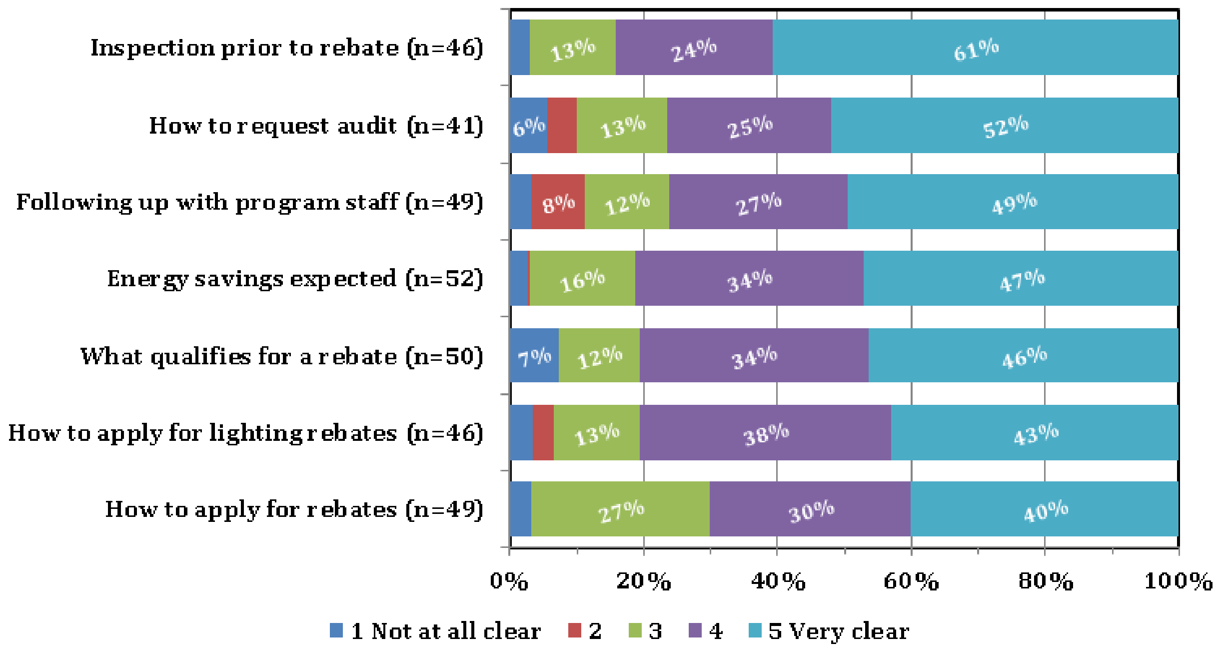

Figure 55: Clarity of Program Information, among Commercial Lighting Rebate Participants

Among respondents, 88% said that qualifying lighting measures were readily available in the market place (Table 213).

Table 213: Lighting Availability, among Commercial Lighting Rebate Participants

	Weighted Percent (n=54)
Readily available	88%
Took a long time	9%
Not available	4%

Majorities of respondents agreed with all positive statements about various phases of the rebate program and the performance of installed equipment (Figure 56). Respondents were particularly positive about the helpfulness of program representatives, and with the performance of installed items.

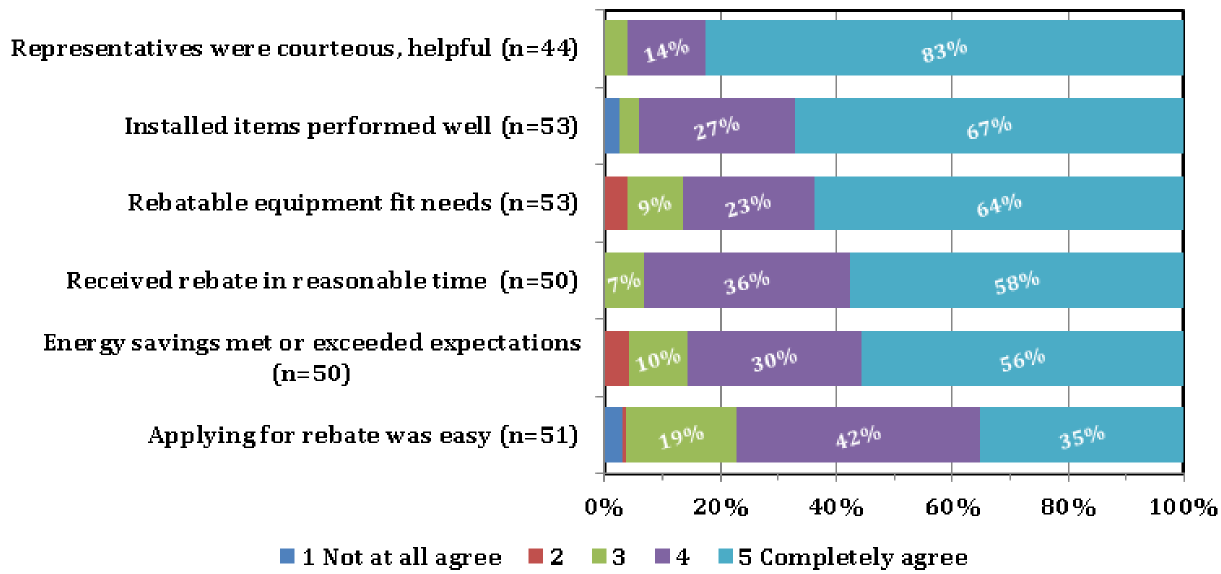

Figure 56: Experience With Installation Process, among Commercial Lighting Rebate Participants

After installation, 66% of the respondents recalled having an on-site inspection by a utility representative, and of those, 89% "completely agreed" that the inspector was courteous and efficient (Figure 57).

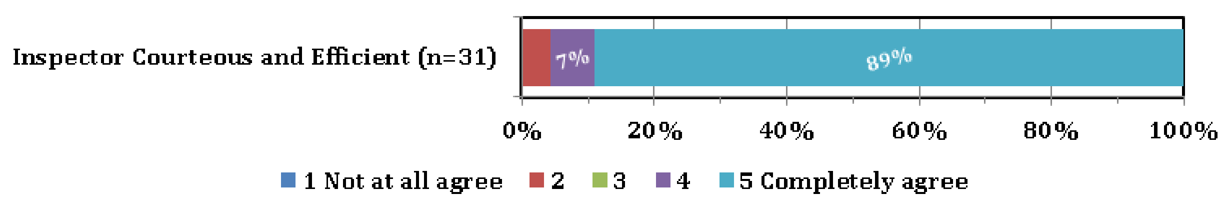

Figure 57: Inspector Performance, among Commercial Lighting Rebate Participants

As a general indicator of overall attitudes about NWE's efficiency activities, the survey asked participants about their likelihood of future participation. A solid majority (83%) were "likely" or "very likely" to participate in future NWE energy efficiency programs (Figure 58).

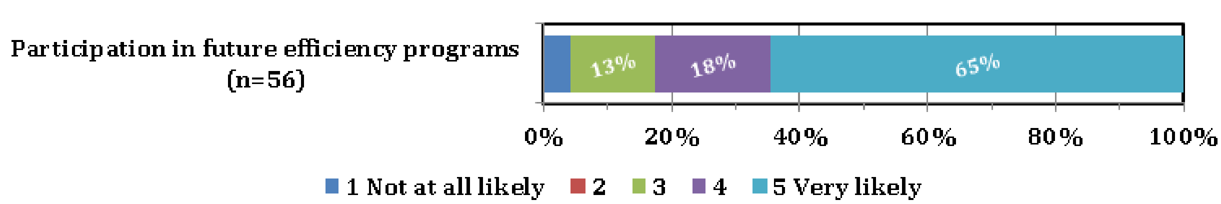

Figure 58: Likelihood of Future Participation, among Commercial Lighting Rebate Participants

10.3.3.2. Commercial CFL Direct Install

We surveyed 42 respondents who had CFLs installed by an auditor conducting an on-site appraisal (and a component of NWE's E+ Commercial Lighting program).

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about NWE's energy efficiency programs, and additional efficiency information they would like to receive.

When asked if they had ever visited NWE's website, 46% had visited the website while 54% had not. Many non-users (44%) said they saw "no need or no reason" to visit it. Among the 19 respondents in this program group who had visited the utility website, most (79%) were looking for utility contact information. About half also used the site for one or more of the following reasons: paying their utility bill (52%) learning about rebates or audits (48%), and/or looking for money-saving tips (48%; Table 214).

Table 214: Website Use, among Commercial CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=19)	79%
Pay utility bill (n=19)	52%
Money saving tips (n=19)	48%
Learn about rebates or audits (n=19)	48%
How-to-videos (n=19)	6%
Other reasons (n=19)	4%
Energy saving educational opportunities (n=19)	

Website-utilizing respondents uniformly (100%) "agreed" or "completely agreed" that the web information was easy to find and helpful.

Half of respondents would like to receive more information on energy-saving educational opportunities, while smaller proportions mentioned wanting other types of information from NWE listed in Table 215.

Table 215: Further Information Desired, among Commercial CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=42)	50%
Energy efficiency programs (n=42)	41%
Does not want any (n=42)	39%
Workshops or events on energy efficiency (n=42)	23%

Those desiring further information prefer to receive information by mail (80%) or by email (59%; Table 216).

Table 216: Information Delivery Preference, among Commercial CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
US mail (n=24)	80%
Email (n=24)	59%
Community event (n=24)	23%
Workshop (n=24)	23%
Webinar (n=24)	18%
Phone (n=24)	10%

Participants became aware of the program primarily when they contacted the utility directly (64%) or noticed a NWE publication or advertisement (66%; Table 217).

Table 217: Means of Program Awareness, among Commercial CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=42)	66%
Directly contacted utility (n=42)	64%
Building professional, vendor, or contractor (n=42)	27%
Utility representative appearance (n=40)	20%
Word of mouth (n=41)	18%
Other (n=42)	5%

Very few (8%) of the respondents, when considering the Commercial CFL Direct Install component, had any initial concerns or questions about the offer.

We asked respondents whether any of four typical reasons for participating in this NWE program component applied to them. As seen in the table below, the most commonly mentioned reason was that the program was easy to use (Table 218). This makes sense as in this program component, auditors installed CFLs on the spot.

Table 218: Reasons For Program Participation, among Commercial CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Easy to use the program (n=39)	59%
Installed equipment would be reliable if done by utility (n=40)	40%

(Allowed Multiple)	Weighted Percent
Contractor recommendation (n=42)	31%
Good experience with other NWE efficiency program (n=41)	25%

Program Experience

Participants reported on their experience with program elements, and they rated the equipment acquired through NWE.

A majority of respondents rated each element of information they received about the program as “clear” or “very clear” (Figure 59).

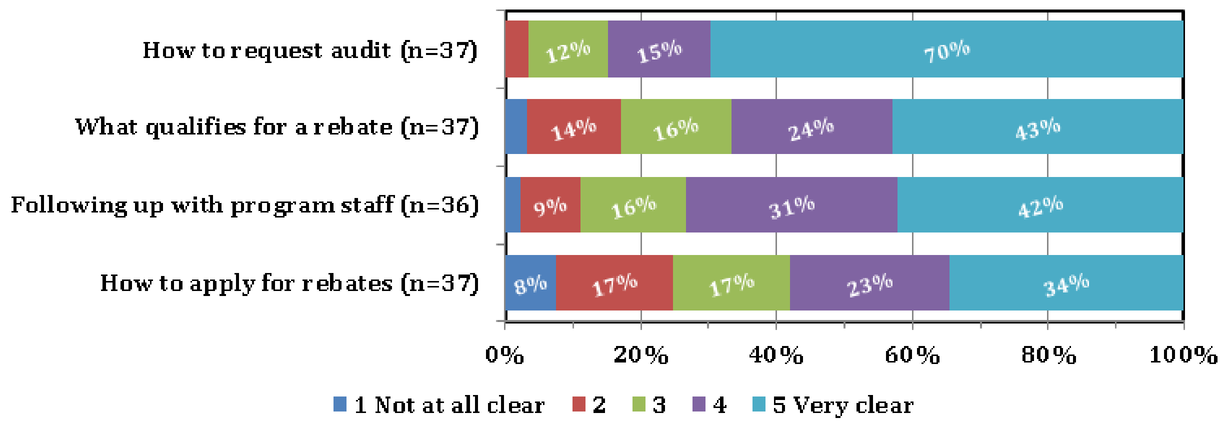

Figure 59: Clarity of Program Information, among Commercial CFL Direct Install Participants

A majority of respondents completely agreed (62%) that the CFL bulbs performed well. Nearly all (83%) respondents also “completely agreed” that the NWE representatives were courteous and helpful (Figure 60).

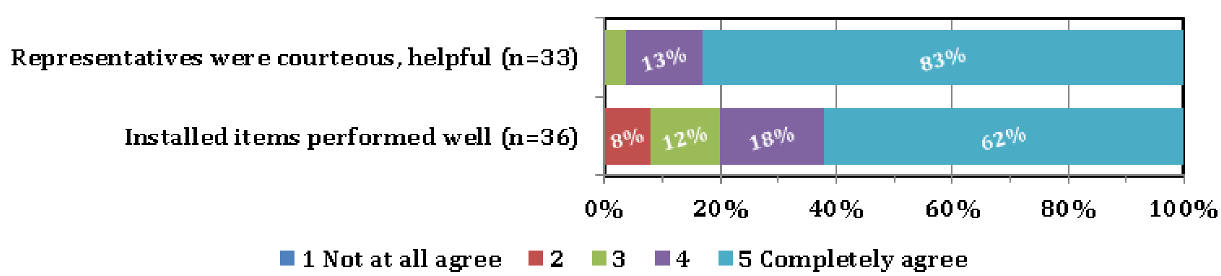

Figure 60: Experience With Installation, among Commercial CFL Direct Install Participants

Based on program data, on-site auditors replaced an average of 10 incandescent lamps operating at least three hours per day with CFLs in the 42 businesses surveyed as participants in this CFL Direct Install program. A large majority of respondents (86%) reported that *all* of their installed CFLs were still in use.

As an indicator of overall attitudes about NWE's energy efficiency activities, participants indicated their likelihood of future program participation. About two-thirds (64%) of respondents would be "likely" or "very likely" to participate in energy efficiency programs in the future (Figure 61).

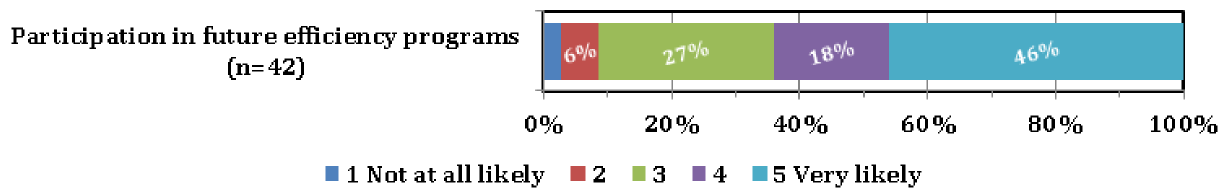

Figure 61: Likelihood of Future Participation, among Commercial CFL Direct Install Participants

10.3.4. Trade Ally Findings

We surveyed 42 NWE trade allies who reported installing commercial lighting.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

10.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event, from noticing a utility publication or advertisement, or by directly contacting the utility (81% reported each of these methods; Table 219).

Table 219: Means of General Program Awareness, among E+ Commercial Lighting Trade Allies

Means (Allowed Multiple)	Percent
Utility representative appearance (n=42)	81%
Utility publication (n=42)	81%

Means (Allowed Multiple)	Percent
Directly contacted utility (n=42)	81%
Utility website (n=42)	57%
Associated vendors and contractors (n=42)	57%
Word of mouth (n=42)	50%
Other (n=42)	7%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly, or through NWE representatives (Table 220).

Table 220: Specific Requirements Awareness, among E+ Commercial Lighting Trade Allies

Means (Allowed Multiple)	Percent
Directly contacted utility (n=42)	50%
Utility representative appearance (n=42)	38%
Utility publication (n=42)	19%
Other (n=42)	14%
Associated vendors and contractors (n=42)	12%
Utility website (n=42)	7%

A majority (78%) of surveyed lighting trade allies visit the utility website. Among website users, approximately two-thirds said they use the site to learn about rebates or audits, or to print rebate forms (Table 221).

Table 221: Website Use, among E+ Commercial Lighting Trade Allies

Reason (Allowed Multiple)	Percent
Finding rebates or audits (n=32)	72%
Print rebate forms (n=32)	69%
To contact utility (n=32)	41%
Educational events information (n=32)	34%
Money saving ideas (n=32)	31%
How-to videos (n=32)	9%
Other (n=32)	6%

Two-thirds of the website users “agreed” or “completely agreed” that the web information was easy to find and helpful (Figure 62).

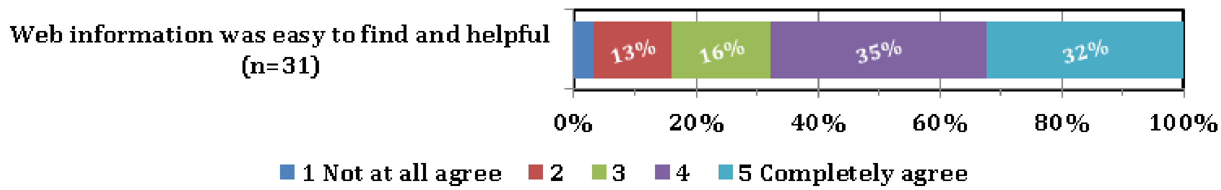

Figure 62: Website Effectiveness, among E+ Commercial Lighting Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority said that they had contacted the utility to learn how the rebate program worked, and to investigate the status of an application (Table 222).

Table 222: Reasons For Contacting NWE, among E+ Commercial Lighting Trade Allies

Ever contacted the utility in order to… (Allowed Multiple)	Percent
Learn how the rebate program works (n=42)	69%
Investigate status of an application (n=42)	55%
Resolve a problem (n=42)	40%
Investigate status of a rebate payment (n=42)	36%
Other (n=42)	19%
None of these (n=42)	19%

About half of surveyed trade allies would like further information on workshops or events (48%); one-third were interested in information on energy-saving educational opportunities (38%) and/or energy efficiency programs (33%). Forty-five percent did not need further information from NWE at the time of the survey (Table 223).

Table 223: Further Information Desired, among E+ Commercial Lighting Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=42)	48%
None (n=42)	45%
Energy saving educational opportunities (n=42)	38%
Energy efficiency programs (n=42)	33%

Those desiring further information somewhat preferred to receive information using email (57%), followed by mail (43%), and other methods such as trainings and workshops (39%) or webinars (26%; Table 224).

Table 224: Information Delivery Preference, among E+ Commercial Lighting Trade Allies

(Allowed Multiple)	Percent
Email (n=23)	57%
US mail (n=23)	43%
Trainings, workshops or seminars (n=23)	39%
Webinar (n=23)	26%
Community event (n=23)	22%
Phone (n=23)	13%

10.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

A large majority of these lighting trade allies (88%) sold lighting controls.

Lighting trade allies were asked if equipment they normally keep in stock was high-efficiency or Energy Star rated, or if they typically keep unrated and standard items in stock and order in the high-efficiency items when needed. Over half (56%) of the respondents said their stock does typically include high-energy efficiency equipment.

Trade allies reported on their sales strategies, listed in Table 225 below. Three-quarters (74%) kept a full range of equipment to offer, and agreed that the “Better” and “Best” equipment is usually more energy-efficient. Just over half (52%) reported they suggest the “Best” equipment to customers first.

Table 225: Equipment Sales Approach, among E+ Commercial Lighting Trade Allies

Percentage who:	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option (n=42)	74%
Agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' (n=31)	100%
Suggest BEST option first to customers (n=29)	52%
Suggest the BETTER option FIRST to customers (n=29)	41%
Present ALL options simultaneously (n=29)	7%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. One-third of these allies reported between 51% and 100% of stocks were of high-efficiency equipment. Most lighting allies (64%) carried stock made up of less than half high-efficiency equipment. A subset of allies estimated the share of sales made in the past two years that were energy-efficient. About one-quarter of this smaller group (23%) felt that *all* of the equipment they sold in the past two years could be categorized as high-efficiency (Figure 63).

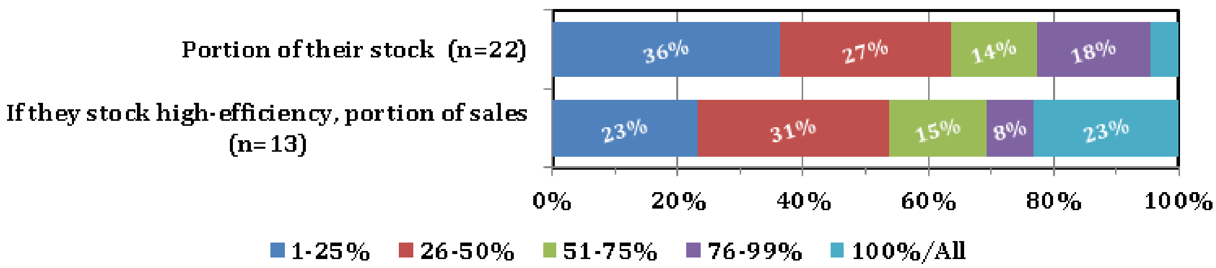

Figure 63: High-Efficiency Equipment Share, among E+ Commercial Lighting Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency items that qualify for rebates. In addition to the 90% of respondents mentioning lower operating costs to the customer, 86% mention the rebate, , and 69% mention lower maintenance costs (Table 226).

Table 226: Customer Benefits Mentioned, among E+ Commercial Lighting Trade Allies

Typical benefits to customers mentioned (Allowed Multiple)	Percent
Lower operation costs (n=42)	90%
Utility rebate (n=42)	86%
Lower maintenance costs (n=42)	69%
High-quality of product (n=42)	62%
Other (n=42)	12%

About 10% of these trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these four mentioned cost or reliability concerns with the equipment on those occasions.

Surveyed trade allies also reported on whether their customers ever install qualifying efficient equipment without pursuing a rebate. One-third (36%) of respondents said they recall installing rebate-qualifying items in cases when they knew customers did not pursue rebates. Among the reasons reported, no single reason stands out as a barrier to rebate applications (Table 227).

Table 227: Circumstances When Rebate Foregone, among E+ Commercial Lighting Trade Allies

(Allowed Multiple)	Percent
Trade ally unaware of rebate/program (n=13)	15%
Customer ineligible (n=13)	15%
Applying takes too long (n=13)	15%

(Allowed Multiple)	Percent
Rebate too small (n=13)	15%
Customer did not apply (n=13)	15%
Application process too difficult (n=13)	8%
Other (n=13)	31%

10.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Three-quarters (74%) of these trade ally respondents say they had trained staff to talk to customers about energy efficient choices. In fact, 52% of these respondents said they typically initiate the discussion about utility rebates for which their customer might qualify (Table 228).

Table 228: Rebate Initiator, among E+ Commercial Lighting Trade Allies

Who brings up utility rebates?	Percent (n=42)
Almost always Trade Ally initiated	52%
Mostly Trade Ally initiated	24%
About half Trade Ally and half Customer	14%
Almost always Customer initiated	7%
Other	2%

Likewise, once a customer is considering the actual equipment purchase, 93% of respondents suggest options that qualify for a rebate to the customer rather than waiting for them to show interest in qualifying.

Trade allies also indicated whether they had any reservations about recommending the program to their customers. Most surveyed trade allies (71%) said nothing about the program raised issues or concerns around customer participation. Among the 29% of respondents who had initial concerns, the most often voiced concern was a general concern about problems customers might have with rebates, such as whether the rebate amount justified the time required (Table 229).

Table 229: Initial Concerns, among E+ Commercial Lighting Trade Allies

Concern	Percent (n=12)
Rebate problems	42%
No LED rebate	17%
Too much paperwork	17%
Other	17%
R-value problems	8%

Nearly half (43%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. When these "regular communicators" were asked how often they notify their customers, about half (53%) said they do so quarterly (Table 230).

Table 230: Customer Contact Frequency, among E+ Commercial Lighting Trade Allies

How often do you contact customers about rebates/efficiency programs?	Percent (n=17)
Once a year	6%
2 times a year	18%
Once a quarter	53%
Every day	12%
Varies by customer	12%

The majority (from 60% to 80%) of these trade ally respondents rated elements of information they received on rebates and on contacting program staff as "clear" or "very clear" (Figure 64).

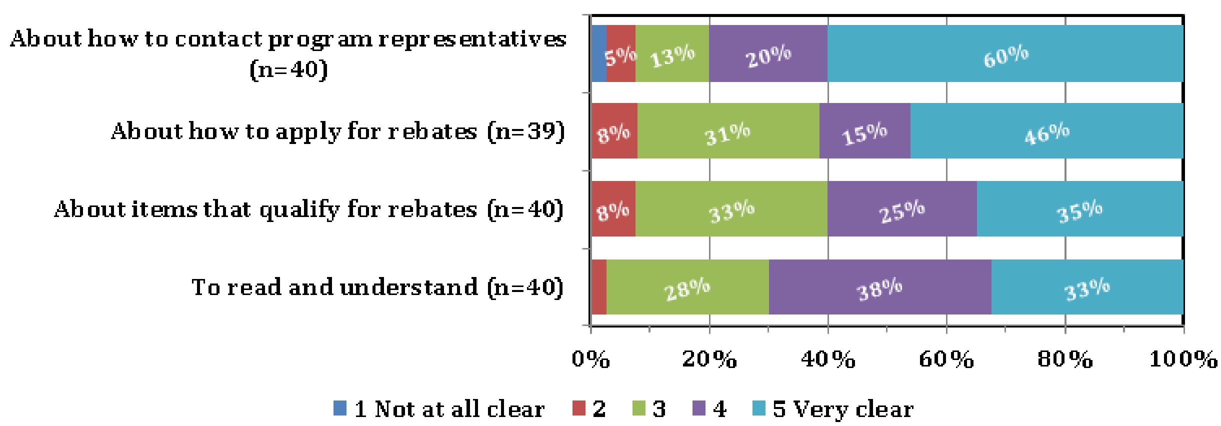

Figure 64: Clarity of Program Information, among E+ Commercial Lighting Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Three-fourths of lighting trade allies (72%) reported they were solely (31%) or jointly (41%) responsible for filling out the rebate application. One-fourth of trade allies reported the customers typically prepared the application.

Table 231: Rebate Application Preparer, among E+ Commercial Lighting Trade Allies

	Percent (n=39)
Both Customer and Trade Ally Respondent	41%
Trade Ally Respondent, Typically	31%
Customer, Typically	26%
Depends	3%

About two-thirds (64%) of the 28 lighting trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process is simple to follow. Almost one-third gave the application's simplicity a middle rating.

Respondents rated their agreement with several positive statements related to staying current with program changes. At least 60% of respondents "agreed" or "completely agreed" with the statements listed in the table below. In particular, 79% of these lighting trade allies found it easy to adapt their marketing efforts after a 2011 change in custom options related to lighting projects (Figure 65).

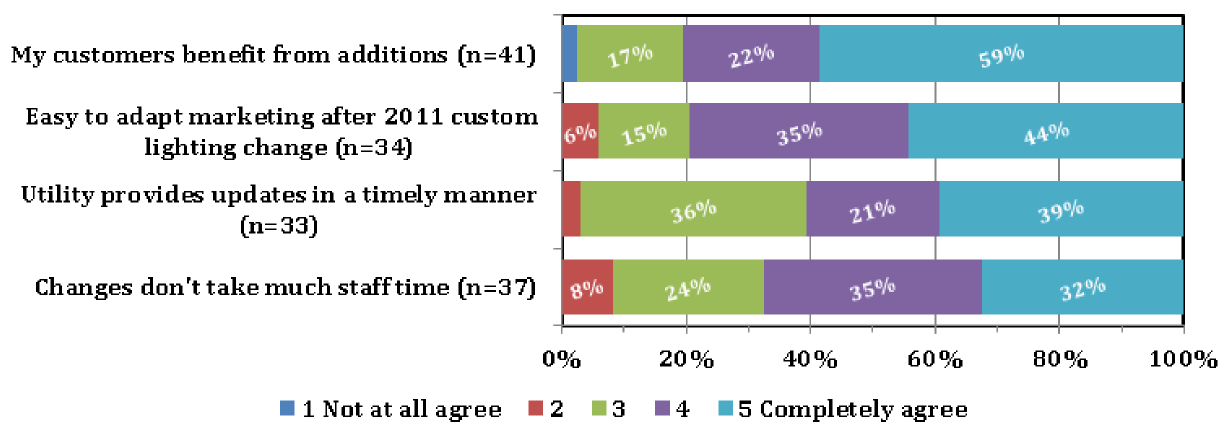

Figure 65: Keeping Up With Program Changes, among E+ Commercial Lighting Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. LED lighting was a popular suggestion (Table 232). These trade allies indicated they would like LEDs added because "customers request the equipment" and this is "where the industry is going" (Table 233).

Table 232: High Efficiency Equipment Suggested, among E+ Commercial Lighting Trade Allies

What would you like to see added?	Percent (n=19)
LED lighting	84%
On demand water heaters	5%
Other heating systems	5%
Other	5%

Table 233: Reasons Equipment Should Be Added, among E+ Commercial Lighting Trade Allies

	Percent (n=19)
Customers request them	26%
Where industry is going	26%
Its more efficient	21%
Rebate will increase sales	11%
Cost	5%
Other	11%

10.3.4.4. Firmographics

A few lighting trade allies (20%) operate at more than 20 Montana locations. More than two-thirds (68%) of respondents serve 10 or fewer locations.

Table 234: Number of Montana Locations, among E+ Commercial Lighting Trade Allies

	Percent (n=40)
1 location	23%
2 to 5 locations	20%
6 to 10 locations	25%
11 to 20 locations	13%
21 to 50 locations	5%
Over 50 locations	15%

The maximum number of miles trade allies reported traveling to serve clients was distributed fairly evenly at the lower and upper ends of the range, with 23% traveling less than 100 miles, and the same proportion (23%) traveling more than 400 miles. Most travel between 101 and 200 miles to serve a client (Figure 66).

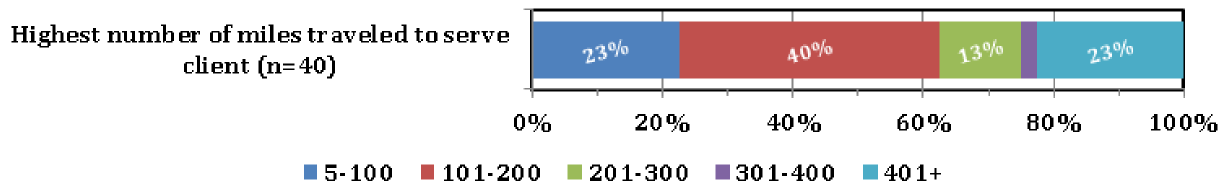

Figure 66: Maximum Miles, among E+ Commercial Lighting Trade Allies

10.4. Recommendations

10.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Actual commercial hours of use:** The Commercial CFL Direct Install component of this program is underestimating savings because it uses a constant value of three hours per day for CFL on-time. Data on the actual on-time is collected by the NWE auditor but not used in the calculation. Consider revising the savings calculation method for this component to use actual on-hours collected during the audit, instead of the constant value.

10.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Commercial Lighting rebate participants were very positive about their participation experiences. Two-thirds of participants wanted more information about efficiency opportunities, although less than half indicated an interest in workshops. Participants reported that contractors played an important role in their decision to install efficient equipment. Participants with direct install CFLs (these participants did not install rebated equipment) were satisfied with their experiences, yet their ratings of clarity of information about what types of equipment apply for rebates, and how to apply, leave room for improvement in providing information about post-audit follow-up.

Surveyed lighting trade allies also reported positive experiences working with the program. Although program staff had wondered whether any confusion surrounded a 2010 change to include among prescriptive rebates some lighting measures previously treated as custom, trade allies reported they adjusted to the change without issues. Most trade allies find the website an effective source of general program information, but still use program staff as their primary source of information about specific program requirements. Trade allies play an important role in promoting the E+ Commercial Lighting program, and in promoting efficient equipment: most trade allies report that they often or always suggest rebates to end-users, and over one-third report that they regularly contact their existing customers to update them with new offers. At the same time, one third of trade allies reported that at times they have had concerns about recommending NWE programs to their customers, mainly because they perceive the incentive amount did not justify the application effort for the particular item, or because the program does not offer incentives for LEDs.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Expand CFL information:** Continue current practice of providing NWE's guidelines. Remember the Four Ls of CFLs to participants. Consider adding to the guideline a reference

to the fact sheet on CFL disposal available on NWE's website. Consider ways to increase dissemination of the guidelines, such as more prominent website access to the guideline and availability at buy-down retailers. Provide materials for retail employees, so they are equipped to answer customer questions.

- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

11. E+ Commercial New Electric Rebate

11.1. Program Description

The E+ Commercial New Construction Electric Savings program began in mid-2011 to provide a comprehensive selection of rebate measures for commercial new construction projects for electric supply and small choice customers. Funding for the supply customers is through DSM, small choice customers receive funding through USB.

NWE defines new construction as any project that requires a building permit for new construction, adding onto pre-existing structures, and in some cases, major renovations.

Alternative delivery mechanisms

Customers may apply for incentives through the E+ Business Partners program for cost-effective electric measures where a prescriptive rebate is not offered.

11.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the program as of July, 2010.

Table 235: Measures Offered for E+ Commercial New Electric Rebate

Electric Measures	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
Automated Exhaust VFD Control – Parking Garage CO Sensors	$/Unit	Fixed rebate per fan motor HP	Base case is constant volume continuous duty fan(s)	X	7/1/2010
Automated Ventilation VFD Control (Occupancy Sensors(OS)/CO2 Sensors	$/Sq. Ft.	Per Sq. Ft. of area controlled	Demand controlled ventilation (VFD and CO2 or occupancy sensors)	X	7/1/2010
Exhaust Hood Makeup Air	$/Unit	Per unit installed	Central heating exclusively with electricity	X	7/1/2010
Hotel Key Card or OS Room Energy Control System	$/Unit	Per room	Heating and cooling exclusively with electricity	X	7/1/2010
Motor Fan System - VFD	$/Unit	Per motor HP		X	7/1/2010
Motor Pump System - VFD	$/Unit	Per motor HP		X	7/1/2010
Optimized variable air volume (VAV) Lab Hood Design	$/Unit	Per unit installed	Constant volume to VAV	X	7/1/2010
Irrigation Pump VFD	$/Unit	Per motor horsepower	Install VFD on an irrigation pump	X	7/1/2010
Dishwashing – Commercial Chemical System*	$/Unit	Per unit installed	Water heating exclusively with electricity; Energy Star rated low temperature dishwashers only	X	7/1/2010

Electric Measures	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
Energy Star Water Cooler	$/Unit	Per unit installed	Energy Star rated water cooler (hot/cold water); leased equipment does not qualify	X	7/1/2010
Hot Food Holding Cabinet – Commercial	$/Unit	Per unit installed	Energy Star rated commercial hot food holding cabinet	X	7/1/2010
Energy Star Battery Charging System	$/Unit	Per unit installed	Energy Star rated battery charging system	X	7/1/2010
Energy Star Computer*	$/Unit	Per unit installed	Energy Star rated computer, features include enabled sleep mode	X	7/1/2010
Energy Star Copier*	$/Unit	Per unit installed	Energy Star rated copier; leased equipment does not qualify	X	7/1/2010
Energy Star Fax*	$/Unit	Per unit installed	Energy Star rated fax; leased equipment does not qualify	X	7/1/2010
Energy Star Printer*	$/Unit	Per unit installed	Energy Star rated printer; leased equipment does not qualify	X	7/1/2010
Energy Star Scanner*	$/Unit	Per unit installed	Energy Star rated scanner; leased equipment does not qualify	X	7/1/2010
Energy Star Server*	$/Unit	Per unit installed	Energy Star rated server; leased equipment does not qualify	X	7/1/2010
Office Computer Network Energy Management Software	$/Unit	Per managed computer	Office computer network energy management software	X	7/1/2010
PC Power Supply 80+*	$/Unit	Per power supply	Energy Star version 5.0 qualified or better; 80% efficient power supply for PC's	X	7/1/2010
Anti-Sweat (Humidistat) Controls	$/Unit	Per linear foot of case	Variable temperature controls (humidistat)	X	7/1/2010
Commercial Reach-In Refrigerator	$/Unit	Per cubic foot	Energy Star rated commercial reach-in refrigerator	X	7/1/2010
Defrost Demand Control – Hot Gas Bypass	$/Unit	Per compressor HP	Refrigerant defrost with hot gas	X	7/1/2010
Refrigerated Display Case	$/Unit	Per linear foot of case	Energy Star rated refrigerated display cases	X	7/1/2010
Floating Head Pressure Control	$/Unit	Per refrigeration ton	Pressure control ≤ 70F with balanced port expansion valves	X	7/1/2010
Night Covers for Display Cases	$/Unit	Per unit installed	Night covers for open refrigerated display case	X	7/1/2010
Reduced Speed or Cycling of Evaporator Fans	$/Unit	Per fan HP	VFD on evaporator fans (evaporator fan control on walk-in)	X	7/1/2010
Refrigeration – Commissioning	$/Ton	Per refrigeration ton	Commissioning (refrigeration system diagnostics/operations and maintenance); Commissioning report required	X	7/1/2010
Refrigeration with Heat Recovery	$/Unit	Per refrigeration ton	Heat recovery from refrigeration system applied to water heating; existing water heating exclusively	X	7/1/2010

Electric Measures	Rebate Type	Unit of Measurement	Qualifier	PY 2011	Effective Date
			with electricity		
Refrigerator eCube	$/Unit	Per unit installed	One eCube per thermostat	X	7/1/2010
Residential-Size Refrigerator	$/Unit	Per unit installed	Energy Star rated residential-size refrigerator ≥ 7.75 cu. Ft.; replacing standard efficiency unit	X	7/1/2010
Special Glass Doors for Refrigerated Reach-In Case	$/Unit	Per linear foot of glass	Does not require anti-sweat heating	X	7/1/2010
Strip Curtains for Refrigerated Walk-In	$/Unit	Per Sq. Ft. of curtain		X	7/1/2010
Strip Curtains for Freezer Walk-In	$/Unit	Per Sq. Ft. of curtain		X	7/1/2010
Refrigerated Vending Machine	$/Unit	per unit installed	Energy Star rated refrigerated vending machine; leased equipment does not qualify	X	7/1/2010
Chiller – Premium Efficiency	$/Unit	Per chiller ton	Must install chiller with ≤ 0.507 kW/ton	X	7/1/2010
Chiller – Advanced Technology	$/Unit	Per chiller ton	Must install chiller with ≤ 0.461 kW/ton	X	7/1/2010
Cooling Tower – Decrease Approach Temperature	$/Unit	Per chiller ton	10 degree to 6 degree F	X	7/1/2010
Cooling Tower – Two Speed Fan Motor	$/Unit	Per chiller ton	Two-speed tower fan motor replaces single-speed fan motor	X	7/1/2010
Cooling Tower – VFD Fan Control	$/Unit	Per chiller ton	Variable speed tower fan motor replace single speed motor	X	7/1/2010
Cooling Tower – VFD Fan Control	$/Unit	Per chiller ton	Variable speed tower fan motor replace two-speed fan motor	X	7/1/2010
Drain Water Heat Recovery Water Heater	$/Unit	Per unit installed	Install Power-Pipe or GFX	X	7/1/2010
Faucet Aerator	$/Unit	Per unit installed	Must install ≤ 1.5 GPM aerator (Water Sense labeled only)	X	7/1/2010
Low –Flow Showerhead	$/Unit	Per unit installed	Must install ≤ 2.0 GPM showerhead (Water Sense labeled only)	X	7/1/2010
Water Heater Thermostat Setback	$/Unit	Per unit installed	Thermostat setback ≤ 120 degrees	X	7/1/2010
NEMA Premium Efficiency Motor Rebate	$/HP	Per Unit	NEMA Premium Efficiency Motor	X	7/1/2010

* Multiple rebates may be available for qualifying measures

Measure savings are UES values from third party electric resource assessment studies (KEMA 2003) (Nexant, Cadmus 2010) based on average annual savings specifically for NWE Montana customers. Each UES must pass a cost-to-benefit test, based on current electric avoided costs, known as the TRC test.

Measure baseline data come from the 2009 International Energy Efficiency Code and ASHRAE 90.1-2007.

11.1.2. History

The program began late in the five-year evaluation cycle in 2011 and there have not been any changes.

11.1.3. Marketing

NWE and their contract marketing team engage in a number of marketing activities to promote the commercial new construction programs to design professionals, contractors, developers, and owners. Beginning in the fourth quarter of 2011, the contract marketing team was expanded from one to four personnel resulting in an increase in non-residential marketing activity. Marketing activities for the commercial electric new construction program include:

- Preferred contractors and other trade allies are briefed annually on the new construction programs. Although NWE's commercial programs do not use preferred contractors as the residential programs do, many contractors that are participating in the residential preferred contractor program are familiar with the commercial rebate programs and promote them to their commercial customers.
- Presentations at architectural, engineering, and construction industry conferences and tradeshows
- Presentations at professional and trade association meetings for healthcare, hospitality, architects, engineers, and service organizations
- Event and program advertising through media news releases, email promotions, and spot advertising in newspapers and other publications
- Co-sponsoring Montana Energy Conferences and other events with trade allies, local governments, and the Northwest Energy Efficiency Alliance (NEEA)
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors

The mix of marketing activities varies from year to year to match program needs and as other opportunities in the community occur.

11.1.4. Program Steps

Customers must consult the program guidelines and application form which is available on NWE's website, to determine the eligibility of measures for which they wish to apply. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers may immediately solicit bids from contractors or do the work themselves. Customers' rebate submittal packages include a completed application form, their contractor's invoice (or materials receipts if self-installed), a NWE bill for the site where the installation occurred, and a completed Internal Revenue Service W-9 form.

11.2. Impact Evaluation

11.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

11.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and energy savings (kWh) were recalculated. We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings (UES) as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the six measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate UES method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and producing energy savings. We collected data as necessary to support a re-estimation of energy savings, using the UES method that resulted from the UES review and data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

11.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

11.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

11.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

11.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

11.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

11.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of five sampled cases for this program across the 2010–2011 program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

UES review

We reviewed the seven UES measures installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. For two of these measures, we determined that the NWE methods were reasonable. For the remaining measures, we determined that changes to the UES methods were appropriate.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 236: Summary of UES Adjustments for E+ Commercial New Electric Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Commercial Reach-In Refrigerator	All	32	kWh per cubic foot	19	kWh per cubic foot
Irrigation Pump VFD	All	300	kWh per HP	300	kWh per HP
Energy Star Scanner	All	187	kWh per unit	3	kWh per unit
Energy Star Printer	All	105	kWh per unit	121	kWh per unit
Energy Star Fax	All	113	kWh per unit	46	kWh per unit
Energy Star Copier	All	1129	kWh per unit	119	kWh per unit
Hotel Key Card Room Energy Control System	All	542	kWh per unit	542	kWh per unit

Irrigation Pump VFD. We could not find a description of this measure, or a derivation of the savings estimate. The applied savings value was 300 kWh/year per horsepower. The RTF, in an irrigation measure workbook (Regional Technical Forum 2012), provides an estimate of average agricultural irrigation hours for Montana of 1421 hours per year. We estimated the savings percentage due to this measure by assuming the baseline motor was 75% loaded. According to this derivation, savings are 38% of baseline usage.

Hotel Key Card Room Energy Control System. This measure required controls on hotel HVAC and lighting to reduce power consumption during unoccupied periods. Separate estimates of savings were provided for both cooling and heating, and final savings were taken as the average of the two values.

We found this measure in other studies, but could not find any basis to make a change to the NWE values. It is not clear if the heating and cooling values should have been added together rather than averaged, since both values presumably include annual lighting savings. We made no changes to the measure UES.

Energy Star Scanner. Savings for this measure were derived with the Energy Star calculator, in this case the “bulk” calculator for scanners. The calculator used was dated July, 2007.

We updated the UES with the December, 2010 office equipment calculator (US EPA 2004). Savings decreased from 187 kWh/year to 3 kWh/year, reflecting the fast pace of technological change in the electronics arena.

Energy Star Printer. Savings for this measure were derived from the Energy Star calculator for office equipment, along with product information from Best Buy.

We updated the UES with the December, 2010 office equipment calculator. We used the simple average of the printer types defined in the calculator, with default assumptions. The UES increased 19%.

Energy Star Fax. Savings for this measure were derived with the Energy Star calculator, in this case the “bulk” calculator for fax machines. The calculator used was dated August, 2007.

We updated the UES with the December, 2010 office equipment calculator. We used the simple average of the fax types defined in the calculator – inkjet and laser - with default assumptions. The UES decreased 59%.

Energy Star Copier. Nexant (2010) cited Energy Star and DEER (2005) as sources for this measure. However, the derived UES also depended on building EUI, average building square footage, copier percent of plug load EUI, and measure savings percentage.

We found DEER (2005) savings to range from 131–323 kWh/year depending on copier type. We updated the UES with the December, 2010 office equipment calculator. We used the simple average of the copier types defined in the calculator— monochrome and color, with varying sizes — with default assumptions. The UES decreased from 1125 kWh/year to 119 kWh/year.

Energy Star Commercial Reach-In Refrigerator. The source cited in (Nexant, Cadmus 2010) for the savings is “NWPPC 6th Power Plan.” A note in the NWE rebate table workbook gives a value of 32.03 kWh per cubic foot as the savings, per Nexant in response to a question in July, 2010. Prior to that date a flat value of 933 kWh/year was used.

We checked the NWPPC (RTF) workbook for commercial refrigerators, and found savings in the range of 10 kWh/cubic foot. We derived a new UES from the Energy Star commercial kitchen calculator. We used the simple average of savings for solid door refrigerators of default sizes (29, 49, 60 cubic feet) – 18.6 kWh/cubic foot/year.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Commercial New Electric Rebate program, we successfully visited five sites. The customers in this program were very accommodating when it came to agreeing to and scheduling site visits (0% refusal rate for the customers contacted by the Special Effort recruiting team).

Table 237: Site Recruitment Disposition for E+ Commercial New Electric Rebate

	Total n	%
Recruitment		
Telephone Lab	2	
Special Effort		
Attempts	3	
No Reply	0	0.0%
Refused	0	0.0%
Recruited	3	100.0%
Total Recruited	**5**	
Onsite		
Refused	0	0.0%
Not Needed	0	0.0%
Total Completed	**5**	**100.0%**

Site Inspections

For the 2010–2011 program years we performed five site inspections which considered four different measures: Efficient Office Equipment, Commercial Reach-In Refrigerator, Variable Speed Control, and Hotel Key Card Room Energy Control System. For all five of the sites, we visited, we found that all of the sampled measures were installed, operational, and matched the quantity and size claimed by NWE.

We calculated savings for each sampled measure by applying the evaluation UES method to the conditions observed during the site visit.

For the following three sites, the evaluation savings are equal to the program savings:

- 2 sites with Irrigation Pump VFD as the measure type.
- 1 site with Hotel Key Card Room Energy Control System as the measure type.

For the other two sites, the reduction in savings is due to a change in the evaluation UES values.

- For the Efficient Office Equipment measure type, the evaluation UES values for Energy Star scanners, copiers, and fax machines are considerably lower than the claimed UES values.

The evaluation UES for an Energy Star printer is slightly higher than the claimed value. At one site we found an "all-in-one" four-function machine. We calculated the energy savings by summing the calculated savings for the four separate functions (as if there were four separate machines as is tracked in the NWE database). The evaluation savings is 0.19 times the program savings.

- For the Commercial Reach-In Refrigerator measure, the evaluation UES value is 0.58 times the claimed UES value, directly resulting in a lower realized savings for this measure.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 238: File Review and Site Visit Adjustment to Savings for E+ Commercial New Electric Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Commercial New Electric Rebate	kWh	95,877	95,877	90,176	90,176	1.00	0.94	0.94

11.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 239: Savings Adjustments by Calendar Year for E+ Commercial New Electric Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Commercial New Electric Rebate	kWh	2011	95,877	0.94	-	-	0.94	90,176	10
	E+ Commercial New Electric Rebate	kWh	All Years	95,877	0.94	-	-	0.94	90,176	10
Electric										
	E+ Commercial New Electric Rebate	kWh	All Years	95,877	0.94	-	-	0.94	90,176	10

11.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 240: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Commercial New Electric Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Commercial New Electric Rebate	kWh	2011	90,176	2.07	1.27	1.11	2.28
	E+ Commercial New Electric Rebate	kWh	All Years	90,176	2.07	1.27	1.11	2.28
Electric								
	E+ Commercial New Electric Rebate	kWh	All Years	90,176	2.07	1.27	1.11	2.28

11.3. Process Evaluation

11.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

Due to small populations and resulting small sample sizes, survey responses from participants in the E+ Commercial New Electric Rebate and E+ Commercial New Gas Rebate programs were analyzed together in order to increase the reliability of the research findings. To understand the process of participation and the experiences of participants, we conducted phone surveys with three E+ Commercial New Electric Rebate participants, two E+ Commercial New Gas Rebate participants, and 93 trade allies. Surveyed trade allies include those who reported offering lighting, HVAC, insulation, irrigation, motors, and/or motor rewind products and services to commercial end-users.

11.3.2. Implementation Findings

11.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, “program staff” or “staff”) to implement this program.

To seek a rebate, customers may use program guidelines and application forms available on NWE’s website, which also lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures such as insulation, air conditioning, and water heating among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

Prior to 2011, NWE treated VFD (variable frequency drives) as custom projects. However, because NWE received frequent applications for small VFD projects, in 2011 NWE included VFDs among its measures eligible for prescriptive rebates. Staff and contractors involved in custom projects report this has been a great time-saving change, reducing work for both the contractors and the applicants and reducing the application processing time.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor’s invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application. Program staff ensure all approved applications include a current NWE bill or accurate NWE account number for the building where the installation occurred. A completed Internal Revenue Service W-9 form must be included.

NWE has linked its master customer lists to the implementation contractor’s databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor’s accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

The implementation contractor has added more marketing staff in recent years and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. In addition, E+ Program Contractors conduct one-on-one and group outreach to promote the program. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

11.3.2.2. Best Practices Assessment

Table 241 through Table 244 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 241: Program Planning and Design Best Practices for E+ Commercial New Electric Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions

Practice	NWE Assessment
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 242: Program Management and Administrative Best Practices for E+ Commercial New Electric Rebate

Practice	NWE Assessment
Develop written process plan Include program management activities Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact

Practice	NWE Assessment
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 243: Marketing and Outreach Best Practices for E+ Commercial New Electric Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website

Practice	NWE Assessment
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 244: Program Quality Control Best Practices for E+ Commercial New Electric Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size

Practice	NWE Assessment
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

11.3.3. Participant Findings

We conducted phone surveys with five commercial customers of NorthWestern Energy who had participated in either the E+ Commercial New Electric Rebate or the E+ Commercial New Gas Rebate program.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

11.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about business energy efficiency rebates from NWE, the kind of additional information they would like to receive from NWE, and provided information about their decision to take actions encouraged by the program, such as purchasing rebate-qualified equipment.

Most (four of five) of respondents had visited the utility website. For the respondents who used the NWE website, the main reason was to locate utility contact information (83%; Table 245). Three of the four website users agreed the website information was easy to find and helpful, although none "completely" agreed.

Table 245: Website Use, among E+ Commercial New Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=4)	83%
Pay utility bill (n=4)	42%
Money saving tips (n=4)	33%
Learn about rebates or audits (n=4)	25%

A majority of respondents would like more information on energy efficiency educational opportunities and energy efficiency programs (Table 246).

Table 246: Further Information Desired, among E+ Commercial New Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Energy efficiency programs (n=5)	87%
Energy saving educational opportunities (n=5)	87%
Does not want any (n=5)	13%

Those desiring further information prefer to receive information by email (100%), by mail (77%), or by phone (54%).

Respondents became aware of the program mostly through a building professional, vendor, or contractor (80%; Table 247).

Table 247: Means of Program Awareness, among E+ Commercial New Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Building professional, vendor, or contractor (n=5)	80%
Utility publication or advertisement (n=5)	47%
Utility representative appearance (n=5)	33%
Directly contacted utility (n=4)	23%

When asked about influences on their decision to purchase rebate-qualifying equipment, most respondents reported being strongly influenced (rating of "4" or "5") by a salesperson or contractor and/or the rebate offer (Figure 67).

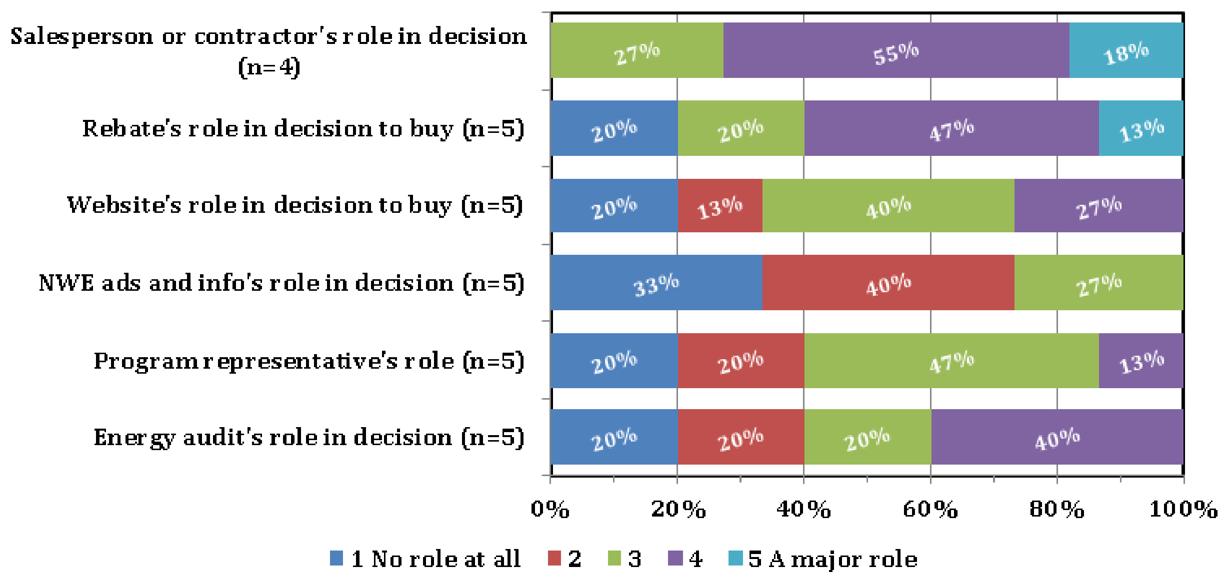

Figure 67: Program Influence on Upgrade Decision, among E+ Commercial New Electric Rebate Participants

Respondents agreed that the ease of program participation, increasing facility comfort, and/or contractor recommendations were relevant reasons for their participation (Table 248).

Table 248: Reasons for Program Participation, among E+ Commercial New Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Easy to use the program (n=5)	100%
Increase facility comfort (n=5)	80%
Contractor recommendation (n=5)	73%
Utility vouched for equipment by rebating (n=5)	67%
Good experience with other NWE efficiency program (n=5)	53%
Check specific equipment performance (n=5)	33%
Rebate needed to offset cost (n=5)	20%

When considering participation in this new construction gas program, all respondents said they had no concerns about participating.

11.3.3.2. Program Experience

Respondents reported on several aspects of program experience, including the rebate application, installation and inspection, and whether they would participate in NWE's efficiency programs again.

In most cases (73%), qualifying projects were initiated through joint discussions between the respondent and their contractor, vendor, or building professional. One respondent's organization initiated the project itself. Most organizations were also involved in the rebate application process. In two cases, though, the vendor/contractor was solely responsible for the rebate application.

Respondents' ratings of the clarity of program information were mixed, with respondents giving particularly low ratings to the clarity of information about how to follow up with program staff (Figure 68).

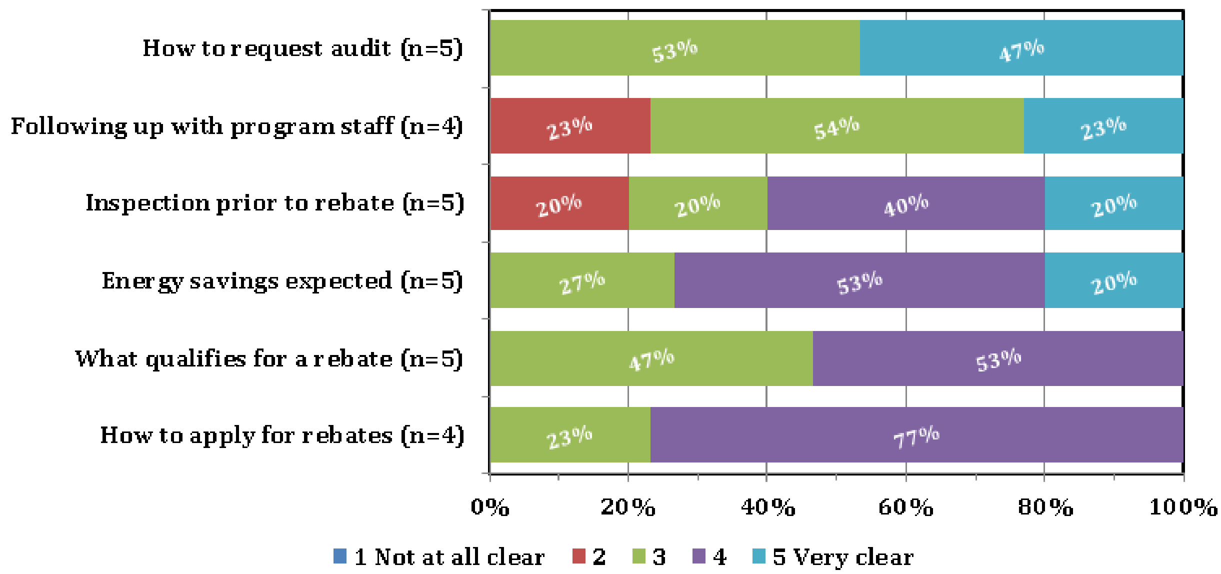

Figure 68: Clarity of Program Information, among E+ Commercial New Electric Rebate Participants

Respondents gave top ratings to the equipment, with 87% "completely agreeing" that it both fit their needs and performed well. All respondents also agreed that they received the rebate in reasonable time. In contrast, just two of four agreed that applying for the rebate was easy (Figure 69).

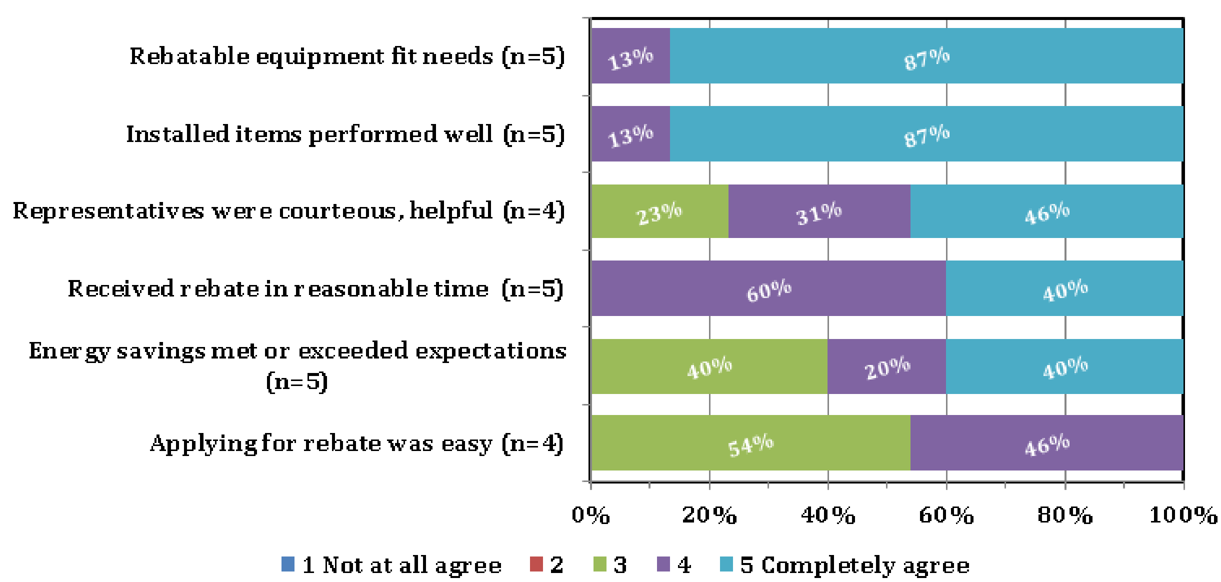

Figure 69: Experience With Installation, among E+ Commercial New Electric Rebate Participants

Two of five respondents reported that a utility representative inspected their rebated equipment. Both these respondents completely agreed that the inspector was courteous and efficient.

As an indicator of overall satisfaction with NWE's energy efficiency activities, we also asked respondents whether they were likely to participate in future efficiency programs (Figure 70). All but one respondent said they were "likely" or "very likely" to participate in a NWE efficiency program in the future.

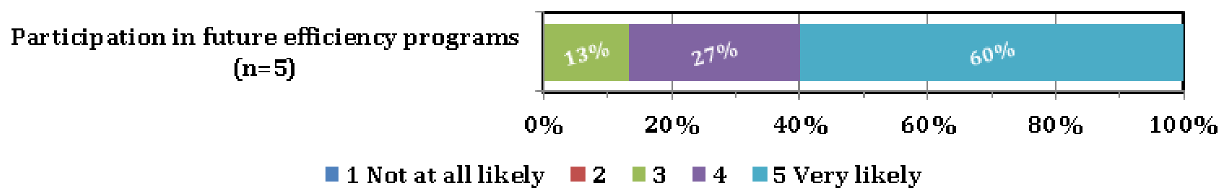

Figure 70: Likelihood of Future Participation, among E+ Commercial New Electric Rebate Participants

11.3.4. Trade Ally Findings

We surveyed 93 NWE trade allies who install measures that qualify for rebates through the E+ New Electric Rebate Program. These respondents include trade allies who reported providing construction, lighting, and/or insulation services to commercial customers.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

11.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event, from noticing a utility publication or advertisement, or by directly contacting the utility (at least 73%reported each method, see Table 249).

Table 249: Means of General Program Awareness, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=93)	77%
Utility representative appearance (n=91)	74%
Directly contacted utility (n=93)	73%
Utility website (n=92)	50%
Associated vendors and contractors (n=93)	46%
Word of mouth (n=93)	45%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly, or through NWE representatives (Table 250).

Table 250: Specific Requirements Awareness, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Directly contacted utility (n=93)	44%
Utility representative appearance (n=93)	43%
Utility publication (n=93)	26%
Associated vendors and contractors (n=93)	11%
Utility website (n=93)	10%

A majority (70%) of surveyed trade allies have visited the utility website. Among those website users, three-fourths said they used the site to learn about rebates or audits, and a smaller majority had printed rebate forms or contacted NWE (Table 251).

Table 251: Website Use, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=62)	76%
Print rebate forms (n=62)	66%
To contact utility (n=62)	53%
Educational events information (n=62)	35%
Money saving ideas (n=62)	34%
How-to videos (n=62)	10%

Two-thirds (67%) of website users "agreed" or "completely agreed" that the web information was easy to find and helpful (Figure 71).

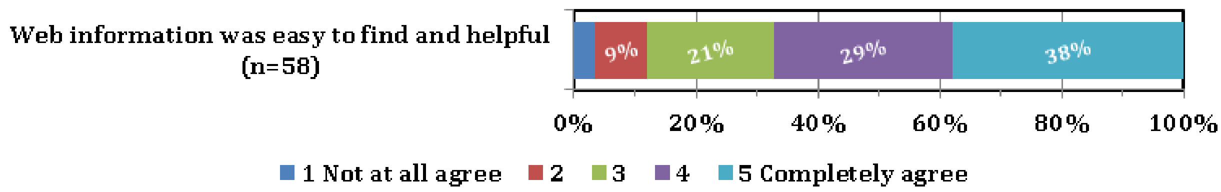

Figure 71: Website Effectiveness, among E+ Commercial New Electric Rebate Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority said they had contacted the utility to learn how the rebate program worked (Table 252).

Table 252: Reasons for Contacting NWE, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=93)	62%
Investigate status of an application (n=93)	43%
To resolve a problem (n=93)	43%
Investigate status of a rebate payment (n=93)	33%
None of these (n=93)	24%

About half of surveyed trade allies would like further information on workshops or events, or were interested in more information about energy efficiency programs. Thirty-five percent did not need further information from NWE at the time of the survey (Table 253).

Table 253: Further Information Desired, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=93)	53%
Energy efficiency programs (n=93)	49%
Energy saving educational opportunities (n=93)	47%
None (n=93)	35%

Those desiring further information preferred to receive information by email (34%), mail (32%), and other methods such as trainings and workshops (26%; Table 254).

Table 254: Information Delivery Preference, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Email (n=93)	34%
US mail (n=93)	32%
Trainings, workshops or seminars (n=93)	26%
Webinar (n=93)	17%
Community event (n=93)	16%
Phone (n=93)	11%

11.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

A large majority of surveyed trade allies (81%) sold lighting controls. Trade allies also reported on whether the equipment they normally keep in stock was high-efficiency or Energy Star rated, or if instead they keep unrated/standard items in stock and *order* the high-efficiency items as needed. Just under half (48%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 255. More than three-quarters (81%) kept a full range of equipment to offer, and 98% agreed that the “Better” and “Best” equipment is usually more energy-efficient. Well over half (59%) reported they suggest the “Best” equipment to customers first.

Table 255: Equipment Sales Approach, among E+ Commercial New Electric Rebate Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option (n=78)	81%
Agree that BETTER and BEST equipment options are typically more energy efficient than the GOOD option (n=61)	98%
Best mentioned first (n=59)	59%
Better mentioned first (n=59)	29%
Present all options simultaneously (n=59)	10%
Good mentioned first (n=59)	2%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock (among the 48% of surveyed trade allies who reported that they typically stock efficient equipment). One-third (33%) of these trade allies reported that a high majority (75% or more) of their stock was high-efficiency equipment. Another third categorized less than 26% of their routine stock as high-efficiency. These trade allies also estimated the share of sales made in the past two years that were energy-efficient items. About one-fifth of this group (19%) categorized *all* of the equipment they sold in the past two years as high-efficiency equipment (Figure 72).

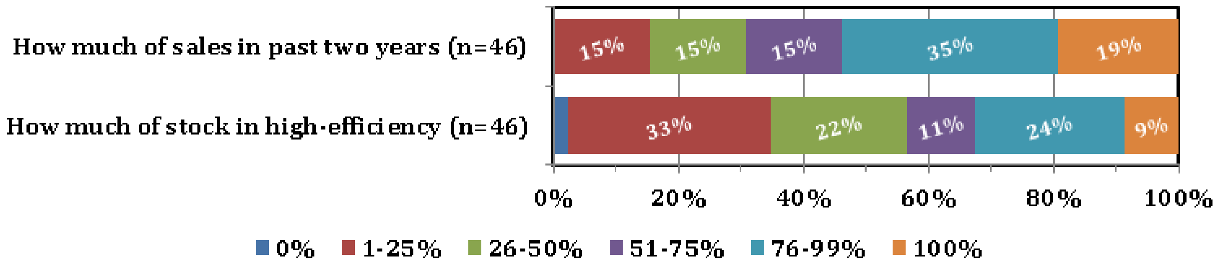

Figure 72: High-Efficiency Equipment Share, among E+ Commercial New Electric Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment and insulation that qualify for rebates. In *insulation* projects, 96% of respondents mention lower energy bills to the customer, 81% mention the rebate, and 78% mention the high quality of the product (Table 256). In energy-saving *equipment* promotion, 87% of respondents stress lower operation costs and 86% the NWE rebate (Table 257).

Table 256: Customer Benefits of Insulation, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=27)	96%
Utility rebate (n=27)	81%
High-quality of product (n=27)	78%
Comfort (n=27)	74%

Table 257: Customer Benefits of Equipment, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=79)	87%
Utility rebate (n=79)	86%
High-quality of product (n=79)	65%
Lower maintenance costs (n=79)	59%

About 15% of these trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these dozen mentioned cost or reliability concerns with the equipment, primarily.

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. One-third (33%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. A higher percentage (42%) of *insulation* installers also recalled qualifying installations when no rebates were sought. Among the reasons reported in Table 258, no single reason stands out as a barrier to rebate applications.

Table 258: Circumstances When Rebate Foregone, among E+ Commercial New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Unspecified or unclear (n=21)	25%
Customer did not apply (n=21)	19%
Rebate too small (n=21)	19%
Trade ally unaware of rebate/program (n=21)	14%
Customer ineligible (n=21)	14%
Applying takes too long or difficult (n=21)	14%

11.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (67%) of these trade ally respondents reported that they had trained staff to talk to customers about energy efficient choices. In fact, 51% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 259).

Table 259: Rebate Initiator, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=90)
Almost always trade ally initiated	51%
Mostly trade ally initiated	27%
About half trade ally and half customer	14%
Almost always customer initiated	7%
Other	1%

When a customer is considering insulating their building, respondents suggest the rebate program to the customer 92% of the time, rather than waiting for the customer to show interest in rebates. Likewise, once a customer is considering an actual equipment purchase, 95% of respondents suggest options that qualify for a rebate to the customer.

Trade allies also indicated whether they had any reservations about recommending the program to their customers. Most surveyed trade allies (78%) indicated that nothing about the program raised issues or concerns for them around their customers' participation. Among the 22% of respondents who had initial concerns, the following table suggests concerns about both rebate processes, and perhaps the rebate not applying to customer equipment choices (Table 260).

Table 260: Initial Concerns, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=20)
Unclear processes or qualifications	45%
Too much paperwork	15%
R-value problems	15%
Other	15%
No LED rebate	10%

A notable minority (30%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" most often notified their customers on a quarterly basis (Table 261).

Table 261: Customer Contact Frequency, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=26)
Once a quarter	38%
2 times a year	15%
Once a year	15%
Once a month	12%
Every day	12%
Varies by customer	8%

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (55%) reported working with the customer in a joint effort to prepare the applications. Another 30% did all or most of the application themselves.

Table 262: Rebate Application Preparer, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=87)
Typically both trade ally and customer	55%
Typically trade ally prepares all or most of the application	30%
Typically the customer prepares all or most of the application	14%
Depends on the rebate	1%

About three-quarters (76%) of the 73 electric trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process is simple to follow.

The majority (from 59% to 84%) of trade ally respondents rated elements of information they received from NWE on rebates and contacting program staff as "clear" or "very clear" (Figure 73).

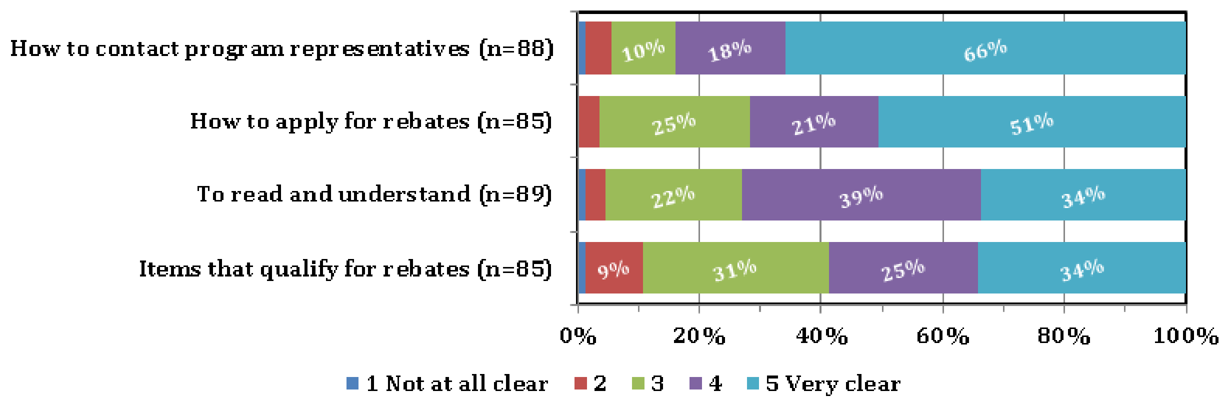

Figure 73: Clarity of Program Information, among E+ Commercial New Electric Rebate Trade Allies

Respondents rated their agreement with several positive statements related to staying current with program changes. At least 66% of respondents "agreed" or "completely agreed" with the statements listed in the table below (Figure 74).

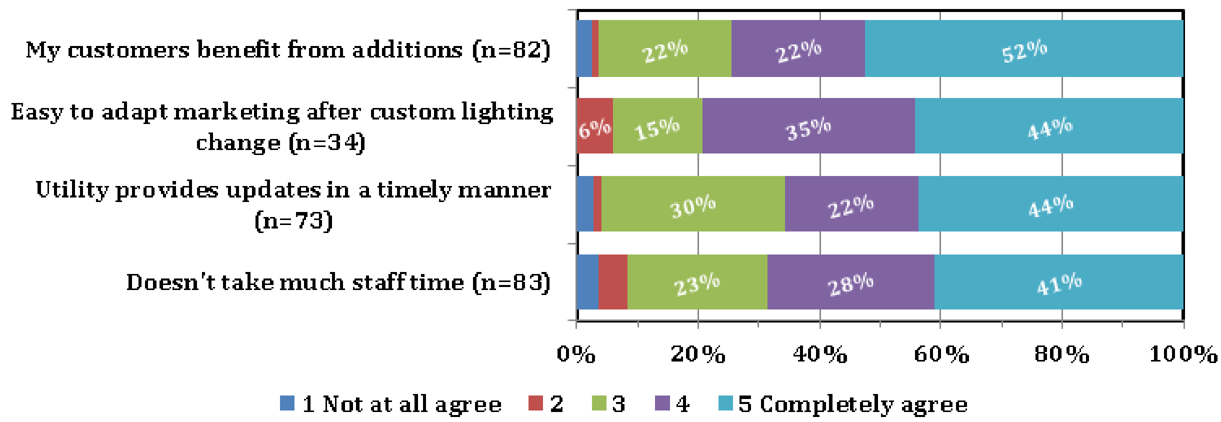

Figure 74: Experience With Program Changes, among E+ Commercial New Electric Rebate Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures for NWE programs. LED lighting was most commonly suggested (Table 263). These trade allies indicated they suggested the items primarily because "it's more efficient," and also "customers request the equipment" (Table 264).

Table 263: High Efficiency Equipment Suggested, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=32)
LED lighting	53%
Other heating systems	19%
Other	13%
Heat pumps	9%
On demand water heaters	6%

Table 264: Reasons Equipment Should Be Added, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=31)
It's more efficient	32%
Customers request them	19%
Where industry is going	16%
Rebate will increase sales	13%
Cost	6%
Other	13%

11.3.4.4. Firmographics

A few electric trade allies (24%) operate at more than 20 Montana locations. More than half (52%) of respondents serve five or fewer locations.

Table 265: Number of Montana Locations, among E+ Commercial New Electric Rebate Trade Allies

	Percent (n=90)
1 location	31%
2 to 5 locations	21%
6 to 10 locations	16%
11 to 20 locations	9%
21 to 50 locations	8%
Over 50 locations	16%

Trade allies reported on the maximum number of miles they would travel to serve clients. The percentage of trade allies reporting travel at the lower and upper ends of the range is similar, with 22% traveling less than 100 miles, and 18% traveling more than 400 miles. The majority would travel between 101 and 200 miles to serve a client (Figure 75).

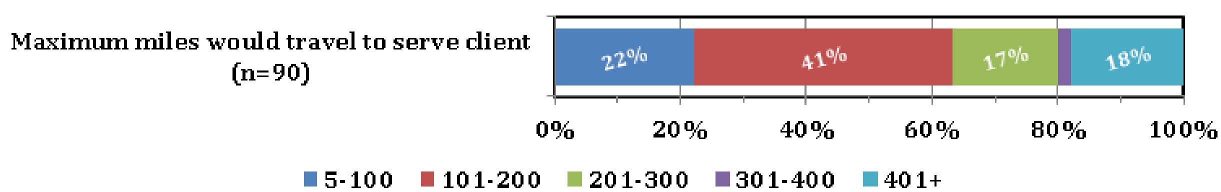

Figure 75: Maximum Miles, among E+ Commercial New Electric Rebate Trade Allies

11.4. Recommendations

11.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **New construction program changes:** New construction programs in general have had few participants in recent years. Consider increasing marketing efforts to increase participation. Also consider combining gas and electric programs into a single new construction program to reduce administrative costs.
- **Customer cost data**: The tracking database for this program does not include customer costs for each record in the savings claim. This lack of complete data for this important

evaluation item complicates and increases the cost of the evaluation. Quality control measures should be instituted to ensure this information is included for all tracking records.

- **Updated values:** Update UES values for the measures included in this program. For all measures, the UES should be based on a direct calculation (e.g., the Energy Star calculator) rather than the potential assessment methodology. For the fan and pump VFD measures, adopt the evaluation UES values, or review the available literature to determine an appropriate value. For the Irrigation VFD measure, consider it a custom measure because its application is too complex to be considered as a UES measure. For the Cooling Tower VFD measure, perform a literature review to determine an appropriate savings value. In addition, the UES value for the office equipment measures should be updated annually because of the fast pace of technology development.

11.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Commercial New Electric participants responses indicate that trade allies play an important role in program outreach: nearly all participants reported learning of the program through their contractor. Half also heard through utility advertising or direct mail. Nearly all participants want more information about NWE efficiency programs and other efficiency opportunities. Participants reported positive program experiences, but some felt that information both about the inspection and about how to contact program staff with questions was unclear, and respondent responses on the ease of applying for a rebate were mixed. (The evaluators note that program application materials clearly state how to reach program staff.)

Surveyed commercial trade allies reported positive experiences with the program, and indicated they played an important role in suggesting the program to customers: nearly all trade allies reported that they proactively suggested the program to their customers. Trade ally responses generally reveal that they have sufficient information to effectively deliver the program.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.

- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

12. E+ Commercial New Gas Rebate

12.1. Program Description

The E+ Commercial Natural Gas Savings program for new construction is a prescriptive rebate program which began in 2009. The program offers measures for high efficiency HVAC, service water heating, and refrigeration heat recovery. All NWE non-residential gas supply customers are eligible to participate in the program. The program is funded through DSM.

NorthWestern defines new construction as any project that requires a building permit for new construction, adding onto pre-existing structures, and in some cases, major renovations.

Alternative delivery mechanisms

Customers may apply for incentives through the E+ Business Partners program for cost-effective gas measures where a prescriptive rebate is not offered.

12.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the program. Measures marked with an "X" in the Program Year columns indicates the measure was offered by the program in all or part of that program year.

Table 266: Measures Offered for E+ Commercial New Gas Rebate

Gas Measures	Rebate Type	Unit of Measurement	Qualifier	PY 2009	PY 2010	PY 2011	Effective Date	End Date[1]
High Efficiency Furnace/Boiler	$/Unit	Kbtu/Hr	AFUE ≥ 90% or 90% TE replaces a standard AFUE ≤ 78%	X	X	X	1/1/2009	-
High Efficiency Water Heater	$/Unit	Kbtu/Hr	EF ≥ 62% or ≥ 90% TE replaces a standard EF ≤ 0.594	X	X	X	1/1/2009	
Stack Heat Exchanger	$/Unit	Kbtu/Hr		X	X	X	1/1/2009	
Refrigeration Heat Recovery	$/Unit	OA - CFM		X	X	-	1/1/2009	
Energy Management System (EMS) Optimization	$/Unit	Fixed rebate per unit	Commissioning report required for rebate	X	X	X	1/1/2009	
Water Heater Tank Insulation	$/Unit	Fixed rebate per unit	R-11 minimum, R-0 previously	X	X	X	1/1/2009	

Gas Measures	Rebate Type	Unit of Measurement	Qualifier	PY 2009	PY 2010	PY 2011	Effective Date	End Date[1]
Energy Star Programmable Thermostat	$/Unit	Square foot of controlled area	Energy Star labeled	X	X		1/1/2009	11/30/2010

[1] The date the program stopped offering the measure. Customer projects with discontinued measures already in progress could extend past that date.

Measure savings are unit energy savings from a third party gas resource assessment study (KEMA 2008 (b)) based on average annual savings specifically for NWE Montana Customers. Each UES must pass a cost/benefit test, based on current gas avoided costs, known as the TRC.

Measure baseline data come from the 2003 International Energy Efficiency Code and ASHRAE 90.1-2001

12.1.2. History

From the beginning of the program in 2009, the program had one change; programmable thermostats were dropped in 2010.

12.1.3. Marketing

NWE and their contract marketing team at KEMA engage in a number of marketing activities to promote the commercial new construction programs to design professionals, contractors, developers, and owners. Beginning in the fourth quarter of 2011, there was an increase in non-residential marketing activity due to the expansion of the contract marketing team. Marketing activities for the commercial gas new construction program include:

- Preferred contractors and other trade allies are briefed annually on the new construction programs. Although NWE's commercial programs do not use preferred contractors as the residential programs do, many contractors that are participating in the residential preferred contractor program are familiar with the commercial rebate programs and promote them to their commercial customers.
- Presentations at architectural, engineering, and construction industry conferences and tradeshows
- Presentations at professional and trade association meetings for healthcare, hospitality, architects, engineers, and service organizations
- Event and program advertising through media news releases, email promotions, and spot advertising in newspapers and other publications
- Co-sponsoring regional energy conferences with trade allies and local governments
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors

The mix of marketing activities varies from year to year to match program needs and as other opportunities in the community occur.

12.1.4. Program Steps

Customers consult the program guidelines and application forms, available on NWE's website, to determine which measures apply to their project. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers' rebate submittal packages include a completed application form, their contractor's invoice (or materials receipts if self-installed), a recent NWE bill for the site where the installation occurred, and a completed Internal Revenue Service W-9 form.

12.2. Impact Evaluation

12.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (dkt) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (dkt) savings and perform the economic analysis.

12.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (dkt). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the three measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods (dkt) that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate unit energy savings method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and produced energy savings. We collected data as necessary to support a re-estimation of energy (dkt) savings, using the UES method that resulted from the UES review, discussed above. Site data collection included installation verification and the collection of data necessary to support an estimate of the inputs to the UES method. We calculated evaluation energy savings (dkt) by applying the final UES method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

12.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

12.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

12.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas

service territory. We considered as "leaked" any measures we found that left the relevant service territory.

12.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

12.2.2. Energy and Demand Impacts

We estimated gross and net savings (dkt) for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

12.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 15 sampled cases for this program across the three program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

UES Review

We reviewed the three UES measures installed in the sampled cases addressed by this evaluation of gross savings. Our review included an examination of the UES methods used by NWE to establish the program estimates. For one of these measures, we determined that the NWE methods were reasonable; although we applied the NWE UES values on a building type basis (building type was collected as part of the site visit process). For the remaining two measures, we determined that changes to the UES methods were appropriate.

NWE calculated a weighted average UES based on the expected savings per building type. We weighted savings for a given building type by the square footage fraction of the building type in NWE territory among all commercial buildings. For each building type, a TRC benefit-to-cost ratio was calculated. Those building types for which the TRC ratio was less than 1 were not included in the overall weighted average UES, although all facilities were eligible to receive an incentive for the measure. This process was justified on the basis that facilities were most likely to install the measure where it was cost-effective, and that therefore the rebate population most likely resembled the cost-effective population rather than the overall building stock population. However, savings estimates varied greatly depending on building type. For the measures with the highest savings, we applied the UES on a building type basis.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 267: Summary of UES adjustments for E+ Commercial New Gas Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
High Efficiency Heating System	Hosp & Health	0.291	dkt per kBtuh	0.526	dkt per kBtuh
High Efficiency Heating System	Office	0.291	dkt per kBtuh	0.396	dkt per kBtuh
High Efficiency Heating System	Grocery	0.291	dkt per kBtuh	0.321	dkt per kBtuh
High Efficiency Heating System	University	0.291	dkt per kBtuh	0.292	dkt per kBtuh
High Efficiency Heating System	Warehouse	0.291	dkt per kBtuh	0.266	dkt per kBtuh
High Efficiency Heating System	Hotel	0.291	dkt per kBtuh	0.227	dkt per kBtuh
High Efficiency Heating System	Misc	0.291	dkt per kBtuh	0.149	dkt per kBtuh
High Efficiency Heating System	Retail	0.291	dkt per kBtuh	0.119	dkt per kBtuh
High Efficiency Heating System	Restaurant	0.291	dkt per kBtuh	0.091	dkt per kBtuh
High Efficiency Heating System	School	0.291	dkt per kBtuh	0.052	dkt per kBtuh
High Efficiency Water Heater	Restaurant	0.133	dkt per kbtuh	0.157	dkt per kbtuh
High Efficiency Water Heater	Grocery	0.133	dkt per kbtuh	0.088	dkt per kbtuh
High Efficiency Water Heater	Warehouse	0.133	dkt per kbtuh	0.071	dkt per kbtuh
High Efficiency Water Heater	Hotel	0.133	dkt per kbtuh	0.063	dkt per kbtuh
High Efficiency Water Heater	Hosp & Health	0.133	dkt per kbtuh	0.061	dkt per kbtuh
High Efficiency Water Heater	Office	0.133	dkt per kbtuh	0.057	dkt per kbtuh
High Efficiency Water Heater	Misc	0.133	dkt per kbtuh	0.033	dkt per kbtuh
High Efficiency Water Heater	University	0.133	dkt per kbtuh	0.016	dkt per kbtuh
High Efficiency Water Heater	School	0.133	dkt per kbtuh	0.014	dkt per kbtuh
High Efficiency Water Heater	Retail	0.133	dkt per kbtuh	0.010	dkt per kbtuh
Clock / Programmable Thermostat	All	0.003	dkt per Sq. Ft.	0.002	dkt per Sq. Ft.

High Efficiency Heating System. This measure was the same as the existing construction efficient heating system measure, based on the improvement over code for the efficient case. This measure included both furnaces and boilers. The efficient unit had to be condensing, with a minimum efficiency of 90%. The baseline unit was assumed to be 78% efficient. NWE derived savings from the 2008 gas efficiency potential study (KEMA 2008 (b)). This study included estimates of average energy use index (EUI) for space heating, in therms per floor area, for commercial buildings. The source for the EUI is not entirely clear – the report only states that the usage per square foot (EUI) was derived from "California Commercial End-Use Survey combined with Montana data." The study also reported average heating capacity density, in kBtu per hour per square foot, for each building type. Combining these parameters with a percentage savings based on the efficiency improvement enabled the calculation of a UES (dkt per kBtuh) for each building type.

All other studies that we examined calculated savings for this measure based on effective full-load hours (EFLH). The KEMA reported parameters allowed the derivation of the implicit EFLH for NWE. We compared the implicit EFLH with those reported by other sources. We found the NWE values to be reasonable.

The federal minimum efficiency for this type of system has been 80% since 1992. We developed new UES values by building type, using the existing methodology, but with the baseline efficiency set to 80% rather than 78%. It was not clear whether the capacity per unit area (in kBtuh per ft^2) referred to input or output capacity. We assumed input rating, which was consistent with the EUI parameter.

High Efficiency Water Heater. This measure was the same as the existing construction efficient water heater measure, based on the improvement over code of the efficient case. The measure required the baseline unit to have an Energy Factor (EF) of 0.594 or less (or a thermal efficiency of less than 80%), and the efficient unit to be condensing with an EF greater than 0.62 (thermal efficiency greater than 90%). Savings were derived in (KEMA 2008 (b)) by combining average water heating EUI, average water heating installed capacity per square foot, and a savings percentage derived from the efficiency gain.

We compared the EUIs assumed by NWE with those reported in other sources, and found them to be in line with other studies. The derivation of this UES would be clearer if it were in terms of EFLH rather than capacity per square foot, but we did not change the existing values. We applied the NWE UES values on a building type basis.

Programmable Thermostat. This measure was nearly the same as the existing construction programmable thermostat measure, based on an equivalent percentage decrease in usage. In 2010 the new construction UES differed from the existing construction UES by less than 1%, based on a slight difference in baseline consumption. The baseline for this measure was a manual thermostat. The savings estimate was reported in KEMA (2008) as derived from "KEMA engineering judgment based on California commercial study." Savings were derived as 5% of the average baseline space heating EUI, and were reported as savings per square foot of controlled space.

We examined other studies and could not find support for a 5% savings value. New York uses a savings fraction of 3.6%, citing (GDS Associates 2002). The Massachusetts TRM (Massachusetts Program Administrators 2010) reports a flat value which nearly matches 3.6% of the NWE EUI. We opted to use a savings percentage of 3.6% based on its support by other programs and studies.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Commercial New Gas Rebate program, we successfully visited 10 sites encompassing three different strata. The relatively high refusal rate (27%) encountered by the Special Effort recruiting team was driven by stratum 1.

Table 268: Site Recruitment Disposition for E+ Commercial New Gas Rebate

	Stratum			Total n	%
	1	2	9		
Recruitment					
Telephone Lab	0	0	0	0	
Special Effort					
Attempts	7	3	5	15	
No Reply	1	0	0	1	7%
Refused	4	0	0	4	27%
Recruited	2	3	5	10	67%
Total Recruited	**2**	**3**	**5**	**10**	
Onsite					
Refused	0	0	0	0	0%
Not Needed	0	0	0	0	0%
Total Completed	**2**	**3**	**5**	**10**	**100%**

Site Inspections

For the 2010–2011 program years we performed ten site inspections which considered three different measures: Efficient Heating System, High Efficiency Water Heater, and Thermostat Control.

Across the ten sites we visited, we found that nearly all of the sampled measures were installed, operational, and matched the quantity and size claimed by NWE. The only exception was one site where one of the three boilers is for back-up use only, and therefore the quantity of *operational* High Efficiency Boilers was reduced from three (as documented by NWE) down to two.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit. For six of the ten sites, we determined the evaluation site-specific savings to be less than the claimed savings; the reduction in savings for five of these sites was due to the UES methods (the sixth site is discussed in the paragraph above).

NWE had developed UES values that varied by building type but only applied a value that was averaged across all building types. The evaluation applied the NWE UES values by building type, rather than using the average (see UES Review section above).

For the Thermostat Control measure, for offices and hospital/health buildings (the two building types in this program with this measure type), the evaluation savings UES is 0.66 times the claimed savings UES.

For the Efficient Heating System and High Efficiency Water Heater measures, four of the buildings in this sample are in the “misc” building type; the evaluation building-specific UES is less than the average UES used in the claimed savings by 49% to 79% depending on the program year.

The four sites where the evaluation savings are higher than the program savings are either restaurants or office buildings. Combined with the measure type (i.e. restaurant with High Efficient Water Heater, or office with an Efficient Heating System), the evaluation building-type specific UES is up to 45% higher than the average UES used by NWE.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 269: File Review and Site Visit Adjustment to Savings for E+ Commercial New Gas Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Natural Gas									
	E+ Commercial New Gas Rebate	dkt	5,758	5,758	5,586	5,586	1.00	0.97	0.97

12.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 270: Savings Adjustments by Calendar Year for E+ Commercial New Gas Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Natural Gas Supply - DSM										
	E+ Commercial New Gas Rebate	dkt	2009	295	0.97	-	-	0.97	287	
	E+ Commercial New Gas Rebate	dkt	2010	4,070	0.97	-	-	0.97	3,949	
	E+ Commercial New Gas Rebate	dkt	2011	1,392	0.97	-	-	0.97	1,350	
	E+ Commercial New Gas Rebate	dkt	All Years	5,758	0.97	-	-	0.97	5,586	
Natural Gas										
	E+ Commercial New Gas Rebate	dkt	All Years	5,758	0.97	-	-	0.97	5,586	

12.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 271: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Commercial New Gas Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Natural Gas Supply - DSM								
	E+ Commercial New Gas Rebate	dkt	2009	287	1.19	1.57	1.24	1.31
	E+ Commercial New Gas Rebate	dkt	2010	3,949	5.25	4.89	3.00	5.77
	E+ Commercial New Gas Rebate	dkt	2011	1,350	1.50	2.43	1.89	1.65
	E+ Commercial New Gas Rebate	dkt	All Years	5,586	3.12	3.72	2.52	3.44
Natural Gas								
	E+ Commercial New Gas Rebate	dkt	All Years	5,586	3.12	3.72	2.52	3.44

12.3. Process Evaluation

12.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

Due to small populations and resulting small sample sizes, survey responses from participants in the E+ Commercial New Electric Rebate and E+ Commercial New Gas Rebate programs were analyzed together in order to increase the reliability of the research findings. To understand the process of participation and the experiences of participants, we conducted phone surveys with three E+ Commercial New Electric Rebate participants, two E+ Commercial New Gas Rebate participants, and 93 trade allies. Surveyed trade allies include those who reported offering lighting, HVAC, insulation, irrigation, motors, and/or motor rewind products and services to commercial end-users.

12.3.2. Implementation Findings

12.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms available on NWE's website, which also lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures such as insulation, air conditioning, and water heating among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

Projects involving an E+ Program Contractor require pre-approval to review the scope of work and to compute the resource value as a basis for the payment to the E+ Program Contractor.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor's invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application. Program staff ensure all approved applications include a current NWE bill for the building where the installation occurred and must include a completed Internal Revenue Service W-9 form. For energy-management-system optimization in a commercial facility of a gas customer, a commissioning report must accompany the rebate application as well.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

The implementation contractor has added more marketing staff in recent years and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. In addition, E+ Program Contractors conduct one-on-one and group outreach to promote the program. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

12.3.2.2. Best Practices Assessment

Table 272 through Table 275 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 272: Program Planning and Design Best Practices for E+ Commercial New Gas Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don’t participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE’s participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 273: Program Management and Administrative Best Practices for E+ Commercial New Gas Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact

Practice	NWE Assessment
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 274: Marketing and Outreach Best Practices for E+ Commercial New Gas Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 275: Program Quality Control Best Practices for E+ Commercial New Gas Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

12.3.3. Participant Findings

We conducted phone surveys with five commercial customers of NorthWestern Energy who had participated in either the E+ Commercial New Gas Rebate or the E+ Commercial New Electric Rebate program.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

12.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about business energy efficiency rebates from NWE, the kind of additional information they would like to receive from

NWE, and provided information about their decision to take actions encouraged by the program, such as purchasing rebate-qualified equipment.

Most (four of five) of respondents had visited the utility website. For the respondents who used the NWE website, the main reason was to locate utility contact information (83%; Table 276). Three of the four website users agreed the website information was easy to find and helpful, although none "completely" agreed.

Table 276: Website Use, among E+ Commercial New Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=4)	83%
Pay utility bill (n=4)	42%
Money saving tips (n=4)	33%
Learn about rebates or audits (n=4)	25%

A majority of respondents would like more information on energy efficiency educational opportunities and energy efficiency programs (Table 277).

Table 277: Further Information Desired, among E+ Commercial New Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Energy efficiency programs (n=5)	87%
Energy saving educational opportunities (n=5)	87%
Does not want any (n=5)	13%

Those desiring further information prefer to receive information by email (100%), by mail (77%), or by phone (54%).

Respondents became aware of the program mostly through a building professional, vendor, or contractor (80%; Table 278).

Table 278: Means of Program Awareness, among E+ Commercial New Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Building professional, vendor, or contractor (n=5)	80%
Utility publication or advertisement (n=5)	47%
Utility representative appearance (n=5)	33%
Directly contacted utility (n=4)	23%

When asked about influences on their decision to purchase rebate-qualifying equipment, most respondents reported being strongly influenced (rating of "4" or "5") by a salesperson or contractor and/or the rebate offer (Figure 76).

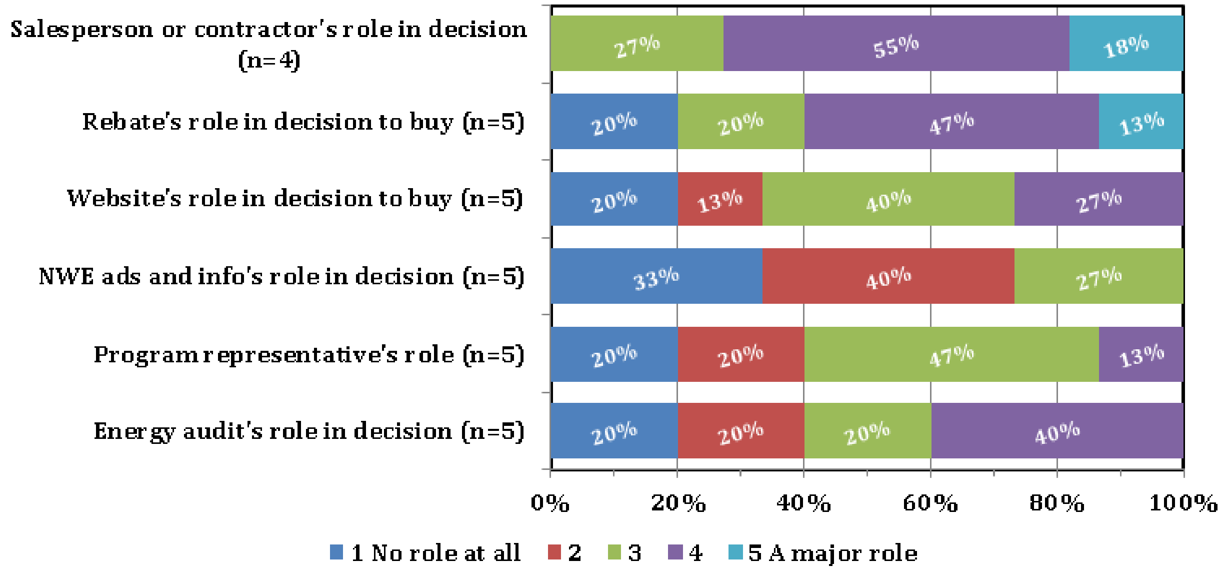

Figure 76: Program Influence on Upgrade Decision, among E+ Commercial New Gas Rebate Participants

Respondents agreed that the ease of program participation, increasing facility comfort, and/or contractor recommendations were relevant reasons for their participation (Table 279).

Table 279: Reasons for Program Participation, among E+ Commercial New Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Easy to use the program (n=5)	100%
Increase facility comfort (n=5)	80%
Contractor recommendation (n=5)	73%
Utility vouched for equipment by rebating (n=5)	67%
Good experience with other NWE efficiency program (n=5)	53%
Check specific equipment performance (n=5)	33%
Rebate needed to offset cost (n=5)	20%

When considering participation in this new construction gas program, all respondents said they had no concerns about participating.

12.3.3.2. Program Experience

Respondents reported on several aspects of program experience, including the rebate application, installation and inspection, and whether they would participate in NWE's efficiency programs again.

In most cases (73%), qualifying projects were initiated through joint discussions between the respondent and their contractor, vendor, or building professional. One respondent's organization initiated the project itself. Most organizations were also involved in the rebate application process. In two cases, though, the vendor/contractor was solely responsible for the rebate application.

Respondents' ratings of the clarity of program information were mixed, with respondents giving particularly low ratings to the clarity of information about how to follow up with program staff (Figure 77).

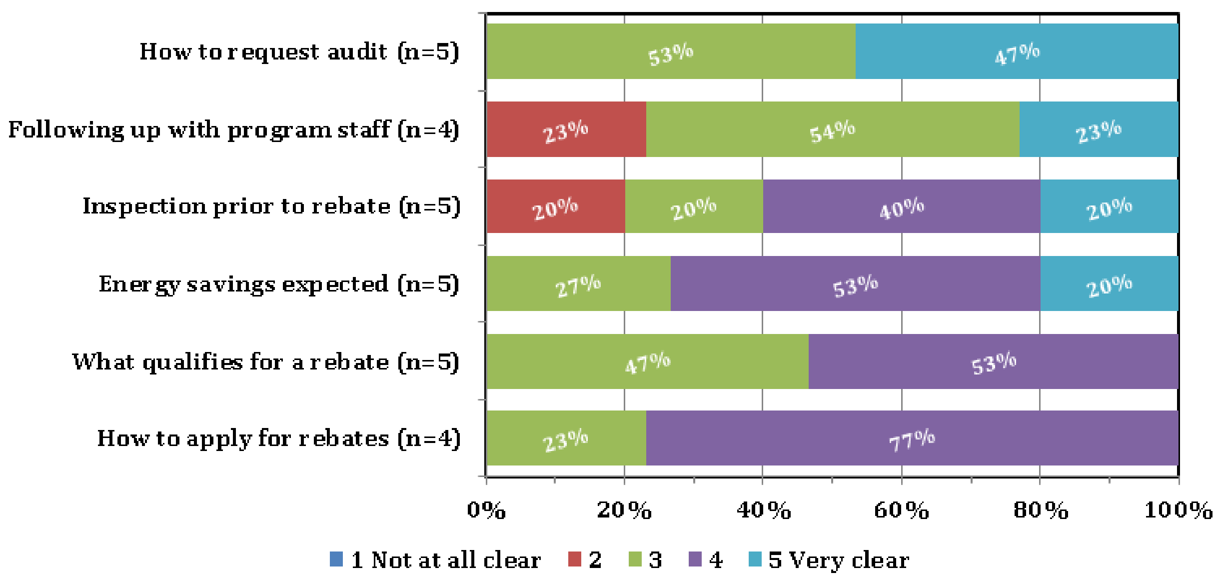

Figure 77: Clarity of Program Information, among E+ Commercial New Gas Rebate Participants

Respondents gave top ratings to the equipment, with 87% "completely agreeing" that it both fit their needs and performed well. All respondents also agreed that they received the rebate in reasonable time. In contrast, just two of four agreed that applying for the rebate was easy (Figure 78).

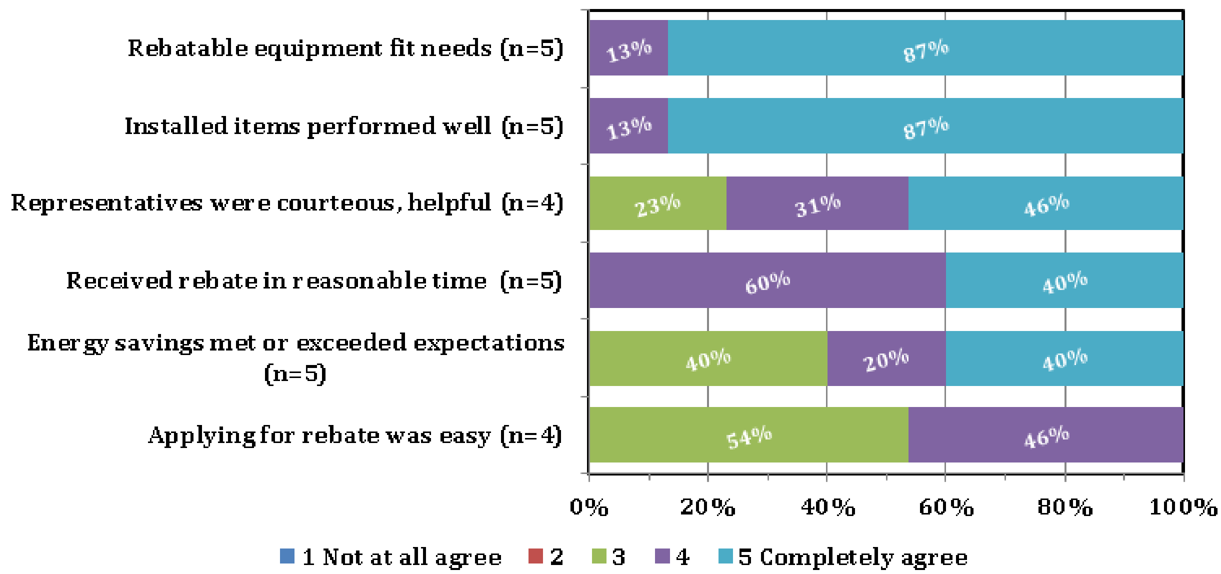

Figure 78: Experience With Installation, among E+ Commercial New Gas Rebate Participants

Two of five respondents reported that a utility representative inspected their rebated equipment. Both these respondents completely agreed that the inspector was courteous and efficient.

As an indicator of overall satisfaction with NWE's energy efficiency activities, we also asked respondents whether they were likely to participate in future efficiency programs (Figure 79). All but one respondent said they were "likely" or "very likely" to participate in a NWE efficiency program in the future.

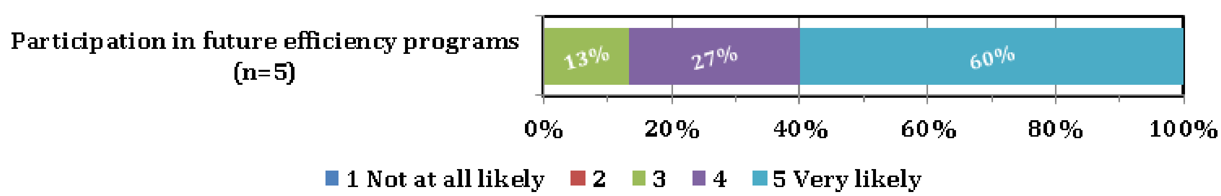

Figure 79: Likelihood of Future Participation, among E+ Commercial New Gas Rebate Participants

12.3.4. Trade Ally Findings

We surveyed 93 NWE trade allies who install measures that qualify for rebates through the E+ New Commercial Gas Rebate Program or E+ New Commercial Electric Rebate Program. These respondents include trade allies who reported providing construction, lighting, and/or insulation services to commercial customers.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

12.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from a utility representative attending a meeting or event, from noticing a utility publication or advertisement, or by directly contacting the utility (at least 73% reported each method, see Table 280).

Table 280: Means of General Program Awareness, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=93)	77%
Utility representative appearance (n=91)	74%
Directly contacted utility (n=93)	73%
Utility website (n=92)	50%
Associated vendors and contractors (n=93)	46%
Word of mouth (n=93)	45%

Trade ally respondents most frequently learned about specific program requirements by contacting NWE directly, or through NWE representatives (Table 281).

Table 281: Specific Requirements Awareness, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Directly contacted utility (n=93)	44%
Utility representative appearance (n=93)	43%
Utility publication (n=93)	26%
Associated vendors and contractors (n=93)	11%
Utility website (n=93)	10%

A majority (70%) of surveyed trade allies have visited the utility website. Among those website users, three-fourths said they used the site to learn about rebates or audits, and a smaller majority had printed rebate forms or contacted NWE (Table 282).

Table 282: Website Use, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=62)	76%
Print rebate forms (n=62)	66%
To contact utility (n=62)	53%
Educational events information (n=62)	35%
Money saving ideas (n=62)	34%
How-to videos (n=62)	10%

Two-thirds (67%) of website users “agreed” or “completely agreed” that the web information was easy to find and helpful (Figure 80).

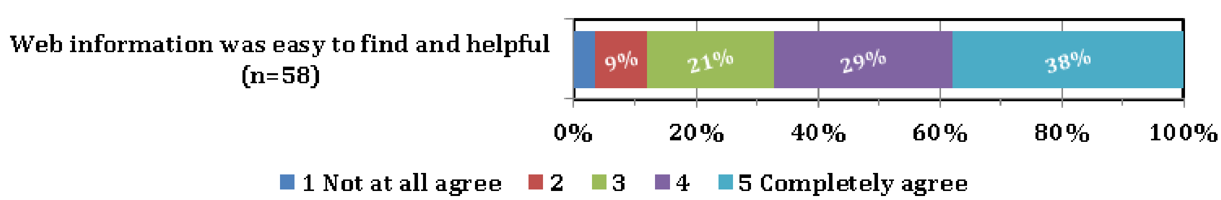

Figure 80: Website Effectiveness, among E+ Commercial New Gas Rebate Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority said they had contacted the utility to learn how the rebate program worked (Table 283).

Table 283: Reasons for Contacting NWE, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=93)	62%
Investigate status of an application (n=93)	43%
To resolve a problem (n=93)	43%
Investigate status of a rebate payment (n=93)	33%
None of these (n=93)	24%

About half of surveyed trade allies would like further information on workshops or events, or were interested in more information about energy efficiency programs. Thirty-five percent did not need further information from NWE at the time of the survey (Table 284).

Table 284: Further Information Desired, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=93)	53%
Energy efficiency programs (n=93)	49%
Energy saving educational opportunities (n=93)	47%
None (n=93)	35%

Those desiring further information preferred to receive information by email (34%), mail (32%), and other methods such as trainings and workshops (26%; Table 285).

Table 285: Information Delivery Preference, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Email (n=93)	34%
US mail (n=93)	32%
Trainings, workshops or seminars (n=93)	26%
Webinar (n=93)	17%
Community event (n=93)	16%
Phone (n=93)	11%

12.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

A large majority of surveyed trade allies (81%) sold lighting controls. Trade allies also reported on whether the equipment they normally keep in stock was high-efficiency or Energy Star rated, or if instead they keep unrated/standard items in stock and *order* the high-efficiency items as needed. Just under half (48%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 286 below. More than three-quarters (81%) kept a full range of equipment to offer, and 98% agreed that the "Better" and "Best" equipment is usually more energy-efficient. Well over half (59%) reported they suggest the "Best" equipment to customers first.

Table 286: Equipment Sales Approach, among E+ Commercial New Gas Rebate Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option (n=78)	81%
Agree that BETTER and BEST equipment options are typically more energy efficient than the GOOD option (n=61)	98%
Best mentioned first (n=59)	59%
Better mentioned first (n=59)	29%
Present all options simultaneously (n=59)	10%
Good mentioned first (n=59)	2%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock (among the 48% of surveyed trade allies who reported that they typically stock efficient equipment). One-third (33%) of these trade allies reported that a high majority (75% or more) of their stock was high-efficiency equipment. Another third categorized less than 26% of their routine stock as high-efficiency. These trade allies also estimated the share of sales made in the past two years that were energy-efficient items. About one-fifth of this group (19%) categorized *all* of the equipment they sold in the past two years as high-efficiency equipment (Figure 81).

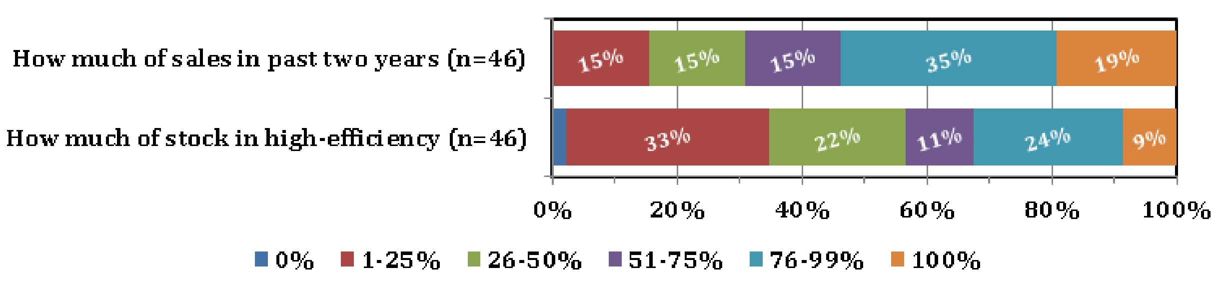

Figure 81: High-Efficiency Equipment Share, among E+ Commercial New Gas Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment and insulation that qualify for rebates. In *insulation* projects, 96% of respondents mention lower energy bills to the customer, 81% mention the rebate, and 78% mention the high quality of the product (Table 287). In energy-saving *equipment* promotion, 87% of respondents stress lower operation costs and 86% the NWE rebate (Table 288).

Table 287: Customer Benefits of Insulation, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=27)	96%
Utility rebate (n=27)	81%
High-quality of product (n=27)	78%
Comfort (n=27)	74%

Table 288: Customer Benefits of Equipment, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=79)	87%
Utility rebate (n=79)	86%
High-quality of product (n=79)	65%
Lower maintenance costs (n=79)	59%

About 15% of these trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these dozen mentioned cost or reliability concerns with the equipment, primarily.

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. One-third (33%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. A higher percentage (42%) of *insulation* installers also recalled qualifying installations when no rebates were sought. Among the reasons reported in the following Table, no single reason stands out as a barrier to rebate applications (Table 289).

Table 289: Circumstances When Rebate Foregone, among E+ Commercial New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Unspecified or unclear (n=21)	25%
Customer did not apply (n=21)	19%

(Allowed Multiple)	Percent
Rebate too small (n=21)	19%
Trade ally unaware of rebate/program (n=21)	14%
Customer ineligible (n=21)	14%
Applying takes too long or difficult (n=21)	14%

12.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (67%) of these trade ally respondents reported that they had trained staff to talk to customers about energy efficient choices. In fact, 51% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 290).

Table 290: Rebate Initiator, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=90)
Almost always trade ally initiated	51%
Mostly trade ally initiated	27%
About half trade ally and half customer	14%
Almost always customer initiated	7%
Other	1%

When a customer is considering insulating their building, respondents suggest the rebate program to the customer 92% of the time, rather than waiting for the customer to show interest in rebates. Likewise, once a customer is considering an actual equipment purchase, 95% of respondents suggest options that qualify for a rebate to the customer.

Trade allies also indicated whether they had any reservations about recommending the program to their customers. Most surveyed trade allies (78%) indicated that nothing about the program raised issues or concerns for them around their customers’ participation. Among the 22% of respondents who had initial concerns, the following table suggests concerns about both rebate processes, and perhaps the rebate not applying to customer equipment choices (Table 291).

Table 291: Initial Concerns, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=20)
Unclear processes or qualifications	45%
Too much paperwork	15%

	Percent (n=20)
R-value problems	15%
Other	15%
No LED rebate	10%

A notable minority (30%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" most often notified their customers on a quarterly basis (Table 292).

Table 292: Customer Contact Frequency, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=26)
Once a quarter	38%
2 times a year	15%
Once a year	15%
Once a month	12%
Every day	12%
Varies by customer	8%

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (55%) reported working with the customer in a joint effort to prepare the applications. Another 30% did all or most of the application themselves (Table 293).

Table 293: Rebate Application Preparer, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=87)
Typically both trade ally and customer	55%
Typically trade ally prepares all or most of the application	30%
Typically the customer prepares all or most of the application	14%
Depends on the rebate	1%

About three-quarters (76%) of the 73 trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process is simple to follow.

The majority (from 59% to 84%) of trade ally respondents rated elements of information they received from NWE on rebates and contacting program staff as "clear" or "very clear" (Figure 82).

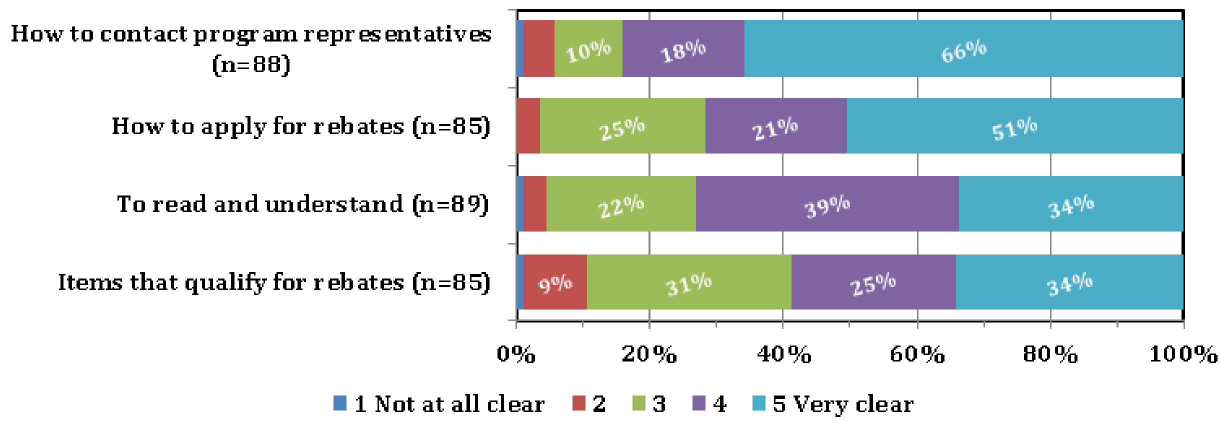

Figure 82: Clarity of Program Information, among E+ Commercial New Gas Rebate Trade Allies

Respondents rated their agreement with several positive statements related to staying current with program changes. At least 66% of respondents "agreed" or "completely agreed" with the statements listed in the table below (Figure 83).

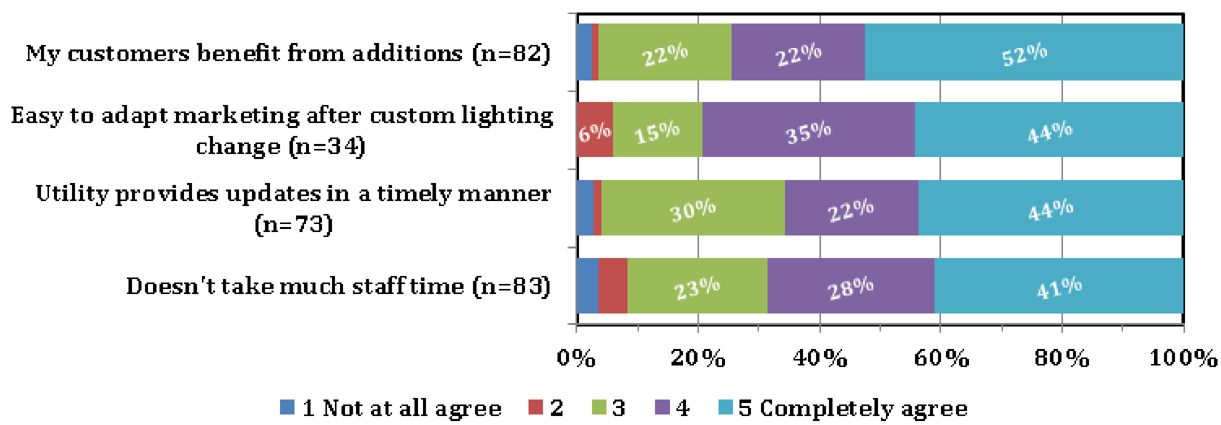

Figure 83: Experience With Program Changes, among E+ Commercial New Gas Rebate Trade Allies

We asked respondents what products and equipment they would like to see added to the list of qualifying measures for NWE programs. LED lighting was most commonly suggested (Table 294). These trade allies indicated they suggested the items primarily because "it's more efficient," and also "customers request the equipment" (Table 295).

Table 294: High Efficiency Equipment Suggested, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=32)
LED lighting	53%
Other heating systems	19%
Other	13%
Heat pumps	9%
On demand water heaters	6%

Table 295: Reasons Equipment Should Be Added, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=31)
It's more efficient	32%
Customers request them	19%
Where industry is going	16%
Rebate will increase sales	13%
Cost	6%
Other	13%

12.3.4.4. Firmographics

A few trade allies (24%) operate at more than 20 Montana locations. More than half (52%) of respondents serve five or fewer locations.

Table 296: Number of Montana Locations, among E+ Commercial New Gas Rebate Trade Allies

	Percent (n=90)
1 location	31%
2 to 5 locations	21%
6 to 10 locations	16%
11 to 20 locations	9%
21 to 50 locations	8%
Over 50 locations	16%

Trade allies reported on the maximum number of miles they would travel to serve clients. The percentage of trade allies reporting travel at the lower and upper ends of the range is similar, with 22% traveling less than 100 miles, and 18% traveling more than 400 miles. The majority would travel between 101 and 200 miles to serve a client (Figure 84).

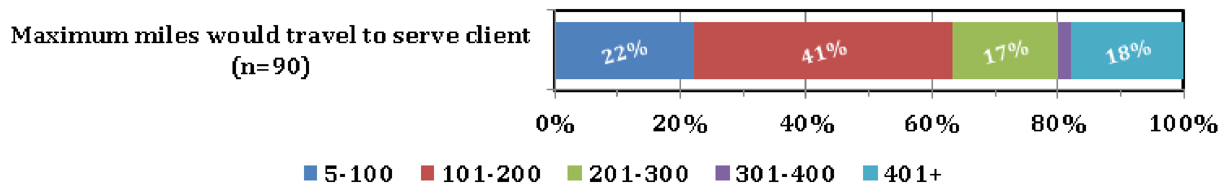

Figure 84: Maximum Miles, among E+ Commercial New Gas Rebate Trade Allies

12.4. Recommendations

12.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Increased marketing:** Consider increasing marketing efforts to increase awareness of the efficiency opportunities that NWE offers. During the site inspections, many customers inquired about getting incentives for efficiency improvements that they were considering. Often they were not aware that they could go to the NWE website to get information regarding the efficiency programs.
- **New construction program changes:** New construction programs in general have had few participants in recent years. Consider increasing marketing efforts to increase participation. Also consider combining gas and electric programs into a single new construction program to reduce administrative costs.
- **Updated values:** Update UES values for the measures included in this program. The UES savings for several of these measures have a large range across the applicable building classification, so it is important that the UES values be applied on a facility-type basis to improve the accuracy of the savings estimates. These measures include efficient heating system, efficient water heating, ceiling insulation, and DHW pump clock. Continuing the current method of applying a single average value will result in widely varying realization rates during the evaluation. For the efficient heating system and efficient water heater measures, the savings should be based on equivalent full load hours rather than the estimated capacity per square foot. This will make the calculation more direct and transparent, and reduce sources of error. For the boiler tune-up, thermostats and efficient windows measures, the evaluation UES values should be adopted. Also consider expanding the efficient windows measure to include the retrofit of single pane windows.

12.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Commercial New Gas participants responses indicate that trade allies play an important role in program outreach: nearly all participants reported learning of the program through their contractor. Half also heard through utility advertising or direct mail. Nearly all participants want more information about NWE efficiency programs and other efficiency opportunities. Participants reported positive program experiences, but some felt that information both about the inspection and about how to contact program staff with questions was unclear, and respondent responses on the ease of applying for a rebate were mixed. (The evaluators note that program application materials clearly state how to reach program staff.)

Surveyed commercial trade allies reported positive experiences with the program, and indicated they played an important role in suggesting the program to customers: nearly all trade allies reported that they proactively suggested the program to their customers. Trade ally responses generally reveal that they have sufficient information to effectively deliver the program.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.

- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

13. E+ Electric Motor/Rewind Rebate

13.1. Program Description

The E+ Motor Rebate program has two components, Premium Efficiency Motor Rebates and Motor Rewind Rebates. The program serves the commercial, industrial, institutional, and agricultural sectors. Electric supply customers and electric choice customers < 1 MW are eligible for the program. Program rebates are funded through DSM supply rates and with USB funds for small Choice Customers. Motor management training is funded with USB funds.

Premium Efficiency Motor Rebates:

The program for new motor purchases began in August 2006 and was discontinued December 31, 2011 due to an upgrade in minimum federal motor efficiency standards. Under the program, customers purchased new NEMA Premium efficiency motors and received a rebate after submitting a mail-in rebate application.

Motor Rewind Rebates:

The rewind program began in 2008. Customers having motors rewound participate through a rewind shop certified as a Green Motors Practice Member. These are rewind shops with technicians trained in best practice motor rewind methods, producing rewound motors of equal or better efficiency than new. Efficiency losses from conventionally rewound motors typically reduce original motor efficiency by 2%-3%. Qualifying motors for the rewind program must be NEMA Premium, EPAct, or standard motor designs A and B.

Both programs offered dealer incentives beginning in September 2008.

Additional Services

Motor Management Training classes are offered annually throughout the NWE service territory.

13.1.1. Energy Savings

Energy savings for new premium efficiency motors are determined by calculating pre and post annual motor energy use. The pre annual kWh calculation uses the code baseline motor efficiency rating for that motor type; the post calculation uses the motor's nameplate NEMA efficiency rating. Amps and volts for both calculations are per the motor nameplate. The customer provides annual operating hours for each motor. The savings are the difference between the annual pre and post kWh calculations.

Energy savings calculations for rewound motors are similar to the premium efficiency motors described above with the exception that the baseline motor efficiency is the original pre-rewind nameplate efficiency. After the motor rewinding process is complete, the Green Motors Practice technicians test the motor and establish a new nameplate efficiency rating, which is used for the post-rewind kWh calculation.

13.1.2. Marketing

The program is promoted at NWE's Motor Management Training sessions. The annual training sessions are held in multiple locations around the state each year and are well attended by electricians, technicians, and facility managers. The curriculum also includes information about NWE's E+ Programs.

For both components, motor retailers and Green Motors Practice rewind shops receive annual training on the program and supplied with program application brochures.

NWE and their contract marketing team promote the program to customers and trade allies through the marketing channels established for all commercial, institutional, industrial, and agricultural sector programs. Those channels include:

- Direct customer marketing through NWE's E+ Energy Appraisal for Small Business Program, the small commercial audit program
- Direct customer marketing by meeting with customers at their business sites, and at conferences and community events
- Attending and presenting at professional and trade association meetings such as those for healthcare, hospitality, architects, engineers, and service organizations
- Direct program marketing to trade allies, electrical equipment distributors, irrigation contractors, HVAC and lighting contractors
- Targeted advertising in television and print media
- Co-sponsoring regional energy conferences with trade allies and local governments

Beginning in the fourth quarter of 2011, there was an increase in non-residential marketing activity due to the expansion of the contract marketing team.

13.1.3. Program Steps

Customers follow these steps to apply for rebates:

Premium Efficiency Motor Rebates:

- Consult NWE tables to determine motor eligibility based on horsepower, motor type, NEMA minimum efficiency rating, and rebate amount.
- Complete the E+ Motor Rebate application
- Attach copies of the invoice with all pertinent motor information, their NWE electrical bill, and a completed W-9 form.

Motor Rewind Rebates:

Motors qualifying for the rewind program must be NEMA Premium, EPAct, or standard motor designs A and B. Only motors rewound by certified Green Motors Practice Members qualify.

- Consult NWE tables to determine motor eligibility based on horsepower, motor type, NEMA minimum efficiency rating, and rebate amount.
- Complete the E+ Motor Rewind Rebate application
- Attach copies of the invoice with all pertinent motor information, their NWE electrical bill, and a completed W-9 form.

All motors receiving rebates are subject to an on-site inspection by a NWE representative. The inspection rate is 25% of the rebated motors or motor rewinds where the rebate is greater than or equal to $200.

13.2. Impact Evaluation

13.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

13.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

Since this was a custom program, the NWE program savings were based on measure-specific engineering calculations. We performed a review of the program algorithm for each sampled site. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the as-built conditions observed during the site visit. For measures where the NWE method was not adequate, we recalculated energy (kWh) and demand (kW) savings using the more reliable techniques.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and were producing energy savings. We collected data as necessary to support a re-estimation of energy (kWh) and demand (kW) savings, using the calculation method that resulted from the algorithm review, discussed above. For some sampled cases the data collection included one-time and/or short terms measurements of parameters relevant to the energy performance of the installed measures. We calculated evaluation energy (kWh) and demand (kW) by applying the final calculation method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

13.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

13.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

13.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

13.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

13.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

13.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 16 sampled cases for this program across the five program years. The results from this review revealed very minor data entry errors in the program tracking database. The data entry errors that were found included:

- No entries made for premium motor efficiency, horsepower or RPM

We re-calculated annual energy savings (kWh) after corrections were made to the minor data entry errors listed above. This resulted in a program savings adjustment rate of 0.99 for the file reviews.

Program Algorithm Review

We reviewed the algorithms used by the program to estimate program savings for the measures installed in the sampled cases. The program algorithm was based on baseline and implemented motor efficiencies, annual hours of operation, motor horsepower and an assumed 75% motor load. We obtained baseline and implemented motor efficiencies from NEMA EPAct and Premium efficiency lookup tables, respectively. We used the same approach to calculate evaluation savings, adjusting the baseline and implemented efficiencies according to site visit findings.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection.

We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited.

We successfully recruited and inspected all six sites in this program.

Table 297: Site Recruitment Disposition for E+ Electric Motor Rewind/Rebate

	Total n	%
Recruitment		
Telephone Lab	2	
Special Effort		
Attempts	4	
No Reply	0	0.0%
Refused	0	0.0%
Recruited	4	100.0%
Total Recruited	6	
Onsite		
Refused	0	0.0%
Not Needed	0	0.0%
Total Completed	**6**	**100.0%**

Site Inspections

We performed site inspections for a sample of six measures that were assigned to the 2010–2011 program years. We found that the measures were generally implemented as specified in the program documentation.

In one case, we could not locate all of the installed measures because documentation for five of nine motors was not available at the time of the site visit. We subsequently obtained this data and found sufficient evidence provided that the site visit findings were considered a sampling of the installed motors.

We calculated savings for each sampled measure by applying the evaluation calculation method to the as-built conditions observed during the site visit. In half the cases we found the evaluation site-specific savings to be in agreement with the reported savings. For one of the sampled sites, we found the baseline motor efficiency used in the algorithm to not be in agreement with values in the NEMA lookup tables. Our correction resulted in a reduction of savings as compared to the program estimates of savings. We found an increase in annual operating hours that resulted in increased savings from tracking values for one of the sites, while we found a second site to have reduced hours of operation with a commensurate reduction from the tracking savings value. The net impact of the site visit adjustments was a reduction in savings from the reported values.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 298: File Review and Site Visit Adjustment to Savings for E+ Electric Motor/Rewind Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Electric Motor/Rewind Rebate	kWh	80,333	79,615	72,977	72,316	0.99	0.91	0.90

13.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 299: Savings Adjustments by Calendar Year for E+ Electric Motor/Rewind Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Electric Motor/Rewind Rebate	kWh	2007	9,792	0.90	-	-	0.90	8,815	1
	E+ Electric Motor/Rewind Rebate	kWh	2008	464	0.90	-	-	0.90	418	0
	E+ Electric Motor/Rewind Rebate	kWh	2009	52,623	0.90	-	-	0.90	47,371	5
	E+ Electric Motor/Rewind Rebate	kWh	2010	7,299	0.90	-	-	0.90	6,571	1
	E+ Electric Motor/Rewind Rebate	kWh	2011	10,155	0.90	-	-	0.90	9,142	1
	E+ Electric Motor/Rewind Rebate	kWh	All Years	80,333	0.90	-	-	0.90	72,316	8
Electric										
	E+ Electric Motor/Rewind Rebate	kWh	All Years	80,333	0.90	-	-	0.90	72,316	8

13.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 300: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Electric Motor/Rewind Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Electric Motor/Rewind Rebate	kWh	2007	8,815	0.65	0.69	0.57	0.71
	E+ Electric Motor/Rewind Rebate	kWh	2008	418	0.03	0.04	0.04	0.03
	E+ Electric Motor/Rewind Rebate	kWh	2009	47,371	0.90	1.50	1.20	0.99
	E+ Electric Motor/Rewind Rebate	kWh	2010	6,571	0.61	2.08	1.65	0.67
	E+ Electric Motor/Rewind Rebate	kWh	2011	9,142	0.19	2.24	1.86	0.21
	E+ Electric Motor/Rewind Rebate	kWh	All Years	72,316	0.50	1.19	0.99	0.55
Electric								
	E+ Electric Motor/Rewind Rebate	kWh	All Years	72,316	0.50	1.19	0.99	0.55

13.3. Process Evaluation

13.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with five E+ Electric Motor/Rewind Rebate participants and 29 trade allies. Surveyed trade allies include those who reported offering motors and/or motor rewind products and services to commercial end-users. All four trade allies who reported offering motor rewind services also reported offering motor products.

13.3.2. Implementation Findings

13.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE's website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website; one set addresses motor rewinds. Program staff provide assistance for questions about the process through a customer help line.

To obtain a rebate, the customer must mail or fax a completed application form and the contractor's invoice to program staff. Program staff ensure all approved applications include a current NWE bill or accurate NWE account number for the building where the installation occurred. A completed Internal Revenue Service W-9 form is required as well.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

The implementation contractor has added more marketing staff in recent years and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. In addition, E+ Program Contractors conduct one-on-one and group outreach to promote the program. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

13.3.2.2. Best Practices Assessment

Table 301 through Table 304 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 301: Program Planning and Design Best Practices for E+ Electric Motor/Rewind Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions

Practice	NWE Assessment
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 302: Program Management and Administrative Best Practices for E+ Electric Motor/Rewind Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact

Practice	NWE Assessment
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 303: Marketing and Outreach Best Practices for E+ Electric Motor/Rewind Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website

Practice	NWE Assessment
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 304: Program Quality Control Best Practices for E+ Electric Motor/Rewind Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size

Practice	NWE Assessment
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

13.3.3. Participant Findings

We surveyed five non-residential NWE customers who participated in a high-performance (National Electrical Manufacturer's Association Premium® efficiency-level) electric motor rebate or a motor "rewind" rebate offer.

Interpreting Response Frequencies

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

13.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about their motor use, how they learned about energy efficiency from NWE, the kind of additional information they wanted, as well as providing information about their decision to participate in this rebate program for electric motors.

Four out of five of these respondents had visited NWE's website. The one non-visitor said he did not have access to the Internet. Among the four respondents who did use the website, *all* did so to learn about rebates and audits and most (75%) also sought utility contact information and/or money-saving tips (Table 305). Responding website users agreed that the website information was easy to find and helpful.

Table 305: Website Use, among E+ Electric Motor/Rewind Rebate Participants

(Allowed Multiple)	Percent
Learn about rebates or audits (n=4)	100%
Utility contact information (n=4)	75%
Money saving tips (n=4)	75%
Pay utility bill (n=4)	25%
Energy saving educational opportunities (n=4)	25%
How-to-videos (n=4)	25%

This group of program respondents said they would like NWE to provide additional energy efficiency program information and energy-saving educational opportunities (Table 306). Those desiring further information mostly prefer to receive information via mail and email, but two respondents expressed interests in a community event or workshop.

Table 306: Further Information Desired, among E+ Electric Motor/Rewind Rebate Participants

(Allowed Multiple)	Percent
Energy efficiency programs (n=5)	100%
Energy saving educational opportunities (n=5)	100%
Workshops or events on energy efficiency (n=5)	60%
Does not want any (n=5)	0%

Respondents provided general information about their motor use. The five respondents surveyed who received motor or rewind rebates each operated different fleets of motors. One respondent organization operated five motors, while the others operated more than forty-five motors—one organization operated 300 motors (Table 307). When compared to our larger sample of 198 commercial respondents, a higher percentage of E+ Electric Motor/Rewind respondents operated large fleets of motors than other commercial NWE program respondents (see Table 307 and Figure 85). Additionally, three E+ Motor/Rewind respondents reported buying none, five, or twelve motors per year; a somewhat higher percentage of motor purchases than that reported by other commercial program respondents who purchased motors.

Table 307: Number of Motors Used, among E+ Electric Motor/Rewind Rebate Participants

Number	Percent (n=5)
5	20%
48	20%
70	20%
95	20%
300	20%

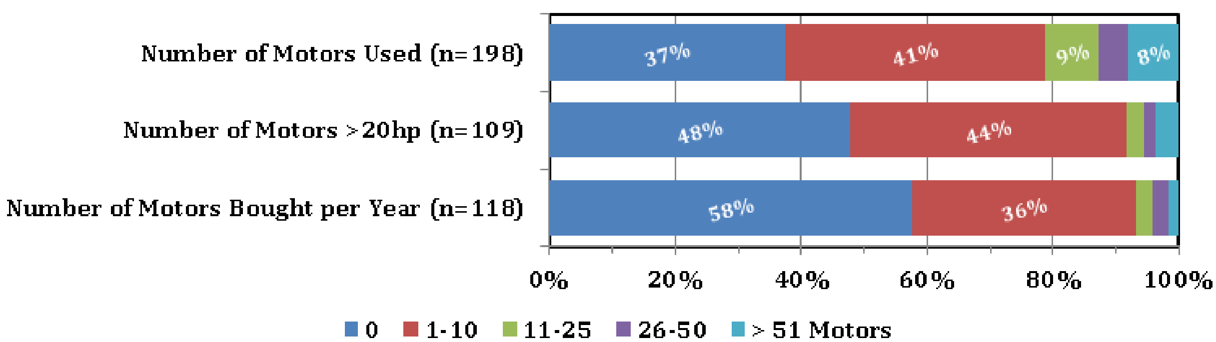

Figure 85: Number of Motors Used, among Other Commercial Program Participants

The five E+ Electric Motor/Rewind Rebate respondents were asked a series of questions about how they handle motor replacements. Majorities kept a stock of spare motors, knew about motor rewinding, and knew of a shop that conducted motor rewinds. Less than half of these respondents had attempted to buy a NEMA Premium certified motor. One of these respondent organizations had a policy to purchase *only* NEMA premium efficiency motors (Table 308).

Table 308: Awareness and Motor Policies, among E+ Electric Motor/Rewind Rebate Participants

	Percent
Awareness of Rewind Shops (n=4)	100%
Awareness of Motor Rewinding (n=5)	80%
Keep A Spare Stock of Motors (n=4)	75%
NEMA Premium Motor Attempted (n=5)	40%
Purchasing Policy For Only NEMA Premiums (n=5)	20%

Table 309 shows the responses given to the same questions by the larger samples of commercial energy efficiency program participants. Compared to the larger sample, Motor/Rewind respondents were at least twice as likely to: keep a spare stock of motors (75% vs. 33%), be aware of motor rewind opportunities (80% vs. 48%) or rewind shops (100% vs. 57%), have attempted to buy NEMA premium motors (40% vs. 15%), or to have a purchase policy for only NEMA premium motors (20% vs. 6%).

Table 309: General Awareness and Policy, among Other Commercial Program Participants

	Percent
Awareness of Rewind Shops (n=28)	57%
Awareness of Motor Rewinding (n=61)	48%
Keep A Spare Stock of Motors (n=121)	33%
NEMA Premium Motor Attempted (n=110)	15%
Purchasing Policy For Only NEMA Premiums (n=121)	6%

Two of the five program respondents (40%) reported rewinding two or three motors each year, on average. Among the larger sample of other commercial program participants who have motors, 57% reported knowing of a rewind shop. Among this sample of commercial firms with motors who had not participated in this program, 45% reported rewinding between 1 and 20 motors per year.

The five surveyed E+ Electric Motor/Rewind Rebate participants reported on their awareness of the program, and their participation influences. Respondents became aware of the motor rebate program chiefly by contacting NWE directly or in communication with a building professional, associated vendor or contractor (80% each; Table 310).

Table 310: Means of Program Awareness, among E+ Electric Motor/Rewind Rebate Participants

(Allowed Multiple)	Percent
Directly contacted utility (n=5)	80%
Building professional, vendor, or contractor (n=5)	80%
Utility publication or advertisement (n=5)	60%
Utility representative appearance (n=5)	40%
Word of mouth (n=5)	40%

Respondents were asked to rate the influence of various program-components on their decision to purchase an efficient motor. Within this small group of respondents, no one reason emerges as a common influence (Figure 86).

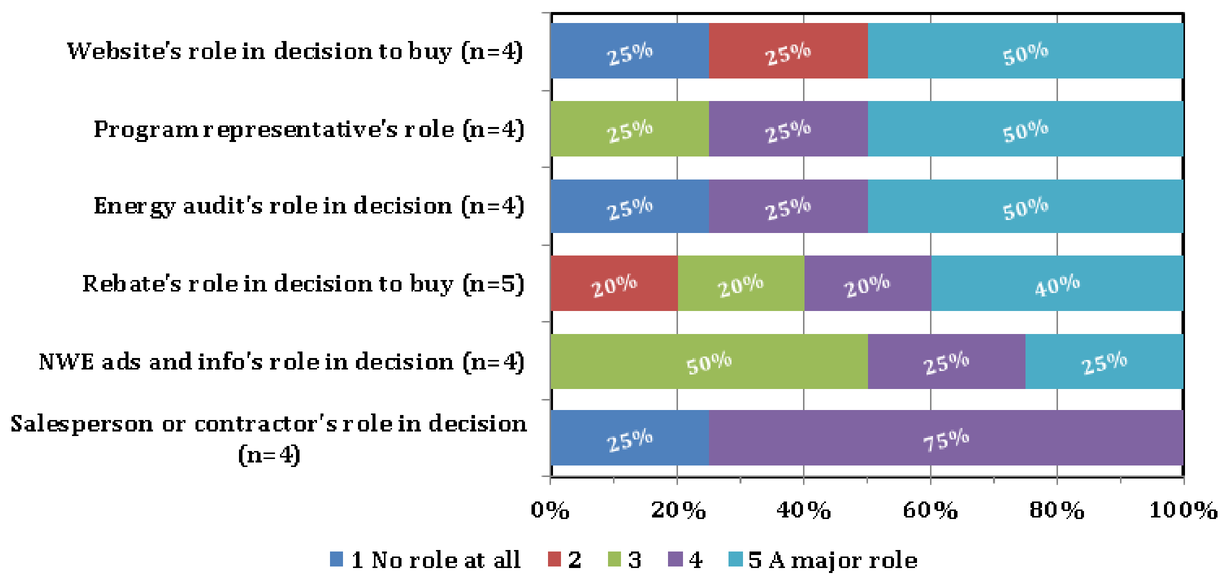

Figure 86: Influences on Purchase Decision, among E+ Electric Motor/Rewind Rebate Participants

When considering this motor efficiency program, all of these participants said that nothing had raised questions or concerns about participating. We also asked respondents if a list of typical reasons for participation applied to them. All were interested in participating to “save energy and money” and majorities agreed with the other reasons listed, such as needing the rebate to offset costs. Three respondents had prior experience with a NWE efficiency program (Table 311).

Table 311: Reasons For Program Participation, among E+ Electric Motor/Rewind Rebate Participants

(Allowed Multiple)	Percent
Save energy and money (n=5)	100%
Contractor recommendation (n=5)	80%
Easy to use the program (n=5)	80%
Rebate needed to offset cost (n=5)	80%
Check specific equipment performance (n=5)	80%
Utility vouched for equipment by rebating (n=5)	60%
Wanted to follow audit with action (n=5)	60%
Good experience with other NWE efficiency program (n=5)	60%

13.3.3.2. Program Experience

Respondents reported on several aspects of their program experience, including rebate application, motor installation, and inspection processes, as well as whether they would participate in NWE efficiency programs again.

Discussions of the rebate opportunity were initiated by *both* the respondent's organization and the associated vendor or contractor in 40% of cases, solely by the associated vendor/contractors just as often (40%), or by the respondent's organization 20% of the time (Table 312).

Table 312: Project Initiator, among E+ Electric Motor/Rewind Rebate Participants

	Percent (n=5)
Associated vendors or contractors	40%
Discussion between both	40%
My organization	20%

Respondents reported varied roles in the application preparation. Two respondents reported that their organization had completed the application, and two reported that their vendor or contractor had completed it (Table 313).

Table 313: Rebate Application Preparation, among E+ Electric Motor/Rewind Rebate Participants

Application Prepared By:	Percent (n=5)
Associated vendor or contractor	40%
My organization	40%
My organization assisted by vendor/contractor	20%

E+ Electric Motor/Rewind Rebate respondents rated the clarity of six types of program information provided by NWE. Information related to what equipment qualifies and how to apply for a rebate was rated “clear” or “very clear” by all respondents (Figure 87).

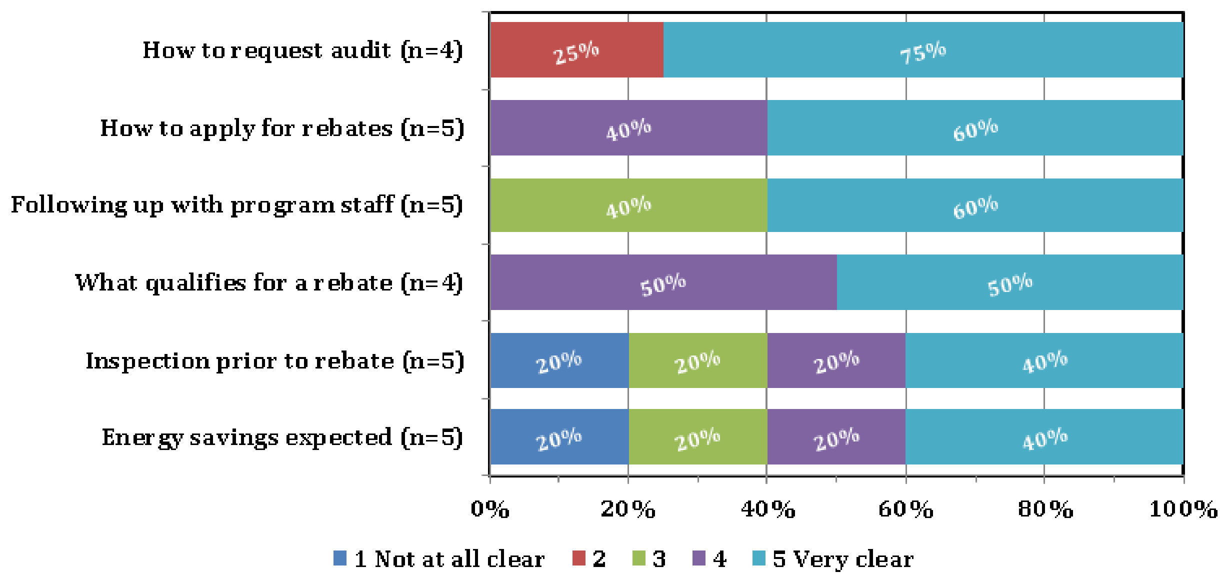

Figure 87: Clarity of Program Information, among E+ Electric Motor/Rewind Rebate Participants

We asked respondents to rate their agreement with six positive statements related to program participation and the installation of equipment. These responded reported “agreeing” or “completely agreeing” (ratings of “4” and “5” on a five-point scale) with all positive statements at least 75% of the time. All respondents agreed that motor equipment savings met expectations, applying was easy, rebates were timely, and program representatives were courteous (Figure 88).

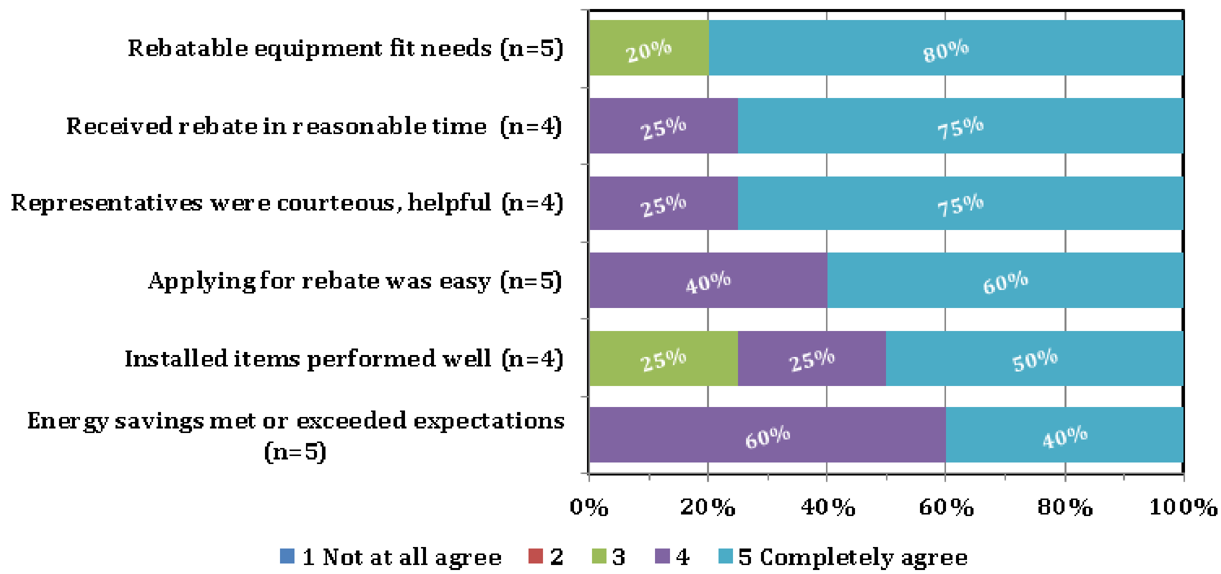

Figure 88: Experience With Installation, among E+ Electric Motor/Rewind Rebate Participants

After installation, 60% of the respondents, or three, reported having an on-site inspection by a utility representative. All "completely agreed" that the inspector was courteous and efficient.

As a general indicator of overall attitudes about NWE efficiency programs, we asked participants about whether they would be likely to participate in NWE efficiency programs in the future. All five respondents were "very likely" to participate in future NWE energy efficiency programs.

13.3.4. Trade Ally Findings

We surveyed 29 NWE trade allies who sold high-efficiency electric motors, including four who provided motor rewind services to commercial customers that qualified for program rebates.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

13.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Most often, respondents learned about high-efficiency motor or motor rewind rebates from a utility publication (83%) or from an NWE representative attending an event or meeting (75%). In addition, majorities of respondents reporting hearing about NWE motor program opportunities in several other ways (Table 314).

Table 314: Means of General Program Awareness, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=29)	83%
Utility representative appearance (n=28)	75%
Directly contacted utility (n=29)	69%
Utility website (n=29)	62%
Word of mouth (n=29)	55%
Associated vendors and contractors (n=29)	52%

Trade ally respondents often learned about specific program requirements from a utility representative (48%) at a meeting or event, or by contacting NWE directly (45%; Table 315).

Table 315: Specific Requirements Awareness, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=29)	48%
Directly contacted utility (n=29)	45%
Utility publication (n=29)	28%
Utility website (n=29)	14%
Associated vendors and contractors (n=29)	3%

A large majority (85%) of surveyed trade allies visited the NWE website. Among these website users, most (82%) said they used the site to find information on rebates or audits. Smaller majorities had used the site to access and print rebate forms (64%) or searched for NWE contact information (59%;Table 316).

Table 316: Website Use, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=22)	82%
Print rebate forms (n=22)	64%
To contact utility (n=22)	59%
Money saving ideas (n=22)	41%
Educational events information (n=22)	36%
How-to videos (n=22)	0%

Finding helpful information on the website was not as easy for these motor/rewind website users compared to many of the other trade allies we surveyed. Although majorities of other trade allies "agreed" or "completely agreed" that web information was easy to find and helpful, only 29% of the Motor/Rewind allies agreed (Figure 89).

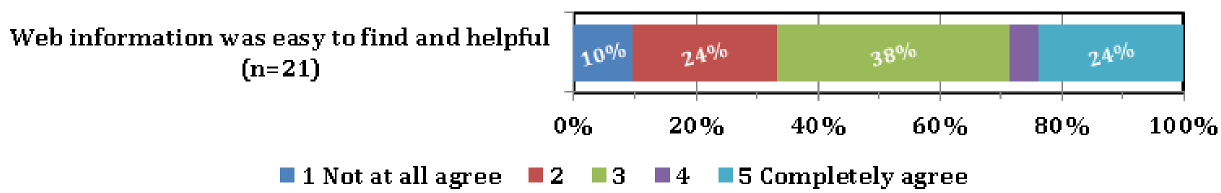

Figure 89: Website Effectiveness, among E+ Electric Motor/Rewind Rebate Trade Allies

Trade ally respondents also described the reasons they typically contact NWE. Three-fourths (76%) reported they had contacted NWE to learn how the rebate program works (Table 317).

Table 317: Reasons for Contacting NWE, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=29)	76%
Investigate status of an application (n=29)	48%
To resolve a problem (n=29)	48%
Investigate status of a rebate payment (n=29)	45%
None of these (n=29)	17%

Over half (62%) of surveyed trade allies would like NWE to sponsor additional workshops or events on energy efficiency. Many were also interested in additional information about energy efficiency programs and/or energy-saving educational opportunities as well (Table 318).

Table 318: Further Information Desired, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=29)	62%
Energy efficiency programs (n=29)	48%
Energy saving educational opportunities (n=29)	45%
None (n=29)	31%

Those wanting further information cited various means by which they would like to receive information, including by email (41%), mail (34%), or training (24%; Table 319).

Table 319: Information Delivery Preference, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
Email (n=29)	41%
US mail (n=29)	34%
Trainings, workshops or seminars (n=29)	24%
Community event (n=29)	21%
Webinar (n=29)	21%
Phone (n=29)	3%

13.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their promotion of energy efficient equipment.

We asked trade allies whether the equipment they had in stock typically included high-efficiency equipment that qualifies for NWE rebates. Among the 18 respondents who were able to specify, over half (56%) said they stocked standard or unrated equipment and ordered efficient equipment when needed for rebates. Fewer motor rebate trade allies (44%) described their stock as typically including high-efficiency equipment.

Three-quarters of the trade allies surveyed sold a range of equipment that gives customers a “Good,” “Better,” and “Best” equipment option. All respondents agreed that the “Better” and “Best” equipment is typically more energy efficient, and 74% of respondents presented customers with the “Best” option first (Table 320).

Table 320: Equipment Sales Approach, among E+ Electric Motor/Rewind Rebate Trade Allies

	Percent
Typically sell a range that gives customers GOOD, BETTER or BEST (n=26)	73%
Agree that BETTER and BEST typically more energy efficient than 'GOOD' (n=18)	100%
Better presented first to customers (n=19)	16%
Best presented first (n=19)	74%
Present all options simultaneously (n=19)	11%

Trade allies who stocked any equipment were asked what percentage of their typical stock they would categorize as "high-efficiency" equipment. Just over half (53%) of these respondents categorized 76% or more of their stock equipment as high-efficient. The majority (88%) of those respondents who reported stocking any high efficient equipment estimated that in the past two-years three-quarters of their sales were comprised of high-efficiency equipment (Figure 90; note that those who were unable to estimate their stock or sales have been excluded from the figure).

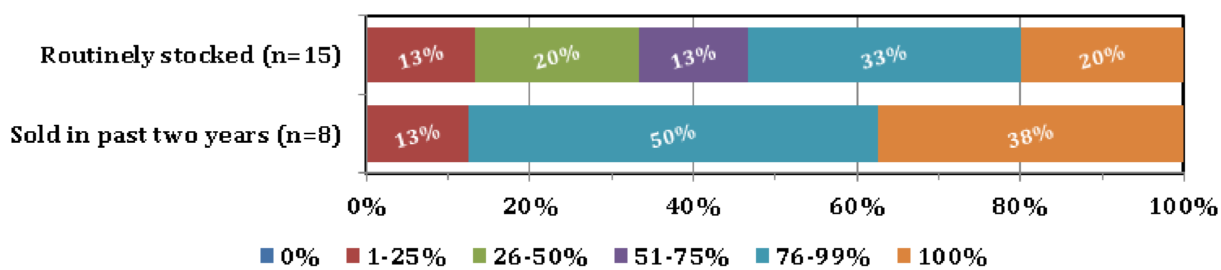

Figure 90: High-Efficiency Equipment Share, among E+ Electric Motor/Rewind Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment that qualifies for NWE rebates. All respondents reported mentioning lower operation costs and the NWE rebate to their customers (Table 321).

Table 321: Customer Benefits Mentioned, among E+ Electric Motor/Rewind Rebate Trade Allies

(Allowed Multiple)	Percent
Lower operation costs (n=26)	100%
Utility rebate (n=26)	100%
High quality of product (n=26)	77%
Lower maintenance costs (n=26)	69%

Some trade allies (15%) recalled discouraging a customer from choosing the high-efficiency option during the past two years. Awareness of customers' needs, such as lower initial cost and limitations presented by current equipment, were offered as explanations.

Motor and motor rewind trade allies were asked to rate their agreement that "my customers are much more likely to purchase a high-efficiency motor" (or a rewind option) when rebates are offered. Responses suggest that rebates may have more influence on motor purchases than on rewinds. Almost half (47%) of respondents "agreed" or "completely agreed" that rebates have an influence on the purchase of high efficiency motors. However, few (25%) motor rewind respondents agreed that rebates influence customers to consider motor rewind options (Figure 91).

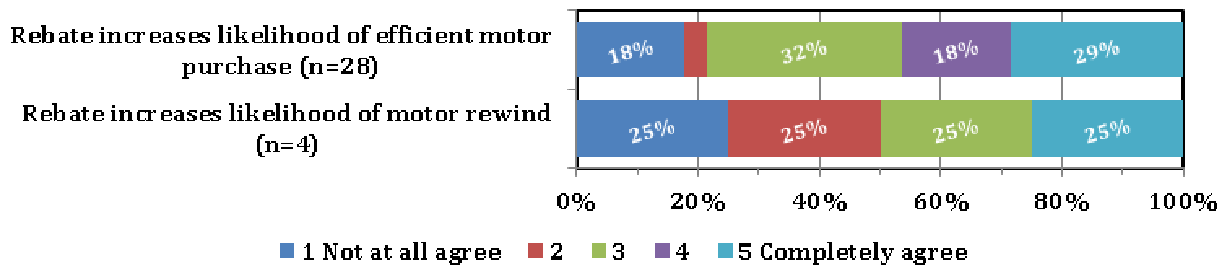

Figure 91: Rebate Influence on Customer Purchases, among E+ Electric Motor/Rewind Rebate Trade Allies

Surveyed trade allies reported on whether they had ever installed motors that would qualify, yet the rebate was not applied for. Almost half (43%) of respondents recalled installing un-rebated, but qualifying equipment. When asked under what conditions this happened, ten respondents described individual barriers, including issues with the rebate application process taking too long or being too difficult, and customers simply opting not to apply (Table 322).

Table 322: Circumstances When Rebate Foregone, among E+ Electric Motor/Rewind Rebate Trade Allies

	Percent
Customer did not apply (n=10)	30%
Trade ally unaware of rebate/program (n=10)	10%
Applying takes too long (n=10)	10%
Application process too difficult (n=10)	10%
Rebate too small (n=10)	10%
Unspecified or unclear (n=10)	30%

13.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

About two-thirds (65%) of these trade ally respondents say they had trained staff to talk to customers about energy efficient choices. In fact, half of the surveyed respondents said they “almost always” bring up the utility rebates for which their customer might qualify (Table 323).

Table 323: Rebate Initiator, among E+ Electric Motor/Rewind Rebate Trade Allies

	Percent (n=26)
Almost always trade ally initiated	50%
Mostly trade ally initiated	38%
About half trade ally and half customer	12%

When customers are considering an equipment purchase, all surveyed respondents said they typically suggest high-efficiency items that qualify for an NWE rebate rather than waiting for the customer to show an interest in qualifying for rebates.

Trade allies also indicated whether they had any reservations about their customers participating in NWE’s rebate programs. Most surveyed trade allies (81%) indicated that nothing about the program raised questions or concerns about their customers’ participation. Among the few allies who had initial concerns, respondents mentioned paperwork or unspecified rebate problems.

Many (46%) trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These “regular communicators” reported contacting customers with varied frequency from daily to once a year (Table 324).

Table 324: Customer Contact Frequency, among E+ Electric Motor/Rewind Rebate Trade Allies

	Percent (n=12)
Every day	25%
Once a quarter	17%
2 times a year	17%
Once a year	17%
Varies by customer	17%
Once a month	8%

The clarity of the rebate program information was generally rated highly. Two-thirds or more of these trade ally respondents rated information on applying for rebates, contacting program staff, and reading the program documents as "clear" or "very clear." Understanding the specific items that qualify for rebates was rated slightly lower, with 43% reporting "clear" or "very clear" ratings (Figure 92).

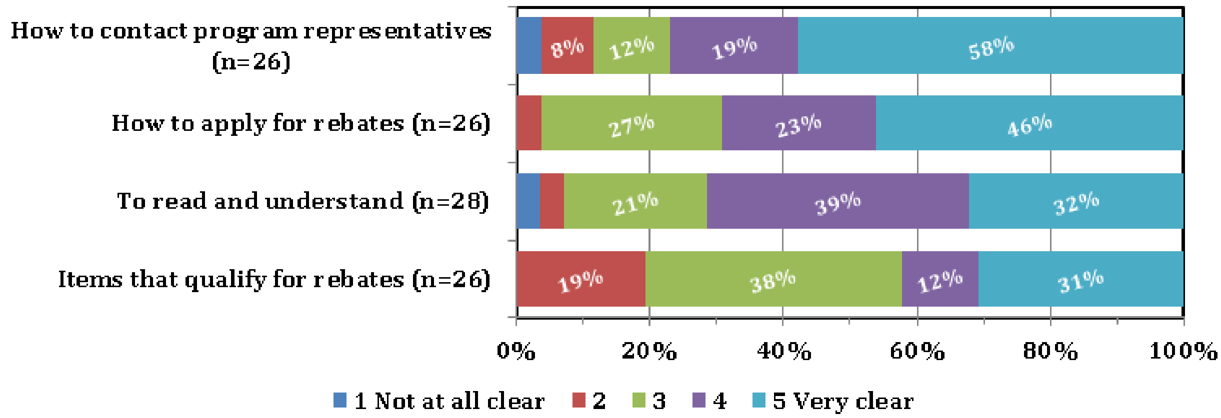

Figure 92: Clarity of Program Information, among E+ Electric Motor/Rewind Rebate Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (58%) reported working with the customer in a joint effort to prepare the applications. Another 31% of respondents prepared all or most of the application themselves.

Table 325: Rebate Application Preparer, among E+ Electric Motor/Rewind Rebate Trade Allies

	Percent (n=26)
Typically both trade ally and customer	58%
Typically trade ally prepares all or most of the application	31%
Typically the customer prepares all or most of the application	8%
Depends on the rebate	4%

About three-quarters (74%) of the 23 trade ally respondents who typically worked on the rebate application "agreed" or "completely agreed" that the process was simple to follow (Figure 93).

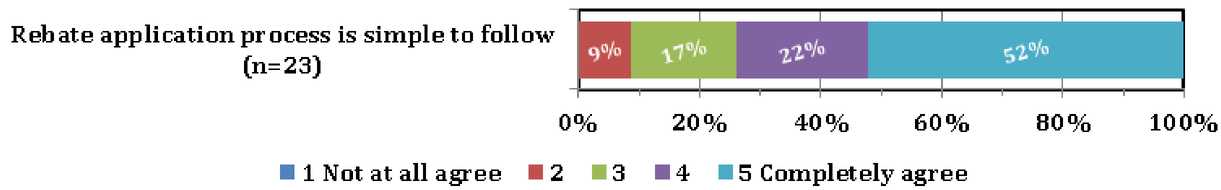

Figure 93: Experience With Application Process, among E+ Electric Motor/Rewind Rebate Trade Allies

Respondents rated their agreement with three statements related to staying current with changes NWE makes to rebate programs. There was strong agreement (73% reporting ratings of a "4" or a "5" on a 5-point scale) among these trade allies that customers benefit from program changes, and that keeping up with changes doesn't take much staff time (60%). About half of respondents (52%) agreed/completely agreed that the utility provides updates in a timely manner (Figure 94).

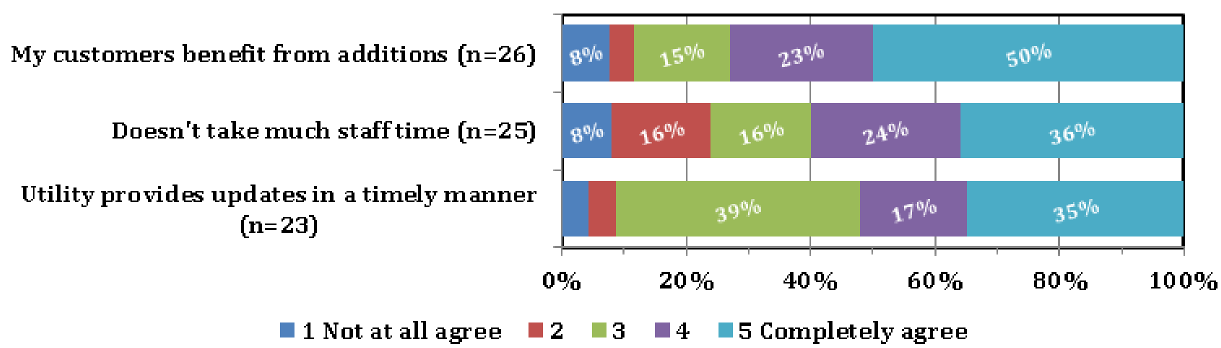

Figure 94: Experience With Program Changes, among E+ Electric Motor/Rewind Rebate Trade Allies

13.3.4.4. Firmographics

Less than one-third of the motor trade allies (29%) serve more than 20 Montana locations. Half of these allies (52%) served customers from five or fewer locations.

Table 326: Number of Montana Locations, among E+ Electric Motor/Rewind Rebate Trade Allies

	Percent (n=27)
1 location	37%
2 to 5 locations	15%
6 to 10 locations	15%
11 to 20 locations	4%
21 to 50 locations	7%
Over 50 locations	22%

Trade allies reported on the maximum number of miles they would travel to serve clients. The largest portion of these trade allies (39%) would travel between 101 and 200 miles. Fewer would travel to 100 miles or less (18%) or more than 400 miles (18%) to serve customers (Figure 95).

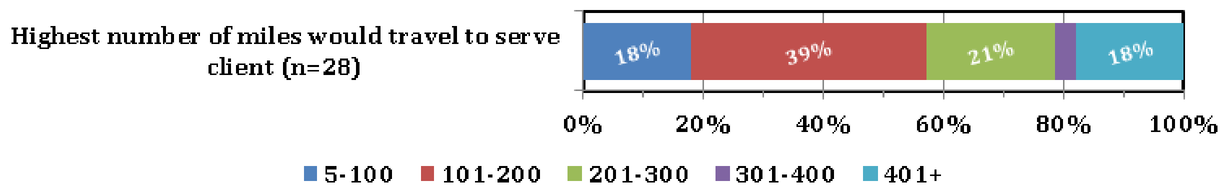

Figure 95: Maximum Miles, among E+ Electric Motor/Rewind Rebate Trade Allies

13.4. Recommendations

13.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Motor rewind program changes:** The E+ Electric Motor/Rewind Rebate program no longer offers incentives for efficient motors. The program does continue to offer a motor rewind incentive, but participation in the motor rewind portion of the program has been low. Perform a cost-effectiveness analysis of the motor rewind portion of the program to determine if it should continue to be offered, if NWE outreach efforts were increased to raise the participation rate.
- **Customer cost and incentive paid date:** The tracking database for this program does not include customer costs and incentive paid dates for each record in the savings claim. This lack of complete data for these important evaluation items complicates and increases the cost of the evaluation. Quality control measures should be instituted to ensure this information is included for all tracking records.

13.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Motor Rewind participants reported very positive program experiences. All participants reported wanting more information about efficiency programs and other efficiency opportunities, and all reported that they would be very likely to participate in future NWE efficiency programs. Participant responses indicate that trade allies play an important role in program outreach: nearly all participants reported that their contractor played a key role in their decision to participate, and all surveyed motor rewind trade allies reported proactively mentioning the rebate to customers.

While surveyed motor rewind trade allies reported positive program experiences overall, their ratings of the clarity of information about qualifying equipment and their rating of the usefulness of the website were lower than those of many other trade ally groups. These ratings suggest that trade allies would appreciate more information about qualifying equipment.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market

intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.

- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

14. E+ Free Weatherization/Fuel Switch

14.1. Program Description

The Free Weatherization and Fuel Switch program has provided weatherization and conversions from electric heat to natural gas heat to qualified low income NWE customer households since approximately 1986. The program is funded with USB dollars.

The program is a partnership between NWE and Montana's Department of Public Health and Human Services (DPHHS). In addition to NWE's USB funding, DPHHS receives program funding from federal and other sources. DPHHS contracts with ten Human Resource Development Councils (HRDCs) across Montana to implement the program.

Program eligibility requires that participants are certified by DPHHS as eligible for the Low Income Energy Assistance Program (LIEAP). Federal and state rules govern LIEAP eligibility.

NWE is not the primary administrator of this program. The HRDCs implement the projects and report the results to DPHHS. NWE reviews project information provided by DPHHS and determines the level of reimbursement for projects and measures. NWE review includes the following areas:

- The residence has not participated in NWE weatherization program in the past 10 years.
- The recipients of the service are NWE natural gas and/or electric customers and a customer or record for the residence.
- Qualifying measures must meet or exceed the Savings to Investment Ratio (SIR). Measures must currently have a SIR ≥ 1.0 as specified by DPHHS.
- Measure costs are reasonable.

Contractually, NWE has the right to inspect completed projects but seldom exercises that right. The contract requires both file and field inspections by DPHHS. If natural gas space heat or water heating equipment is installed, a NWE service technician inspects the equipment and approves the installation. NWE Service technicians also inspect existing natural gas appliances if HRDC personnel identify potential health or safety concerns.

Residences eligible for the program may be manufactured or stick-built, either owned or rented by the participants. The owner of a rental property going through the program is encouraged to contribute to the weatherization and fuel switch measures being installed and agree to not raise the rent for five years following the weatherization work.

Free Weatherization: Qualified customers first receive an energy audit conducted by the HRDC to determine which measures are appropriate and cost effective for the home.

Fuel Switch: Homes with electric heat are screened by the HRDC as candidates for conversion to natural gas heat. Homes passing the initial screening for fuel switching are referred to another NWE program contractor to perform billing data regression analysis to assess the savings potential in converting to natural gas space heat. The results of this analysis are returned to the

HRDC and NWE. The HRDC makes the determination on whether to proceed with the fuel switch.

Income qualified customers may participate in NWE's gas and electric rebate programs but may not receive rebates on measures installed through the E+ Free Weatherization program.

14.1.1. Energy Savings

Energy savings are derived from an energy simulation software program DPHHS uses as part of its compliance with federal funding requirements. Program funding is a mix of NWE's USB, federal, and other dollars. Overall funding varies from year to year, consequently the number of customers served and the associated savings vary. NWE's funding level commitments to this program are based upon PSC orders guiding allocations to low income activity funding with USB dollars.

14.1.2. History

In the 2007–2009 program years, NWE funding was provided only for measures reducing consumption of NWE-supplied fuels. In the 2009–2011 program years, all measures became eligible for funding provided the home is served by NWE for natural gas, electricity, or both. This contractual change was made in an effort to better accommodate administrative and funding needs as communicated by DPHHS to NWE.

All envelope measures are eligible for weatherization through the SIR, a benefit/cost value. Repair and health and safety measures are incorporated in the standards and are included in the total household dwelling SIR. For most of the evaluation period the SIR was 1.8, meaning that at least $1.80 in energy savings must be achieved for every $1.00 expended on weatherization. Currently, a SIR greater than 1.0 is considered to be cost effective. The SIR is computed over the lifetimes of the retrofit measures installed and expressed in terms of the net present value of the retail cost of the dwelling's fuel.

14.1.3. Marketing

NWE markets the program through bill inserts and on their website. NWE provides the HRDCs with printed materials for distribution to the participants on safety and energy management education.

14.1.4. Program Steps

NWE provides funding through a contract with DPHHS but does not administer the program with the individual agencies.

14.2. Impact Evaluation

14.2.1. Methodology

We performed an impact evaluation of this program to assess the gross energy (kWh and dkt) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews, verification of measure counts and a review of the savings estimation methods used by the program to estimate savings. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross energy (kWh and dkt) and demand (kW) savings and perform the economic analysis.

14.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh and dkt). We recorded reasons for differences with the program tracking savings.

NWE provided a detailed workbook listing each installed measure and providing the energy savings method provided by DPHHS to estimate program savings. We verified the counts of implemented measures, to the extent possible. We reviewed the energy savings method and verified that it was being applied properly. If problems were identified, we re-estimated annual energy (kWh and dkt) and demand (kW) savings.

14.2.1.2. Free Ridership

No site visits were possible for this program. Therefore, we were not able to evaluate Free ridership.

14.2.1.3. Spillover

No customer surveys or site visits were possible for this program. Therefore, we were not able to estimate spillover.

14.2.1.4. Leakage

No customer surveys were possible for this program. Therefore, we were not able to estimate leakage.

14.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

14.2.2. Energy and Demand Impacts

We estimated gross energy (kWh and dkt) and demand (kW) savings for each of the implemented measures. The results of our savings analysis are discussed below.

14.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 86 sampled cases for this program across the five program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

Review of Savings Estimation Method

Program energy savings were derived from an energy simulation software program that DPHHS uses that meets federal funding requirements. The simulation is named the CDS Energy Audit System (Version 2012e). It was developed for the DPHHS by Northrop Grumman. The CDS Energy Audit program is a simplified, web based tool used to determine the energy savings and cost-effectiveness of weatherization measures on residential low income dwellings. Outputs are determined by entering basic information about the dwelling such as location, square footage and number of occupants. More detailed inputs are made for specific measures, such as pre-retrofit and post-retrofit R-values for insulation measures.

We requested and received a copy of the model and available documentation. We reviewed the documentation and found the use of the model to be reasonable from a practical and cost perspective for a program such as this. To check the savings estimation results for reasonableness, we attempted to rerun a sample of cases with the simulation to see if we could reproduce the savings estimates in the tracking database. This proved to be very difficult and ultimately not possible because the documentation in the project files was incomplete. The documentation did not include the input screens. It did include the standard program form, completed by hand. However, the forms were not fully completed and many entries were illegible. So there was insufficient information available to successfully rerun the model.

We then attempted to check the reasonableness of the savings estimates by comparing the results from a sample of cases to the Regional Technical Forum's (RTF's) energy savings estimates for weatherization measures. The comparison were made on a per square foot basis for the affected surfaces (e.g., ceiling, wall). This comparison was complicated by the fact that the RTF estimates were for electric heat only, were not developed for low income applications and used different baseline assumptions.

The results of this work showed that NWE savings values are nearly always greater than the RTF values. However, considering the limitations of this comparison discussed above, this result is not unreasonable.

Count Verification

We reviewed the documentation of installed measures in the tracking database that was the basis for the NWE savings claim. The results from the review indicate that the data records were in order and reasonable. The measure count accurately reflected the program accomplishments claimed by NWE.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review for this program. The table compares the reported savings to those adjusted for changes based on our file review. All results shown are for gross savings.

Table 327: File Review Adjustment to Savings for E+ Free Weatherization/Fuel Switch

			Savings			Savings Adjustment Rates	
Funding	Study Name	Units	Reported	File Review	Final	File Review	Final
Electric							
	E+ Free Weatherization/Fuel Switch	kWh	1,442,579	1,442,579	1,442,579	1.00	1.00
Natural Gas							
	E+ Free Weatherization/Fuel Switch	dkt	117,486	117,486	117,486	1.00	1.00

14.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews. The table shows for each USB funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings.

Table 328: Savings Adjustments by Calendar Year for E+ Free Weatherization/Fuel Switch

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric – USB										
	E+ Free Weatherization/Fuel Switch	kWh	2007	154,536	1.00	-	-	1.00	154,536	18
	E+ Free Weatherization/Fuel Switch	kWh	2008	175,504	1.00	-	-	1.00	175,504	20
	E+ Free Weatherization/Fuel Switch	kWh	2009	351,105	1.00	-	-	1.00	351,105	40
	E+ Free Weatherization/Fuel Switch	kWh	2010	503,601	1.00	-	-	1.00	503,601	57
	E+ Free Weatherization/Fuel Switch	kWh	2011	257,833	1.00	-	-	1.00	257,833	29
	E+ Free Weatherization/Fuel Switch	kWh	All Years	1,442,579	1.00	-	-	1.00	1,442,579	165
Natural Gas – USB										
	E+ Free Weatherization/Fuel Switch	dkt	2007	20,925	1.00	-	-	1.00	20,925	
	E+ Free Weatherization/Fuel Switch	dkt	2008	18,404	1.00	-	-	1.00	18,404	

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	E+ Free Weatherization/Fuel Switch	dkt	2009	28,003	1.00	-	-	1.00	28,003	
	E+ Free Weatherization/Fuel Switch	dkt	2010	34,866	1.00	-	-	1.00	34,866	
	E+ Free Weatherization/Fuel Switch	dkt	2011	15,288	1.00	-	-	1.00	15,288	
	E+ Free Weatherization/Fuel Switch	dkt	All Years	117,486	1.00	-	-	1.00	117,486	
Electric										
	E+ Free Weatherization/Fuel Switch	kWh	All Years	1,442,579	1.00	-	-	1.00	1,442,579	165
Natural Gas										
	E+ Free Weatherization/Fuel Switch	dkt	All Years	117,486	1.00	-	-	1.00	117,486	

14.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 329: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Free Weatherization/Fuel Switch

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios: Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	E+ Free Weatherization/Fuel Switch	kWh	2007	154,536	0.10	0.10	0.10	0.11
	E+ Free Weatherization/Fuel Switch	kWh	2008	175,504	0.11	0.11	0.10	0.12
	E+ Free Weatherization/Fuel Switch	kWh	2009	351,105	0.85	0.85	0.72	0.93
	E+ Free Weatherization/Fuel Switch	kWh	2010	503,601	1.53	1.53	1.25	1.69
	E+ Free Weatherization/Fuel Switch	kWh	2011	257,833	0.43	0.43	0.41	0.47
	E+ Free Weatherization/Fuel Switch	kWh	All Years	1,442,579	0.35	0.35	0.33	0.39
Natural Gas - USB								
	E+ Free Weatherization/Fuel Switch	dkt	2007	20,925	2.49	2.49	1.51	2.74
	E+ Free Weatherization/Fuel Switch	dkt	2008	18,404	3.14	3.14	2.16	3.45
	E+ Free Weatherization/Fuel Switch	dkt	2009	28,003	1.78	1.78	1.43	1.96
	E+ Free	dkt	2010	34,866	3.81	3.81	2.70	4.19

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	Weatherization/Fuel Switch							
	E+ Free Weatherization/Fuel Switch	dkt	2011	15,288	0.79	0.79	0.74	0.87
	E+ Free Weatherization/Fuel Switch	dkt	All Years	117,486	2.10	2.10	1.61	2.31
Electric								
	E+ Free Weatherization/Fuel Switch	kWh	All Years	1,442,579	0.35	0.35	0.33	0.39
Natural Gas								
	E+ Free Weatherization/Fuel Switch	dkt	All Years	117,486	2.10	2.10	1.61	2.31

14.3. Process Evaluation

14.3.1. Methodology

We met with all key members of NWE's program team. To inform our implementation findings for this program, we interviewed those team members involved with the program. This program was delivered through DPHHS who coordinated with the local HRDCs. We spoke to one DPHHS representative and five staff (one executive director and four weatherization directors) at four HRDCs; these staff administer and manage the program for their organizations. NWE staff did not interact with participants; thus, the process evaluation research plan for this program did not include a participant sample. No trade allies were involved in program delivery.

14.3.2. Implementation Findings

14.3.2.1. Interview Findings

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

This program delivers two activities: free weatherization and fuel switching. It is a result of a longstanding relationship between NWE, DPHHS, and the HRDCs. For this program, “implementation staff” and “staff” refer to HRDC and DPHHS staff.

For free weatherization, NWE provides funds for weatherization and the HRDCs deliver the program. NWE's role in the overall program is limited to the scope defined in the contract. Income guidelines, criteria for measure eligibility and installation requirements are primarily set through DPHHS. The funding from multiple sources varies from year to year, as do expenditures and number of homes served.

NWE staff observe that one of the challenges for this program is the number of organizations that are involved. There are multiple funding streams that are combined to deliver this program, and each has different restrictions that the HRDCs have to work with. For example, NWE funding is restricted to NWE’s customers.

Significant changes to the program since 2007 have been associated with the implementation of electronic database screening and the influx of American Recovery and Reinvestment Act (ARRA) funds in program years 2009 – 2011, starting with the 2009-2010 heating season. Implementation staff widely reported being satisfied with the change to electronic database screening. Although staff reported it to be challenging to adjust to the influx of ARRA funds, a discussion of their experiences is outside the scope of this evaluation.

Fuel switching is a small part of the program, as candidates are limited to those for whom a statistical billing analysis indicates fuel switching will be cost effective. Only a handful of fuel switches are completed each year.

Weatherization Services

DPHHS typically weatherizes approximately 2,000 homes per year, of those about 800–900 per year receive NWE’s USB funding. Additional NWE low income customer homes receive weatherization services separate of NWE USB funding through other funding sources administered by DPHHS. Measures include all those supported by federal funding such as attic and wall insulation, health and safety, and minor home repairs. An HRDC may spend, on average across all homes, 15% of total project costs on minor home repairs. However, in some cases, health and safety concerns exceed the mitigation capability of the program, such as cases where asbestos is present. In these cases, the customer is given the opportunity to perform abatement, but if it is cost-prohibitive, the program must “walk away” and leave these homes unweatherized.

For the years 2009 -2011, households at 200% of the poverty level were eligible to participate in the E+ Free Weatherization program. DPHHS sets the poverty eligibility level for Montana within federal guidelines. Prior to the 2009-2010 heating season and beginning in the 2011-2012 heating season, households at 150% of the poverty level were eligible. Customers most commonly enter the program through application to LIEAP. Customers who are LIEAP-eligible are automatically prioritized at the state level based on factors such as energy burden, disability, and number of people in the household. Each HRDC works from the priority list of customers in their area starting with the homes of customers with the highest energy burden are weatherized until the funding, or funding period itself, runs out.

The HRDCs schedule the audit appointment, perform an energy audit, and determine if the home meets the minimum safety criteria. Back in the HRDC offices, the auditors enter the information into a combined tracking database and audit analysis tool operated by the DPHHS. The CDS audit analysis tool calculates and ranks all measures based on cost-effectiveness. The specific rank order is generated by an economic analysis that is a function of the cost, lifespan, and heat retention characteristics of the measure, the heating degree days, and fuel costs. A requirement of the program is that the savings to investment ratio (SIR) must be met. For much of the evaluation period the SIR was 1.8 meaning that at least $1.80 in energy savings must be achieved for every $1.00 expended on weatherization. The current SIR is 1.0. HRDC implementation staff schedule the appropriate weatherization work, which may be done either by an HRDC's in-house crew or by an independent contractor.

Weatherization crews vary among the ten HRDCs between mostly in-house staff and mostly contracted auditors and laborers. HRDCs hire only auditors who have been certified through Montana State University's auditor certification program. In addition, auditors receive extensive amounts of on-the-job training; many of them have numerous years of weatherization experience.

After completion of the weatherization services, an HRDC-hired certified inspector, who cannot be the person who did the weatherization work, conducts a final inspection to ensure compliance with the recommendations of the energy audit. This includes comparing the initial work order to the actual results on-site to ensure satisfactory installation of the measures, as well as to check for anything the initial audit may have missed. As necessary, the work crew then revisits the site to take corrective action. DPHHS also has four monitoring inspectors who conduct field inspections of 10% of the jobs conducted by each HRDC each year, in addition to reviewing every audit report.

DPHHS is responsible for developing and executing the installation contracts with the HRDCs, for compliance monitoring and enforcement of those contracts, and for monitoring the performance of the HRDCs. DPHHS's contract with NWE also calls for DPHHS to perform additional program monitoring activities including:

- A random file review of 20% of homes weatherized or fuel-switched through the program, including 10% of homes completed by each HRDC.
- A random site inspection of 15% of the homes weatherized or fuel switched through the program, including 10% of the homes completed by each HRDC.
- An annual on-site monitoring of contractors
- An annual survey of contractors
- The distribution of customer satisfaction cards to all program participants
- Periodic energy savings evaluations.

Projects must be reviewed and may be approved by DPHHS when the estimated cost of weatherization work on a residence exceeds $9,000. In addition, NWE staff inspect audit reports for discrepancies, such as previous weatherization, excessive measure cost, customer of record, invalid account numbers, SIR values meeting contract requirements, and that any space heat and/or domestic water heaters being replaced have been condemned by NWE gas service personnel. Since 2007, this screening has been done electronically, which implementers reported as an improvement to the previous manual review process.

In addition to scrutiny by NWE, the State of Montana and DOE periodically review the program's activities and performance. Most recently, the State of Montana Legislative Audit Division conducted an audit in June 2011. The program is also audited annually as part of a regularly scheduled Legislative Audit Division financial compliance audit.

The US Department of Energy also produced an on-site monitoring report in July 2010, November 2010, and May 2011 in accordance with ARRA regulations. All three of these reports found that Montana's Weatherization Assistance Program was in compliance with DOE administrative and programmatic requirements.

Weatherization Marketing

As found in the previous evaluation, program marketing occurs primarily through outreach to customers in the Low Income Energy Assistance Program (LIEAP); this is the principal gateway to program participation. To market LIEAP, DPHHS and the HRDCs employ diverse media, including billboards, television, newspapers, and radio. Websites of other public assistance programs have links to LIEAP as well.

HRDC staff members reported a minimal amount of additional marketing beyond LIEAP – such as a booth at the state fair – explaining that demand usually outstrips available funding and word of mouth is often effective at informing potential E+ program participants. As one HRDC director explained, "The demand is always there. It gets pretty intense the minute we get our first cold snap." In one interview, however, an implementer explained that ARRA funds enabled their organization to weatherize more homes than usual in 2011, having the effect of requiring additional outreach to locate qualifying customers now in 2012. This individual noted that conducting outreach in the extremely rural areas of that HRDC's part of Montana has presented a challenge.

NWE provides marketing support of the Free Weatherization program and other USB funded low income activities such as the NWE low income bill discount and emergency energy assistance through bill inserts, literature left with customers during energy audits and at home improvement shows and events, website, through customer contact center, and with occasional targeted print media. Customers are referred to their local HRDC to apply or for additional program qualifications.

Weatherization Strengths and Challenges

HRDC implementation staff viewed their partnerships with NWE as a program strength. Most of the HRDC staff interviewed for this evaluation expressed appreciation for the low-income work NWE does. One weatherization director said, "…it's a great program. It really helps a lot of people." Another said, "It's a fantastic partnership and I appreciate everything NWE does and their work."

Another perceived strength of the program is the commitment and qualifications of the weatherization auditors and installation crews who work with the low-income population through the HRDCs. During the 2012 interviews, all of the HRDC weatherization directors noted that their in-house staff as well as their subcontractors were highly qualified and experienced doing this work.

Implementers routinely perceived two primary challenges for the program:

- Insufficient funding to meet the demand for weatherization services in the low-income population; and
- Health and safety concerns (most commonly asbestos) in dwellings that prevent crews from performing weatherization services.

Although one HRDC weatherization director said that ARRA funds enabled them to weatherize enough homes in 2011 to cause a need for more outreach in 2012, all the other weatherization directors interviewed continually experience a need for weatherization services that outpaces available funding. Several of the HRDC directors also said that health and safety concerns prevent them from helping a significant portion of the low-income population, which they see as a weighty challenge in their work. One weatherization director tracked the number of E+ qualified homes in her region that were refused services due to asbestos, and it was over a third of all potential participants. Interviewees offered several examples where a simple fix would make a big difference for a client (such as a new front door that closed and sealed) but the presence of asbestos prevented the weatherization team from doing any work on the home.

14.3.2.2. Best Practices Assessment

NWE's role in this program is confined to funding and oversight; NWE has no involvement in program delivery. Thus, we do not provide a best practices assessment for this program.

14.3.3. Participant Findings

We did not speak to any participants for this evaluation.

14.3.4. Trade Ally Findings

No trade allies were involved in program delivery.

14.4. Recommendations

14.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendation for improving the program.

- **Documentation and quality control:** Institute quality control procedures that require more complete documentation from each program participant in future years. The documentation should include input screens for the model that is used to estimate savings.

Also require that standard program forms be completely filled out by the applicants or HRDC. This documentation is necessary for a reasonable degree of due diligence for future evaluations.

14.4.2. Process Evaluation

We do not offer process recommendations for this program, as the federal and state governments have that responsibility.

15. E+ New Homes

15.1. Program Description

The E+ New Homes rebate program began in 2006 and ended on December 31, 2008. Rebate funding was through DSM and marketing through USB. From 2009 through the end of 2011, the program continued to provide training, verification, targeted marketing, and advertising with USB funds. Tables in the Installed Measures and History sections below provide additional detail on measures and funding sources by year.

The Northwest Energy Efficiency Alliance (NEEA) leads the regional NW Energy Star Homes initiative and funds a separate contract with the National Center for Appropriate Technology (NCAT) for limited training, education, and certification in Montana which NWE supplements with USB funding for expanded reach in its service territory. Additionally, NWE contracted with NCAT for rebate program administration in the two years the rebate program was offered. The NWE contract with NCAT supports marketing targeted to builders and other trade allies, as well as to prospective new homeowners. Additionally, NWE funds targeted advertising for high efficiency in new homes.

Electrically-heated homes sited where natural gas is available are not eligible for the Northwest (NW) Energy Star manufactured home (Electric Heat) rebate.

15.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the program for program years 2007 - 2011. Measures marked with an “X” in the Program Year columns indicates the measure was offered by the program in all or part of that program year.

Table 330: Measures Offered for E+ New Homes

Equipment/Measure Description	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
Northwest Energy Star Manufactured Home (Electric Heat)	$/Unit	Northwest Energy Star certified non-foundation home where gas is not available	X	X	-	-	-	-	12/31/2008[3]
Northwest Energy Star Site-Built Home (Electric)	$/Unit	Northwest Energy Star certified site-built	X	X	-	-	-	-	12/31/2008
Foundation/Slab	$/Ft	Electric heat site-built home	X	X	-	-	-	-	12/31/2008

Equipment/Measure Description	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
Windows U-value ≤ 0.32	$/Ft²	Electric heat site-built home	X	X	-	-	--	-	12/31/2008
Programmable Thermostat	$/Unit	Electric heat site-built home	X	X	-	-	-	-	12/31/2008
Electric Water Heater Wrap	$/Unit	Electric heat site-built home	X	X	-	-	-	-	12/31/2008
Compact Fluorescent lamps/fixtures	$/Unit	Energy Star CFLs	X	X	-	-	-	-	12/31/2008
Compact Fluorescent lamps/fixtures			-	-	X	X	-	1/1/2009	12/31/2010[4]
Compact Fluorescent lamps/fixtures		≥ 50% of sockets that have CFL lamps	-	-	-	-	X	1/1/2011[5]	

[1] Effective measure date if it was after the beginning of the program cycle, 7/1/2006.

[2] The date the program stopped offering the measure. Customer projects with discontinued measures already contracted could extend past that date.

[3] This measure was moved to the E+ Residential New Gas Rebate program from 01/01/2009 through 03/31/2011 and then was moved to the E+ Residential New Electric Rebate program on 04/01/2011.

[4] NCAT verified NW Energy Star homes from 01/01/2009 through 12/31/2010 and claimed savings for all CFLs installed and not rebated through any other E+ Residential Lighting program.

[5] NCAT verified NW Energy Star homes starting on 01/01/2011 and claimed savings for all CFLs above 50% of sockets installed with CFLs and not rebated through any other E+ Residential Lighting program.

CFL savings are calculated by subtracting pre from post fixture Wattage, then multiplying by a deemed 3.7 hours per day. Pre Wattages are based on lumen-equivalent incandescent Wattages from the Energy Star Lumen Table.

Non-lighting measure savings used by NWE are UES values from a third party electric resource assessment study (KEMA 2003) based on average annual savings specifically for NWE Montana customers. Each UES must pass a cost-to-benefit test, based on current electric avoided costs, the TRC test.

15.1.2. History

Program measures and rebates are reviewed and adjusted annually based on total resource cost and other metrics. At the annual review, measures must be cost effective to remain in or be added to the program. Montana's energy code determines the baseline from which new construction energy savings are measured.

In 2009, the program ceased providing DSM-funded rebates but continued with USB-funded marketing work through 2011. The table below lists 2006–2011 programs by duration, funding source, and fuel savings type.

Table 331: 2006 – 2011 Program Modifications for E+ New Homes

Program Timespan	Funding Source	Savings
7/1/2006 – 12/31/2008	DSM – Rebates	DSM – Electric
	USB – Marketing	n/a
1/1/2009 – 12/31/2011	USB – Marketing	USB – Electric for CFLs in site-built homes (no rebates paid)

15.1.3. Marketing

A broad mix of marketing activities is employed to promote the program to the design and construction industries, homeowners, and other interested parties.

Marketing activities for the 2007–2011 program years include:

- Builder recruitment/training
- Verifier recruitment/training
- Preferred Contractor annual training sessions
- NWE customer service personnel training
- NWE sponsored public informational workshops directed at customers who may be purchasing new homes
- Design and construction industry conferences and tradeshows
- Code training for the builders and the design community
- Event and program advertising through media news releases, email and website promotions, and spot advertising in newspapers and home publications
- Homebuilder associations - outreach, training, and publication articles
- Parade of Homes publications and web site featuring Northwest Energy Star certified homes and Energy Star certified builders

NWE marketing activities are supported by NCAT, KEMA, NEEA, and utility personnel. The mix of marketing activities varies from year to year to match program needs and as other opportunities in the community present themselves.

15.1.4. Program Steps

Below are the steps for a customer to participate in the rebate program that was offered from 2006–2008, NWE pre-approval was not required:

- The customer/builder consults the program guidelines/application form(s) to determine the eligible measures they wish to apply. NWE provides assistance through a customer help line.
- Select method to get the work done:
  - Solicit bids from contractors
  - Self-installed by the customer
- The customer submittal package includes:
  - The completed and signed application form
  - The contractor invoice or materials receipt for self-installed projects. Contractor invoices must provide sufficient detail on the installation as noted on the application form.
  - If applicable, a Northwest Energy Star Home Certificate
  - A recent NWE bill for the residence where the installation occurred

Inspections are done on a random basis, prior to payment approval. The customer receives the rebate check in 4-6 weeks.

15.2. Impact Evaluation

15.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

15.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

We performed a review of the savings estimation methods that NWE applied to the measures included in our sample. Our review included an examination of relevant documentation from prior studies and standard engineering methods used to estimate savings for each measure. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the as-built conditions observed during the site visit. For measures where the NWE method was not adequate, we recalculated energy (kWh) and demand (kW) savings using the more reliable techniques. To the extent possible, we documented reasons for differences between the evaluated and program savings.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and producing energy savings. We collected data as necessary to support a re-estimation of energy savings, using the evaluation savings method and data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

15.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

15.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

15.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

15.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

15.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

15.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 32 sampled cases for this program across the five program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

Review of Program Savings Method

We reviewed the algorithm used by the program to estimate program savings for CFL installations. We determined that the NWE method was reasonable with respect to the wattages of the installed CFLs. We used actual installed bulb wattages and took baseline bulb wattages from lookup tables of equivalent-lumen output for incandescent bulbs[10]. This approach was necessary as the CFLs were installed by the home owners and either pre-existing incandescent bulb wattages were not recorded or the CFLs were installed where no previous bulb had existed.

The savings algorithm incorporated a consistent deemed operating hours value of 3.7 hours per day into the calculation of energy savings (kWh). We conducted a study (see section 27.2) of CFL operating hours incorporating monitored data for a randomly-selected sample of sites included in the residential lighting sites. We found the resulting average operating hours to be 2.02 hours per day in 2012. We applied this value to each measure installed under these programs (2010-11) in lieu of the program-specified value. For earlier years the realization rate

[10] NWE provided an equivalent-lumen lookup table identifying an incandescent bulb wattage that would provide lumens commensurate with the lumens provided by a CFL of a specific wattage rating. The values in the table are based on a similar table created by US DOE and US EPA as part of their Energy Star program.

found for 2010-11 CFLs was modified by an adjustment to the operating hours (see section 18.2.2.1).

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ New Homes program we successfully visited 20 sites. The Special Effort team encountered a low response rate (72% “No Reply”) when recruiting for this program; and the on-site inspectors experienced a high refusal rate (26% “Onsite Refused”) when it came time to schedule the visit or meet at the site.

Table 332: Site Recruitment Disposition for E+ New Homes

	Stratum		Total n	%
	1	2		
Recruitment				
Telephone Lab	13	3	16	
Special Effort				
Attempts	41	17	58	
No Reply	32	10	42	72.4%
Refused	2	3	5	8.6%
Recruited	7	4	11	19.0%
Total Recruited	**20**	**7**	**27**	
Onsite				
Refused	6	1	7	25.9%
Not Needed	0	0	0	0.0%
Total Completed	**14**	**6**	**20**	**74.1%**

Site Inspections

For the 2010–2011 program years we performed 20 site inspections which considered one measure: CFL bulbs. At eight of the 20 sites we visited, we found the same count and Wattages of CFL bulbs as documented by NWE. At one site we found the same count, but with different Wattages. And at 11 of the sites we found less CFL bulbs than documented by NWE.

We calculated evaluation savings by applying the evaluation algorithm to the conditions observed during the site visit.

For all 20 of the sites, the evaluation savings were primarily driven by the evaluation on-hours per day. We based the evaluation hours on the measured results described in section 27.2. The evaluation on-hours of 2.02 hours per day in 2012 was nearly half the on hours (3.7 hours per day) used by the program. The hours per day may be different for previous years.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 333: File Review and Site Visit Adjustment to Savings for E+ New Homes

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ New Homes	kWh	729,876	729,876	329,853	329,853	1.00	0.45	0.45

15.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 334: Savings Adjustments by Calendar Year for E+ New Homes

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ New Homes	kWh	2007	74,662	0.45	-	-	0.45	33,742	4
	E+ New Homes	kWh	2008	16,762	0.45	-	-	0.45	7,575	1
	E+ New Homes	kWh	2009	321,487	0.45	-	-	0.45	145,289	17
	E+ New Homes	kWh	All Years	412,911	0.45	-	-	0.45	186,607	21
Electric - USB										
	E+ New Homes	kWh	2010	188,812	0.45	-	-	0.45	85,330	10
	E+ New Homes	kWh	2011	128,153	0.45	-	-	0.45	57,916	7
	E+ New Homes	kWh	All Years	316,965	0.45	-	-	0.45	143,246	16
Electric										
	E+ New Homes	kWh	All Years	729,876	0.45	-	-	0.45	329,853	38

15.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 335: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ New Homes

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ New Homes	kWh	2007	33,742	3.91	1.66	0.98	4.30
	E+ New Homes	kWh	2008	7,575	0.98	2.42	1.40	1.08
	E+ New Homes	kWh	2009	145,289	9.17	3.13	1.79	10.08
	E+ New Homes	kWh	All Years	186,607	5.94	2.74	1.58	6.53
Electric - USB								
	E+ New Homes	kWh	2010	85,330	0.31	0.38	0.32	0.34
	E+ New Homes	kWh	2011	57,916	0.29	0.31	0.28	0.31
	E+ New Homes	kWh	All Years	143,246	0.15	0.16	0.15	0.16
Electric								
	E+ New Homes	kWh	All Years	329,853	0.55	0.54	0.47	0.61

15.3. Process Evaluation

15.3.1. Methodology

We met with all key members of NWE’s program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with 20 participants and 50 trade allies. Surveyed trade allies include those who reported offering HVAC products and services to residential end-users.

15.3.2. Implementation Findings

15.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, “program staff” or “staff”) to implement this program.

To seek a rebate, customers may use program guidelines and application forms available on NWE’s website, which also lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

For certain residential measures, there are two tiers of rebates, with higher rebates paid for work performed by preferred contractors, and lower rebates paid for self-installed measures and work done by non-preferred contractors. Some residential measures require use of a preferred contractor for rebate eligibility.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor’s invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application.

The customer’s application must include a current NWE bill for the building where the installation occurred. Rebate applications for new manufactured homes must include a copy of the homes’ NorthWest Energy Star certificate. Gas-heating new-home-construction measures require only the customer’s account number in lieu of the utility bill.

NWE has linked its master customer lists to the implementation contractor’s databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor’s accounting department for processing. The implementation contractor’s program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

15.3.2.2. Best Practices Assessment

Table 336 through Table 339 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 336: Program Planning and Design Best Practices for E+ New Homes

<table>
<tr><th>Practice</th><th>NWE Assessment</th></tr>
<tr><td>Develop a sound program plan
State program target and timing
Identify policy objective(s) (resource acquisition, equity, market transformation)
Identify policy and other constraints
Identify program goals and corresponding success metrics
Ensure program strategies and tactics (activities) drive to goals</td><td>NWE programs reflect this planning
Opportunity exists to formalize the outcome of its planning efforts with written program plans
Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic</td></tr>
<tr><td>Understand local market conditions
Conduct market research as necessary for understanding</td><td>NWE programs reflect strong understanding of local market conditions</td></tr>
<tr><td>Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)</td><td>NWE seeks out hard-to-reach customers
Example: Programs use multiple distribution methods to reach customers that typically don't participate
Example: Programs conduct outreach to all known contractors, ensuring wide market reach
Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach</td></tr>
</table>

Practice	NWE Assessment
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 337: Program Management and Administrative Best Practices for E+ New Homes

Practice	NWE Assessment
Develop written process plan Include program management activities Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate

Practice	NWE Assessment
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 338: Marketing and Outreach Best Practices for E+ New Homes

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits

Practice	NWE Assessment
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 339: Program Quality Control Best Practices for E+ New Homes

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis

Practice	NWE Assessment
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

15.3.3. Participant Findings

We surveyed 20 NWE customers who participated in the E+ New Homes program during 2010 or 2011.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

15.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NWE, the kind of additional information they wanted, as well as providing information about their decision to purchase appliances or other actions recommended by the program.

Most respondents (75%) had visited NWE's website. This is higher than some other residential program participants we surveyed, when often fewer than one-third had visited the utility website. The five non-visitors mostly "don't like to use" the internet or saw "no need or reason" to visit the site. Among respondents who did use the website, about one-half did so for one of more of the following reasons: to pay their utility bill, to look for money-saving tips, and/or utility contact information. Learning about rebates and audits was mentioned by about one-third (33%) of respondents who visited NWE's website (Table 340).

Table 340: Website Use, among E+ New Homes Participants

(Allowed Multiple)	Weighted Percent
Pay utility bill (n=15)	58%
Money saving tips (n=15)	46%
Utility contact information (n=15)	46%
Learn about rebates or audits (n=15)	33%
Energy saving educational opportunities (n=15)	6%
Look up general information (n=15)	6%
View employment information (n=15)	6%

Most website users (85%) agreed (and 71% "completely agreed") that the website information was easy to find and helpful (Figure 96).

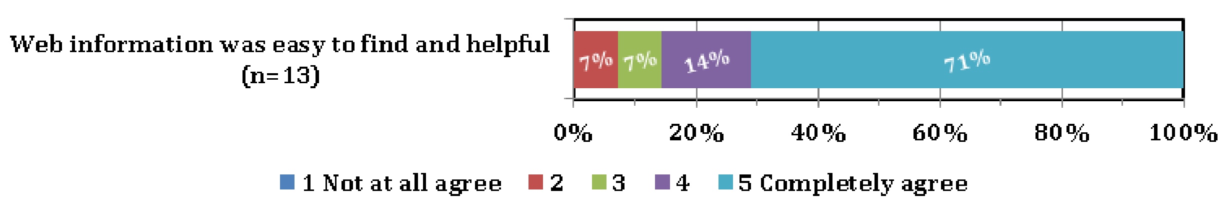

Figure 96: Website Effectiveness, among E+ New Homes Participants

Over one-third of respondents expressed interest in further educational opportunities in energy saving (45%) and energy efficiency program information (34%). Half of respondents, 55%, do not want more information from NWE on efficiency at this time (Table 341).

Table 341: Further Information Desired, among E+ New Homes Participants

(Allowed Multiple)	Weighted Percent
Does not want any (n=20)	55%
Energy saving educational opportunities (n=20)	45%
Energy efficiency programs (n=20)	34%
Workshops or events on energy efficiency (n=20)	14%

Those desiring further information prefer to receive information via mail (69%), followed by community events (55%) and email (51%; Table 342).

Table 342: Information Delivery Preference, among E+ New Homes Participants

(Allowed Multiple)	Weighted Percent
Mail (n=9)	69%
Community event (n=9)	55%
Email (n=9)	51%
Webinar (n=9)	45%
Phone (n=9)	20%
Trainings, workshops or seminars (n=9)	20%

Respondents became aware of the E+ New Homes program chiefly through noticing a utility publication or advertisement (84%). Well over on-half of those surveyed (59%) also learned about the program opportunity from their building professional or contractor (Table 343).

Table 343: Means of Program Awareness, among E+ New Homes Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=20)	84%
Building professional, vendor, or contractor (n=20)	59%
Utility representative appearance (n=19)	30%
Word of mouth (n=20)	23%
Heard of program other ways (n=20)	19%
Directly contacted utility (n=20)	14%

We asked E+ New Home respondents if a list of typical reasons for participation had applied to them. Typically, two-thirds or more reported that each reason applied to them. The exception was when a smaller portion, about one-third, of respondents participated due to prior experience with an NWE efficiency program, which may suggest first time program participation for some respondents (Table 344).

Table 344: Reasons For Program Participation, among E+ New Homes Participants

(Allowed Multiple)	Weighted Percent
Save money (n=20)	95%
Save energy (n=20)	91%
Increase home comfort (n=20)	77%
Increase home value (n=20)	68%
Easy to use the program (n=20)	66%
Contractor recommendation (n=20)	64%
Utility vouched for equipment by rebating (n=20)	56%
Good experience with other NWE efficiency program (n=15)	32%

When considering whether to participate, all of the surveyed participants said they had no questions or concerns about participating.

15.3.3.2. Program Experience

Respondents reported on several aspects of their program experience.

E+ New Home program respondents gave high ratings to the clarity of rebate and program information offered by NWE, Over three-quarters (77%) of them rated information on the following aspects of program information "clear" or "very clear" (Figure 97).

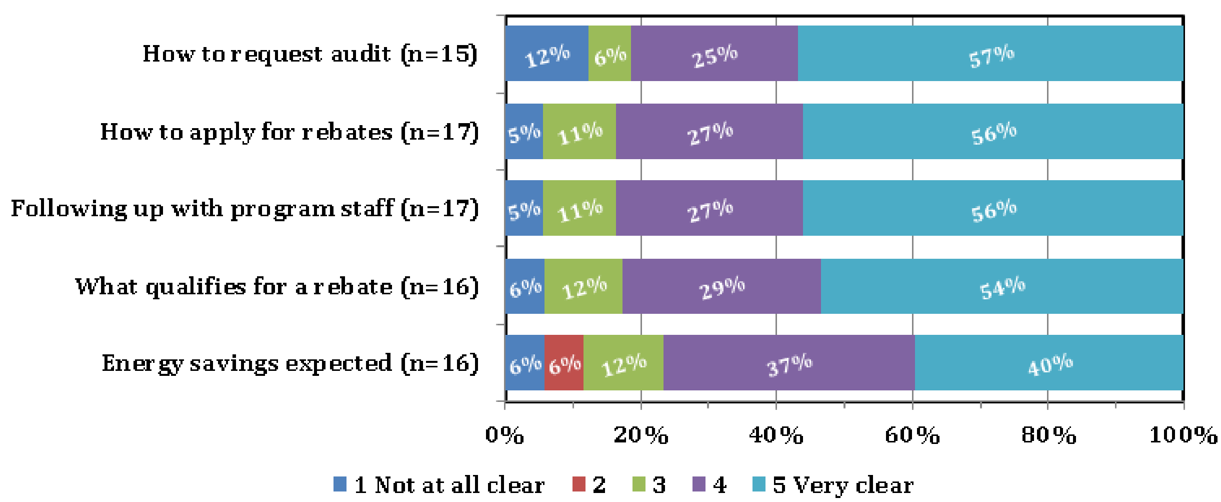

Figure 97: Clarity of Program Information, among E+ New Homes Participants

Respondents tended to agree that applying for a rebate was easy, that utility representatives were courteous and helpful, and that they valued an energy-conscious home above and beyond the dollar costs and benefits. Participants "completely agreed" with statements about each stage a minimum of 58% of the time (Figure 98).

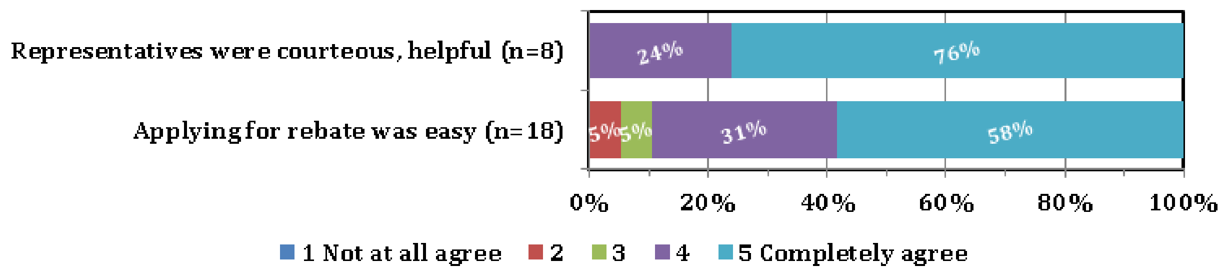

Figure 98: Experience With Project Development, among E+ New Homes Participants

As a general indicator of overall attitudes towards NWE's efficiency activities we asked participants about the likelihood that they would participate in efficiency programs in the future. Seventy-one percent were "likely" or "very likely" to participate in future NWE energy efficiency programs (Figure 99).

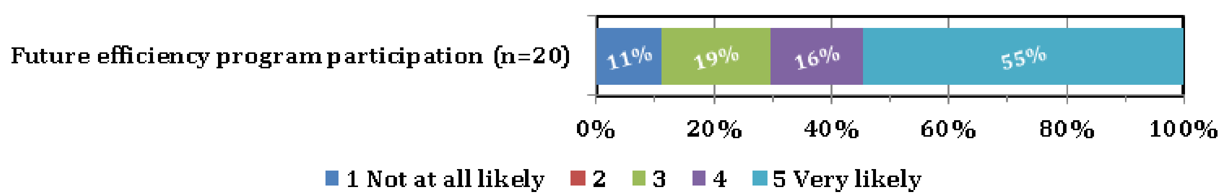

Figure 99: Likelihood of Future Participation, among E+ New Homes Participants

15.3.4. Trade Ally Findings

We surveyed 50 NWE equipment trade allies who installed equipment that qualified for rebates through NWE residential programs.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

15.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from noticing a utility publication or advertisement (76%), by directly contacting the utility, or from a utility representative at a meeting or event (Table 345).

Table 345: Means of General Program Awareness, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=50)	76%
Directly contacted utility (n=50)	70%
Utility representative appearance (n=50)	68%
Utility website (n=50)	46%
Word of mouth (n=50)	44%
Associated vendors and contractors (n=50)	38%

Trade ally respondents most frequently learned about specific program requirements from a utility representative at a meeting or event (53%), or by contacting NWE directly (42%; Table 346).

Table 346: Specific Requirements Awareness, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=50)	52%
Directly contacted utility (n=50)	42%
Utility publication (n=50)	28%
Associated vendors and contractors (n=50)	10%
Utility website (n=50)	6%

A majority (66%) of surveyed trade allies had visited NWE's website. Among those website users, approximately three-quarters (76%) said they used the site to find information related to rebates or audits, and smaller majorities had printed rebate forms or searched for NWE contact information (Table 347).

Table 347: Website Use, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
Finding rebate or audit information (n=33)	76%

(Allowed Multiple)	Percent
NWE contact information (n=33)	64%
Print rebate forms (n=33)	55%
Educational events information (n=33)	39%
Money saving ideas (n=33)	36%
How-to videos (n=33)	9%

Most (62%) of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful, however 13% gave low ratings (Figure 100).

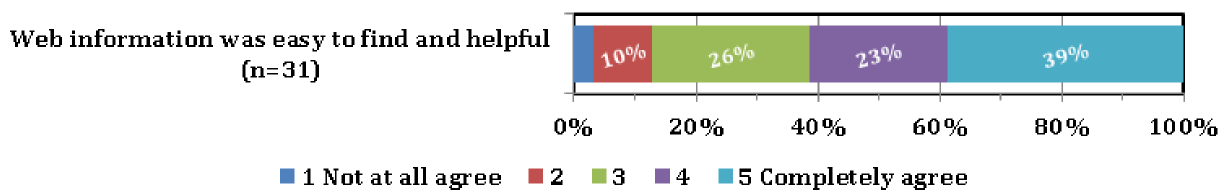

Figure 100: Website Effectiveness, among E+ New Homes Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority (62%) said they had contacted the utility to learn how the rebate program worked (Table 348).

Table 348: Reasons for Contacting NWE, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=50)	62%
To resolve a problem (n=50)	44%
Investigate status of an application (n=50)	36%
Investigate status of a rebate payment (n=50)	30%
None of these (n=50)	24%
Other (n=50)	16%

About half of surveyed trade allies would like to receive further information on energy savings programs and opportunities, or to attend additional workshops or events (Table 349).

Table 349: Further Information Desired, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=50)	60%
Energy efficiency programs (n=50)	58%
Energy saving educational opportunities (n=50)	54%
None (n=50)	30%

Those desiring further information preferred to receive information by mail (38%) and other methods such as email (30%) or trainings and workshops (26%; Table 350).

Table 350: Information Delivery Preference, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
US mail (n=50)	38%
Email (n=50)	30%
Trainings, workshops or seminars (n=50)	28%
Community event (n=50)	16%
Webinar (n=50)	16%
Phone (n=50)	8%

15.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

We asked residential trade allies if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if instead they kept unrated/standard items in stock and *ordered* the high-efficiency items as needed. Just over half (54%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 351. Most (84%) kept a range of equipment that varied in quality and prices to offer customers, and 97% agreed that the “Better” and “Best” equipment is usually more energy-efficient than the “Good.” Over half (63%) reported they suggest the “Best” equipment to customers first.

Table 351: Equipment Sales Approach, among E+ New Homes Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option to buy (n=49)	84%
Agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' option (n=39)	97%
Best presented first (n=40)	63%
Better presented first (n=40)	23%
Present all options simultaneously (n=40)	13%
Good presented first (n=40)	3%

Figure 101 illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. Less than half (42%) of these trade allies reported that over three-quarters of their stock was high-efficiency equipment. A third of these respondents said that no more than 25% of their regular stock was comprised of high-efficiency equipment. Those trade allies who reported that they stocked efficient equipment also estimated the share of sales made in the past two years that were energy-efficient items. A majority (63%) reported that more than three-fourths of the equipment they sold in the past two years as high-efficiency.

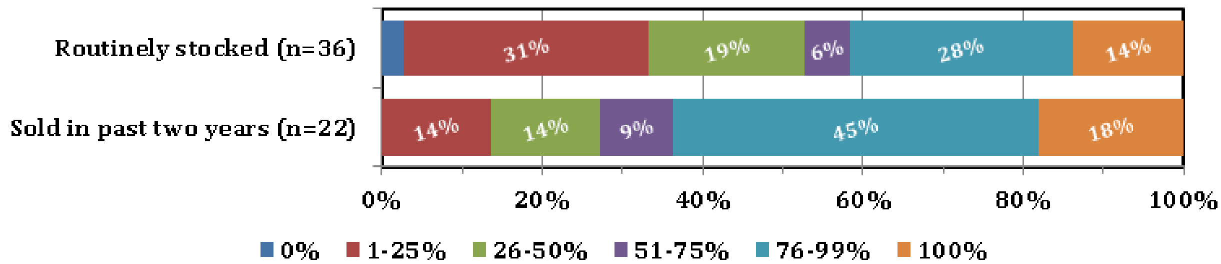

Figure 101: High Efficiency Equipment Share, among E+ New Homes Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment that qualifies for rebates. The most commonly mentioned benefits, by 88% of these trade allies, were the rebate itself and the lower operation costs of the equipment (Table 352).

Table 352: Customer Benefits Mentioned, among E+ New Homes Trade Allies

Benefit	Percent
Lower operation costs (n=50)	88%
Utility rebate (n=50)	88%
High-quality of product (n=50)	70%
Lower maintenance costs (n=50)	54%

About 20% of these residential trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these ten respondents mentioned cost half the time (Table 353).

Table 353: Reasons for Discouraging Efficient Equipment Purchase, among E+ New Homes Trade Allies

(Allowed Multiple)	Percent
Cost (n=10)	50%
Installations are too complex (n=10)	20%
Less reliable than standard items (n=10)	20%
Other (n=10)	20%

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. About one-third (35%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. Among the reasons reported in the following table, no single reason stands out as a barrier to rebate applications (Table 354).

Table 354: Circumstances When Rebate Foregone, among E+ New Homes Trade Allies

	Percent
Trade ally unaware of rebate/program (n=14)	21%
Customer did not apply (n=14)	21%
Customer ineligible (n=14)	14%
Rebate too small (n=14)	14%
Applying takes too long (n=14)	7%
Unspecified or unclear (n=14)	21%

15.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (64%) of trade ally respondents said they had trained staff to talk to customers about energy efficient choices. In fact, 46% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 355).

Table 355: Rebate Initiator, among E+ New Homes Trade Allies

	Percent (n=50)
Almost always trade ally initiated	46%
Mostly trade ally initiated	36%
About half trade ally and half customer	10%
Almost always customer initiated	8%

When a customer is considering an equipment purchase, 94% of these respondents suggest equipment that qualifies for the rebate program, rather than waiting for the customer to show interest in qualifying for rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Most surveyed trade allies (86%) indicated that nothing about the program raised issues or concerns about their customers' participation. Among the seven respondents who had initial concerns, the reasons given showed no pattern. However, problems with the rebate were concerns for two respondents.

A minority (18%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" were contacting customers with varied frequency, some as often as daily and some yearly (Table 356).

Table 356: Customer Contact Frequency, among E+ New Homes Trade Allies

	Percent (n=9)
Once a year	33%
Every day	33%
Once a month	11%
2 times a year	11%
Varies by customer	11%

A majority of these trade ally respondents rated four aspects of program information they received from NWE about rebate processes as "clear" or "very clear." Slightly lower ratings were given for two of the four: reading and understanding program information, and information about which items qualify for rebate (Figure 102).

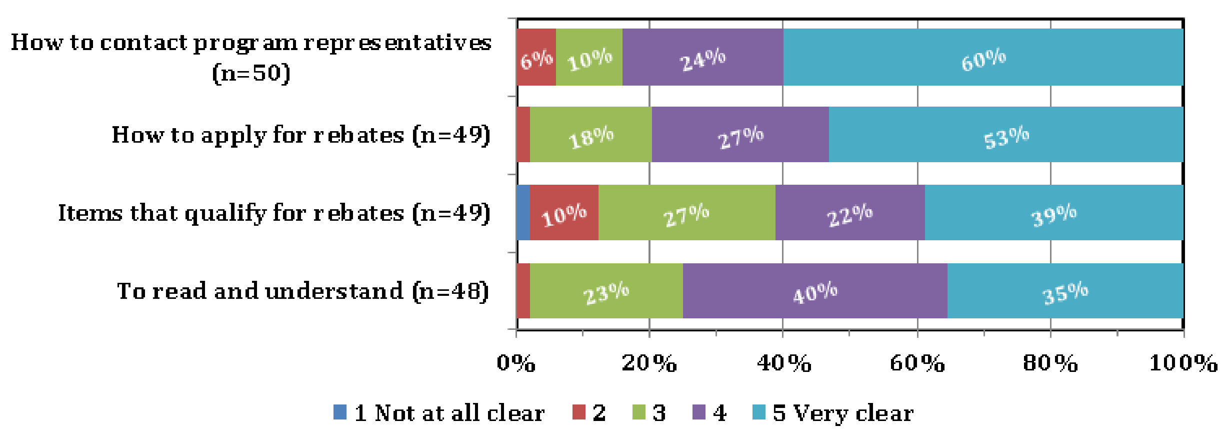

Figure 102: Clarity of Program Information, among E+ New Homes Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (62%) reported working with the customer in a joint effort to prepare the applications. Another 26% reported doing all or most of the application themselves.

Table 357: Rebate Application Preparer, among E+ New Homes Trade Allies

	Percent (n=50)
Typically both trade ally and customer - around half and half effort	62%
Typically the trade ally prepares all or most of the application	26%
Typically the customer prepares all or most of the application	10%
Depends on the rebate	2%

About three-quarters (72%) of the 43 trade ally respondents involved with completing the rebate application "agreed" or "completely agreed" that the process was simple to follow (Figure 103).

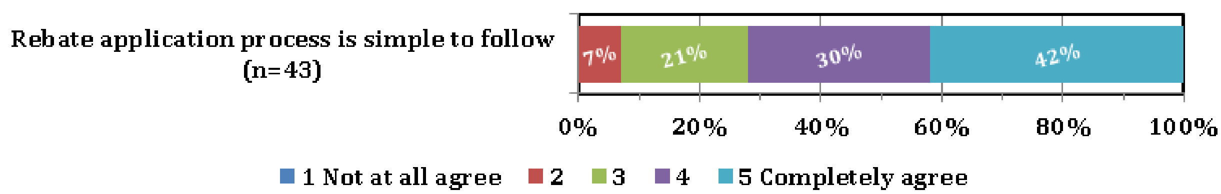

Figure 103: Rebate Application Process, among E+ New Homes Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes. At least 61% of respondents "agreed" or "completely agreed" that NWE provided updates in a timely manner, staying current takes little staff time, and that customers benefit from program additions (Figure 104).

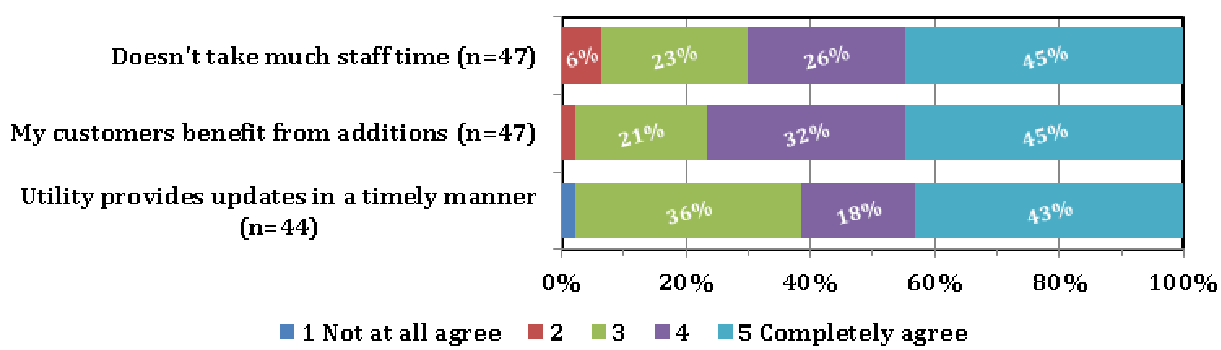

Figure 104: Experience With Program Changes, among E+ New Homes Trade Allies

Most (83%) of the 46 residential allies surveyed reported that they were on NWE's Preferred Contractors list. Almost all of the preferred contractors (97%) "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (84%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." However, just under half (48%) agreed or completely agreed that being a preferred contractor had "helped grow our business" (Figure 105).

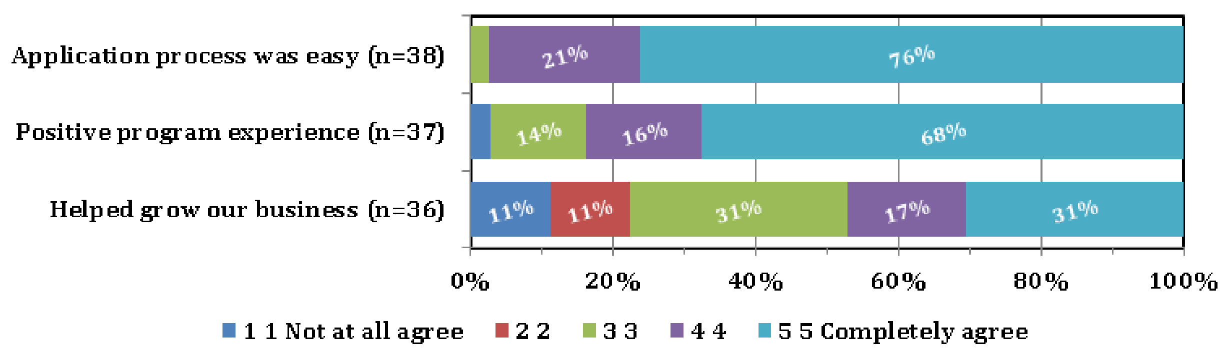

Figure 105: Experience As Preferred Contractor, among E+ New Homes Trade Allies

We asked the eight trade allies who gave a rating of "1" or "2" on the five-point agreement scale to explain their low ratings. Their answers indicated they did not think being on the preferred list was a reason customers contacted them, and that there is little outreach coordination with NorthWestern.

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. The most common suggestion, made by 40%, was an expanded range of HVAC systems (Table 358). LED lighting and heat pumps were suggested by 20%. These trade allies indicated they suggested such items primarily because they were "more efficient" (Table 359).

Table 358: High Efficiency Equipment Suggested, among E+ New Homes Trade Allies

	Percent (n=15)
Other heating systems	40%
LED lighting	20%
Heat pumps	20%
On demand water heaters	13%
Other	7%

Table 359: Reasons Equipment Should Be Added, among E+ New Homes Trade Allies

	Percent (n=14)
It's more efficient	50%
Cost	14%

	Percent (n=14)
Customers request them	14%
Where industry is going	7%
Other	14%

15.3.4.4. Firmographics

A few trade allies (18%) served customers in more than 20 Montana locations. More than half (60%) of these respondents reported serving five or fewer locations.

Table 360: Number of Montana Locations, among E+ New Homes Trade Allies

	Percent (n=50)
1 location	36%
2 to 5 locations	24%
6 to 10 locations	12%
11 to 20 locations	10%
21 to 50 locations	4%
Over 50 locations	14%

Trade allies reported on the maximum number of miles they would travel to serve clients. About a quarter (24%) would travel less than 100 miles, while 14% would travel more than 400 miles. The largest portion (46%) would travel between 101 and 200 miles to serve a client (Figure 106).

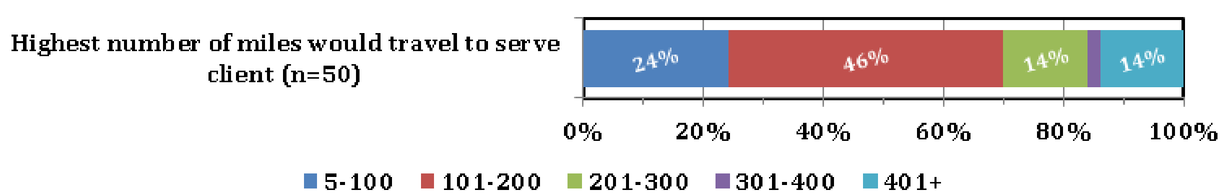

Figure 106: Maximum Miles, among E+ New Homes Trade Allies

15.4. Recommendations

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Most (84%) surveyed E+ New Homes participants reported hearing about the program through a utility advertisement or direct mail, although contractor outreach also played a role. Respondents reported very positive program experiences, and large majorities found all program information clear. Over half of contacts did not want any additional information about efficiency opportunities from NWE, which contrasts with the responses of all the other commercial program participant groups.

Surveyed commercial trade allies reported positive program experiences, with no major concerns or suggestions. Many are interested in receiving more efficiency information: nearly two-thirds of trade allies reported interest in efficiency workshops or other events. Just under two-thirds reported that they trained their staff to talk to clients about energy efficiency. Although two-thirds of trade allies have used the website, just one tenth report that they get information about program requirements from the website. Nearly all trade allies report that they proactively mention the program to customers, but reported rates of customer-initiated rebates are higher than for other programs.

We offer no recommendations for this program, as it has ended.

16. E+ Residential Existing Electric Rebate

16.1. Program Description

The E+ Residential Existing Electric Rebates program began in 2006. All NWE residential electric supply customers are eligible to participate in the program. However, measure eligibility varies depending on whether the home uses electricity for space and/or service water heating. Homes with electric heat (hard-wired and primary heating source) are eligible for the insulation and equipment components of the program. Electric hot water customers are eligible for the electric water heating measures. The program is funded through DSM.

Based upon the 2010 End Use and Load Profile Study (Nexant, Cadmus 2009), few customers meet the space-heating eligibility requirement. Overall program activity is light because only 3% of NWE's residential customers have electric heat as the primary heating source. A larger number of homes have electric water heating, but in NWE's service territory, electricity is not the primary fuel for heating water. Air-conditioning, home electronics, and appliances were added to the program in April 2011.

The program has preferred contractors to perform home weatherization and equipment installation. Preferred contractors are trained in the program standards, must sign a participation agreement, be licensed and insured, and attend annual training sessions. Certain measures require installation by a preferred contractor to be eligible for a rebate. However, most measures may be installed by customers or non-preferred contractors. Measures usually have two rebate tiers with higher rebates paid for installations by preferred contractors.

Qualified customers are identified through the audit program, through other marketing efforts such as free weatherization-kit distribution events, or are recruited by preferred contractors. Savings associated with the event give-aways are credited to this program.

Measures for fuel switching from primary electric space heat or electric water heat to regulated natural gas were funded in 2007 and 2008, but were discontinued in 2009.

This program is closely associated with the E+ Audit Home or Business program as a source of marketing and referrals. Direct installations of water-saving measures during the home audits are funded and savings are reported separate of this program.

16.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the program for program years 2007 - 2011. Measures marked with an "X" in the Program Year columns indicates the measure was offered by the program in all or part of that program year.

Table 361: Measures Offered for E+ Residential Existing Electric Rebate

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Start Date[1]	End Date[2]
Insulation Measures									
Attic Insulation, R-49[3]	$/FT²	R-0 existing	X	X	X	X	X		
Attic Insulation, R-49[3]	$/FT²	R-1 to R-11 existing	X	X	X	X	X		
Attic Insulation, R-38[3]	$/FT²	R-0 existing	X	X	X	X	X		6/1/2011
Attic Insulation, R-38[3]	$/FT²	R-1 to R-11 existing	X	X	X	X	X		6/1/2011
Attic Insulation, R-38[3]	$/FT²	R-12 to R-19 existing	X	X	X	X	X		6/1/2011
Crawl Space Wall Insulation, R-19[3]	$/FT²	R-0 existing	X	X	X	X	X		
Exterior Wall Insulation (above grade), R-13[3]	$/FT²	R-0 existing	X	X	X	X	X		6/1/2010
Exterior Wall Insulation (above grade), R-11[3]	$/FT²	R-0 existing	X	X	X[3]	X[3]			6/1/2010
Exterior Wall Insulation (2x6 studs), R21[3]	$/FT²	R-0 existing					X		
Basement Wall Insulation, R-13[3]	$/FT²	R-0 existing	X	X	X	X	X		6/1/2010
Basement Wall Insulation, R-11[3]	$/FT²	R-0 existing	X	X	X[3]	X[3]			6/1/2010
Basement or Crawl Wall, R-19[3]	$/FT²	R-0 existing					X	4/1/2011	
Slab Insulation, R-10[3]	$/FT²	R-0 existing	X	X	X	X	X		6/1/2011
Slab Insulation, R-5[3]	$/FT²	R-0 existing	X	X	X	X	X		6/1/2011
Equipment Measures									
Air Source Heat Pump	$/Ton	SEER ≥ 14, HSPF ≥ 8.5, Energy Star rated					X	4/1/2011	
Ground or Water Source Heat Pump Desuperheater	$/Unit	DHW water heating heat recovery unit with new ground source heat pump					X	4/1/2011	
Air to Air Heat Exchanger[3]	$/Home	Must be heated with an electric furnace					X	4/1/2011	
Proper Sizing Central Air Conditioner	$/Unit	Must provide completed ACCA Manual 'J'					X	4/1/2011	

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Start Date[1]	End Date[2]
		calculation form							
Proper Sizing Heat Pump—AC only	$/Unit	Must provide completed ACCA Manual 'J' calculation form					X	4/1/2011	
R-11 Steel Door Foam Core[3]	$/Door	Replaces R-3 exterior door, minimum of 2 exterior doors, NFRC label is required.					X	4/1/2011	
R-5 Composite Door Foam Core[3]	$/Door	Replaces R-3 exterior door, minimum of 2 exterior doors, NFRC label is required.					X	4/1/2011	
Weather Stripping and Door Sweep[3]	$/Door	Minimum of 2 exterior doors					X	4/1/2011	
Pool Pump Timer	$/Door	Reduce operating hours ≥67% for pools or hot tubs					X	4/1/2011	
Miscellaneous Measures									
Install Outlet Gasket[3]	$/Home	All outlets $ switch covers on all exterior walls					X	4/1/2011	
Canned Lighting Air Tight Sealing[3]	$/Can	Applicable to attic space locations only					X	4/1/2011	
Duct Sealing (Mastic or Aerosol)[3]	$/Home	Unheated spaces only with duct blaster test					X	4/1/2011	
High Efficiency Clothes Dryer with Moisture Sensor	$/Unit	Must replace electric clothes dryer w/o a moisture sensor. Must install an electric clothes dryer with moisture sensor located in the drum.					X	4/1/2011	
Energy Star rated Stand Alone Freezer	$/Unit	Energy Star Rating					X	4/1/2011	
Energy Star rated Refrigerator/Freezer	$/Unit	Energy Star Rating and ≥ 7.75 cubic feet					X	4/1/2011	

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Start Date[1]	End Date[2]
Hot Water Pipe Insulation, R-4	$/Linear Ft	Minimum of R-4 pipe insulation, piping with no existing insulation					X	4/1/2011	
Programmable Thermostat	$/Unit or $/kWh	Applicable rebate is whichever is less	X	X	X	X	X		4/1/2011
Programmable Thermostat	$/FT²	Rebate varies: (1) electrically heated home, (2) home has central A/C, (3) both central electrical heat and A/C					X	4/1/2011	
Lighter Colored Shingles	$/Home	Asphalt shingles only; must be Energy Star rated. Home must have central A/C system					X	4/1/2011	
Low Flow Faucet Aerator[4]	$/Unit		X	X	X	X	X		4/1/2011
Faucet Aerator (≤ 0.5 GPM)[4]	$/Unit	Minimum of 3 faucets; Water Sense labeled only and ≤ 0.5 GPM					X	4/1/2011	
Faucet Aerator (≤ 1.5 GPM)[4]	$/Unit	Minimum of 3 faucets; Water Sense labeled only and ≤ 1.5 GPM					X	4/1/2011	
Faucet Aerator (≤ 2.2 GPM)[4]	$/Unit	Minimum of 3 faucets; Water Sense labeled only and ≤ 2.2 GPM					X	4/1/2011	
Low Flow Showerhead (≤ 2.5 GPM)[4]	$/Unit		X	X	X	X	X		4/1/2011
Low Flow Showerhead (≤ 2.0 GPM)[4]	$/Unit	Water Sense labeled only					X	4/1/2011	
Water Heater Thermostat Setback[4]	$/Unit	Thermostat ≤ 120 degrees F					X	4/1/2011	
Hot Water Heater Tank Insulation, R-11[4]	$/Unit	R-0 on existing water heater					X	4/1/2011	
Hot Water Heater	$/Unit		X	X	X	X			4/1/2011

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Start Date[1]	End Date[2]
Tank & Pipe Wrap4[4]									
Fuel Switch from Electric to Natural Gas Heating[3]	Formula	Heating kWh * % heat converted * 0.966	X	X					12/31/2008
Fuel Switch for Electric to Natural Gas DHW[4]	Water heating kWh	Water heating kWh	X	X					12/31/2008

[1] The date the measure was offered by the program - if it was after the beginning of the program evaluation cycle 7/1/2006.

[2] The date the program stopped offering the measure. Customer projects with discontinued measures already in progress could extend past that date. The extensions were part of a catch-up period for customers and contractors.

[3] Home must be heated exclusively by electricity.

[4] Must be electric DHW

Measure savings used by NWE are unit energy savings (UES) from third party electric resource assessment studies (KEMA 2003) (Nexant, Cadmus 2010) based on average annual savings specifically for NWE Montana customers. Each UES must pass a cost/benefit test, based on current electric avoided costs, known as the TRC test.

16.1.2. History

Program measures and rebates are reviewed and adjusted annually based on total resource cost and other metrics. At the annual review, measures must be cost-effective to remain in or be added to the program.

From the beginning of the program evaluation cycle in July 2006 until April 2011, the major change in the program measure offerings was the discontinuation of rebates for fuel switching at the end of 2008. Those rebates were for primary electric space heat or electric water heating customers to switch to regulated natural gas for those end uses. In April 2011, in response to an electric resource assessment (Nexant, Cadmus 2010), a broad range of measures was added to the program.

16.1.3. Marketing

The primary avenues of program marketing are customer bill inserts, home improvement shows and other events, during energy audits that find a need for qualifying measures, information and weatherization kits distributed through implementation contractors, NWE's website, mass media (spot television, radio, newspaper), news releases, and some point-of-purchase materials at preferred contractors.

Other marketing included Saturday customer appreciation events (2005–2010) held in the fall. The customers appreciation events, to which all NWE residential customers were invited, spurred customer interest in conservation tied to low-cost measures such as air-sealing and water-saving measures through education and distribution of free kits. Kits are also provided to electric space- or water-heat customers identified through past energy audit participation.

Promotion of the events in 2007–2010 included press releases, newspaper and radio advertisements, direct mail to customers, flyers in NWE offices, community centers, senior centers, libraries, post offices, and other public bulletin board locations. Live radio remotes during Saturday events were utilized to draw attention to the events and to the E+ programs and rebates available to customers. The distribution trucks at these events were wrapped with signage promoting the 2010 events.

The approach changed for 2011 when promotion was primarily direct mail targeted at natural gas customers who had not participated in the past. No mass media or large customer-appreciation events were held in 2011. Weatherization events in 2006–2011 primarily targeted residential natural gas customers. Only when a customer self-identified as having electric space or electric water heat customer did their weatherization kit count towards the E+ Residential Electric Savings Program.

16.1.4. Program Steps

Until April 2011, electric space-heat or water-heat customers whose homes had received an energy audit were sent a solicitation to participate in the electric savings program. Customers received a cover letter containing a list of incentives including custom incentives for insulation and fuel switching, a program guideline sheet, and an application. The implementation contractor, KEMA, followed up with customers who did not respond to those mailings within four months.

When KEMA received a customer's reply to the solicitation, the electric consumption for the previous 12 months was compared with the electric consumption at the time of the earlier audit. If the current consumption level varied from the earlier one by ≥10%, another on-site audit could be conducted. Alternatively, in cases where the consumption level varied by ≥10%, a mail-out audit could be sent to the customer. For residential customers whose homes had not previously been audited, a free on-site, energy audit was required.

Since April 2011, a postage-paid reply card or a rebate-offer letter is not used and the audit is not required. Instead, customers must consult the program guidelines and application form, available on NWE's website, to determine the eligibility of measures for which they wish to apply. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers may immediately solicit bids from contractors or do the work themselves. Customers' rebate submittal packages include a completed application form, their contractor's invoice or materials receipts if self-installed, and a recent NWE bill for the residence where the installation occurred. Contractor invoices must provide considerable detail on the installation as noted on the application form. Inspections occur on a random basis prior to payment approval as described earlier. Customers receive their rebate checks in four to six weeks.

16.2. Impact Evaluation

16.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

16.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings (UES) as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the eight measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate UES method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and producing energy savings. We collected data as necessary to support a re-estimation of energy savings, using the UES method that resulted from the UES review and data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

16.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

16.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

16.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

16.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

16.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

16.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 43 sampled cases for this program across the five program years. The results from this review revealed the following entry error in the program tracking database associated with energy savings.

- 380 ft² of attic insulation was entered as above-grade wall insulation in the database. Since we could not change the measure type, we instead changed the area entry from 380 ft² to 754 ft²; this increase in area is in proportion to the increase in UES value for attic vs. wall insulation.

We re-calculated annual energy savings (kWh) after corrections were made to the data entry error listed above. The energy savings increased by 1,002 kWh after the correction was made.

UES review

We reviewed the eight UES measure groups installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. For two of these measures, we determined that the NWE methods were reasonable and made no changes. In one case we used the existing UES value, but applied it on a building type basis. For the remaining measures, we determined that changes to the UES methods were appropriate.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 362: Summary of UES Adjustments for E+ Residential Existing Electric Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Electric clothes dryer with moisture sensor	All	139	kWh per unit	108	kWh per unit
Refrigerator/Freezer - Energy Star	All	95	kWh per unit	118	kWh per unit
Insulation Ceiling/Attic R-0 to R-49	All	5.32	kWh per Sq. Ft.	5.32	kWh per Sq. Ft.
Insulation Ceiling/Attic R-11 to R-49	All	2.27	kWh per Sq. Ft.	2.27	kWh per Sq. Ft.
Insulation Ceiling/Attic R-19 to R-49	All	0.98	kWh per Sq. Ft.	0.98	kWh per Sq. Ft.
Basement wall insulation	All	1.08	kWh per Sq. Ft.	1.81	kWh per Sq. Ft.
Foundation/Slab Insulation, R-10	All	0.18	% of heating	0.18	% of heating
Wall insulation, 2x4 walls,	Residential,	2.41	kWh per Sq. Ft.	2.55	kWh per Sq. Ft.

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Electric room heat	Single-family				
Wall insulation, 2x4 walls, electric furnace	Residential, Single-family	2.41	kWh per Sq. Ft.	2.93	kWh per Sq. Ft.
Wall insulation, 2x4 walls, heat pump	Residential, Single-family	2.41	kWh per Sq. Ft.	2.12	kWh per Sq. Ft.
Wall insulation, 2x4 walls, Electric room heat	Residential, Manufactured home	2.41	kWh per Sq. Ft.	2.55	kWh per Sq. Ft.
Wall insulation, 2x4 walls, electric furnace	Residential, Manufactured home	2.41	kWh per Sq. Ft.	2.93	kWh per Sq. Ft.
Wall insulation, 2x4 walls, heat pump	Residential, Manufactured home	2.41	kWh per Sq. Ft.	2.12	kWh per Sq. Ft.
Wall insulation, 2x4 walls, Electric room heat	Residential, Multi-family	2.41	kWh per Sq. Ft.	2.16	kWh per Sq. Ft.
Wall insulation, 2x4 walls, electric furnace	Residential, Multi-family	2.41	kWh per Sq. Ft.	2.25	kWh per Sq. Ft.
Wall insulation, 2x4 walls, heat pump	Residential, Multi-family	2.41	kWh per Sq. Ft.	1.39	kWh per Sq. Ft.
Wall insulation, 2x6 walls, All	All	2.68	kWh per Sq. Ft.	2.68	kWh per Sq. Ft.
Programmable T-Stat, heating, Electric room heat	Residential, Single-family	0.368	kWh per Sq. Ft.	0.477	kWh per Sq. Ft.
Programmable T-Stat, heating, electric furnace	Residential, Single-family	0.368	kWh per Sq. Ft.	0.477	kWh per Sq. Ft.
Programmable T-Stat, heating, heat pump	Residential, Single-family	0.368	kWh per Sq. Ft.	0.318	kWh per Sq. Ft.
Programmable T-Stat, heating, Electric room heat	Residential, Multi-family	0.368	kWh per Sq. Ft.	0.366	kWh per Sq. Ft.
Programmable T-Stat, heating, electric furnace	Residential, Multi-family	0.368	kWh per Sq. Ft.	0.366	kWh per Sq. Ft.
Programmable T-Stat, heating, heat pump	Residential, Multi-family	0.368	kWh per Sq. Ft.	0.277	kWh per Sq. Ft.
Programmable T-Stat, heating, All	Residential, Manufactured home	0.368	kWh per Sq. Ft.	0.956	kWh per Sq. Ft.
Programmable T-Stat, cooling, Packaged/rooftop	Residential, Single-family	0.026	kWh per Sq. Ft.	0.028	kWh per Sq. Ft.
Programmable T-Stat, cooling, Packaged/rooftop	Residential, Multi-family	0.026	kWh per Sq. Ft.	0.063	kWh per Sq. Ft.
Programmable T-Stat, cooling, Packaged/rooftop	Residential, Manufactured home	0.026	kWh per Sq. Ft.	0.049	kWh per Sq. Ft.
Energy Star freezer	All	44	kWh per unit	51	kWh per unit

Electric Clothes Dryer with Moisture Sensor. The program value is based on (Nexant, Cadmus 2010), which set savings at 15% of an estimated UEC of 927 kWh/year. We reviewed the Technical Support Document (TSD) (US DOE 2012) for clothes dryers, which estimates the average UEC at 718 kWh/year. The 15% savings is supported by the TSD, as well as (California Energy Commission 2012). We updated the UES based on the more recent estimate of dryer UEC.

Energy Star Refrigerator. Savings were based on (Nexant, Cadmus 2010), which used 20% savings of a UEC of 476 kWh/year (apparently based on Energy Star). We verified that the UEC is reasonable with DEER (Itron 2006) and the RTF measure (Regional Technical Forum 2011). We re-calculated the savings with the July, 2012 Energy Star appliance calculator (specification date April, 2008). As a result we increased the UES from 95 to 118 kWh/year.

Energy Star Freezer. Savings were based on (Nexant, Cadmus 2010), which used 10% savings of a UEC of 444 kWh/year (apparently based on Energy Star). We verified that the UEC is reasonable by comparison with the RTF measure (Regional Technical Forum 2012). We re-calculated the savings with the July, 2012 Energy Star appliance calculator (specification date April, 2008). As a result we increased the UES from 44 to 51 kWh/year.

Ceiling/Attic Insulation. Nexant provided unit savings values per square foot in a personal communication to NWE. We compared the values with NWE's residential gas program's attic insulation measures, and with the RTF attic insulation measures (Regional Technical Forum 2012). We found that the existing NWE values are reasonable.

Wall Insulation. Nexant provided unit savings values per square foot in a personal communication to NWE. We compared the values with NWE's residential gas program's attic insulation measures, and with the RTF wall insulation measures (Regional Technical Forum 2012). The existing NWE values were lower than the other program values. We updated the UES to the RTF values for Kalispell, MT, and provided savings based on building type and heating system type for use in the evaluation.

Basement Insulation. Nexant provided unit savings values per square foot in a personal communication to NWE. We compared the values with NWE's residential gas program's attic insulation measures, and with the RTF wall insulation measures (Regional Technical Forum 2012). The existing NWE values were lower than the other program values. We updated the UES to the RTF values for Kalispell, MT.

Slab Insulation. NWE no longer supports this measure, but it was supported in 2009. Savings were based on the 2003 gas potential assessment (KEMA 2003), which estimated savings at 18% of space heating UEC for R-10 insulation. We reviewed the literature but found no basis to critique the savings estimate. We made no changes to the UES.

Programmable Thermostat. Savings were estimated in the 2010 electric potential assessment (Nexant, Cadmus 2010) as 6.8% of space heating and cooling UEC. Separate measures were provided by NWE for heating, cooling, or both. Cooling savings were around 5% of heating savings. The savings for combined heating and cooling appeared too low – it should be greater than the savings for just heating.

We reviewed the literature for this measure, and found three state TRMs (MA, NY, OH) which cite one report (RLW Analytics 2007) as support for 6.8% savings. We accepted the existing NWE UES values, but applied them on a building type and heating system type basis for the evaluation. Savings for combined heating and cooling we estimated as the sum of the two measures.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Residential Existing Electric Rebate program we successfully visited 27 sites encompassing four different strata. The Special Effort team encountered a low response rate (44% “No Reply”) when recruiting for this program; and the on-site inspectors experienced a high refusal rate (23% “Onsite Refused”) when it came time to schedule the visit or meet at the site. Stratum 2, 3, and 9 sites that could not be visited were replaced with stratum 1 sites.

Table 363: Site Recruitment Disposition for E+ Residential Existing Electric Rebate

	Stratum				Total n	%
	1	2	3	9		
Recruitment						
Telephone Lab	13	1	1	0	15	
Special Effort						
Attempts	20	15	6	2	43	
No Reply	11	8	0	0	19	44%
Refused	1	0	2	1	4	9%
Recruited	8	7	4	1	20	47%
Total Recruited	**21**	**8**	**5**	**1**	**35**	
Onsite						
Refused	5	2	1	0	8	23%
Not Needed	0	0	0	0	0	0%
Total Completed	**16**	**6**	**4**	**1**	**27**	**77%**

Site Inspections

For the 2010–2011 program years, we performed 27 site inspections which considered eight measures: Attic Insulation, Slab Insulation, Exterior Above-Grade Wall Insulation, Basement

Wall Insulation, Thermostat Control, Efficient Refrigerator, Efficient Freezers, and Efficient Clothes Dryers.

Across the 27 sites we visited, we found that nearly all of the sampled measures were installed, operational, and matched the quantity and size claimed by NWE. The only exception was one Exterior Above-Grade Wall Insulation site where we found that no walls were insulated, above-grade or otherwise.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit. Aside from the one case described in the paragraph above, all of the discrepancies between evaluation and claimed savings are due to the evaluation UES methods.

For the four Attic Insulation and two Slab Insulation measure sites, the evaluation savings is equal to the program savings. For the one Basement Wall Insulation measure site, the evaluation savings is 1.67 times the program savings due to the change in the evaluation UES value (see UES Review section above).

For the Exterior Above-Grade Wall Insulation measure, NWE had developed UES values that varied by building type and heating type but only applied a value that was averaged across all building and heating types. The evaluation applied the NWE UES values by specific building and heating type, rather than using the average. For five of the six sites in this measure type, the evaluation savings is 0.9 to 1.0 times the claimed savings. For the sixth site, the evaluation savings is zero based on the lack of any wall insulation found at the site.

For the five sites with Efficient Refrigerator/Freezer measure, the evaluation savings is 1.24 times the claimed savings; this is due to changes in the evaluation UES. For the five sites with Efficient Clothes Dryer measure, the evaluation savings is 0.77 times the claimed savings; this is due to changes in the evaluation UES.

For the four sites with the Thermostat Control measure, the evaluation savings vary between 1.07 and 1.25 times the evaluation savings. This is due to changes in the evaluation UES method which uses the building-type specific UES values rather than the averaged UES values.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 364: File Review and Site Visit Adjustment to Savings for E+ Residential Existing Electric Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Residential Existing Electric Rebate	kWh	460,654	462,684	434,209	421,763	1.00	0.94	0.92

16.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 365: Savings Adjustments by Calendar Year for E+ Residential Existing Electric Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Residential Existing Electric Rebate	kWh	2007	51,968	0.92	-	-	0.92	47,581	5
	E+ Residential Existing Electric Rebate	kWh	2008	153,038	0.92	-	-	0.92	140,118	16
	E+ Residential Existing Electric Rebate	kWh	2009	190,452	0.92	-	-	0.92	174,373	20
	E+ Residential Existing Electric Rebate	kWh	2010	30,581	0.92	-	-	0.92	27,999	3
	E+ Residential Existing Electric Rebate	kWh	2011	34,615	0.92	-	-	0.92	31,692	4
	E+ Residential Existing Electric Rebate	kWh	All Years	460,654	0.92	-	-	0.92	421,763	48
Electric										
	E+ Residential Existing Electric Rebate	kWh	All Years	460,654	0.92	-	-	0.92	421,763	48

16.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 366: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Residential Existing Electric Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Residential Existing Electric Rebate	kWh	2007	47,581	0.44	0.56	0.45	0.49
	E+ Residential Existing Electric Rebate	kWh	2008	140,118	0.80	1.34	0.96	0.88
	E+ Residential Existing Electric Rebate	kWh	2009	174,373	1.17	1.20	0.94	1.28
	E+ Residential Existing Electric Rebate	kWh	2010	27,999	1.10	1.69	1.33	1.21
	E+ Residential Existing Electric Rebate	kWh	2011	31,692	0.20	0.22	0.22	0.22
	E+ Residential Existing Electric Rebate	kWh	All Years	421,763	0.66	0.82	0.68	0.73
Electric								

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios: Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	E+ Residential Existing Electric Rebate	kWh	All Years	421,763	0.66	0.82	0.68	0.73

16.3. Process Evaluation

16.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with 26 participants and a sample of trade allies. Surveyed trade allies include 50 respondents who reported offering HVAC and 28 who reported offering insulation products and services to residential end-users.

16.3.2. Implementation Findings

16.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE's website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures such as insulation, air conditioning, and water heating among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

For certain residential measures, there are two tiers of rebates, with higher rebates paid for work performed by preferred contractors, and lower rebates paid for self-installed measures and work done by non-preferred contractors. Some residential measures require use of a preferred contractor for rebate eligibility.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor's invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application.

For all program rebates except those for home electronics, the customer's application must include a current NWE bill or accurate NWE account number for the building where the installation occurred; home electronics require only the customer's account number in lieu of the utility bill with the application. For residential door installations, the product's National Fenestration Rating Council (NFRC) label must accompany the rebate application.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

16.3.2.2. Best Practices Assessment

Table 367 through Table 370 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 367: Program Planning and Design Best Practices for E+ Residential Existing Electric Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 368: Program Management and Administrative Best Practices for E+ Residential Existing Electric Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact

Practice	NWE Assessment
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 369: Marketing and Outreach Best Practices for E+ Residential Existing Electric Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 370: Program Quality Control Best Practices for E+ Residential Existing Electric Rebate

<table>
<tr><th>Practice</th><th>NWE Assessment</th></tr>
<tr><td>Conduct sample-based post-installation inspections
Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance
Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types
Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure</td><td>NWE follows these inspection practices
Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs
Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings</td></tr>
<tr><td>Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)</td><td>NWE follows this practice, inspecting projects over a specified size</td></tr>
<tr><td>Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions</td><td>E+ Program Contractors follow this practice</td></tr>
<tr><td>Assess customer satisfaction</td><td>NWE assesses satisfaction with all programs during its program cycle evaluation each five years
Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis</td></tr>
<tr><td>Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market</td><td>NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.</td></tr>
</table>

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

16.3.3. Participant Findings

We surveyed 26 NWE customers who participated in the E+ Residential Existing Electric Rebate program.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

16.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NWE, the kind of additional information they wanted, as well as providing information about their decision to purchase appliances or other actions recommended by the program.

Respondents became aware of the electric rebate program chiefly through noticing a utility publication or advertisement (81%). Each of the other methods also reached more than one in five of the respondents (Table 371).

Table 371: Means of Program Awareness, among E+ Residential Existing Electric Rebate Participants

Means (Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=26)	81%
Building professional, vendor, or contractor (n=26)	38%
Heard of Program Other Ways (n=24)	37%
Directly contacted utility (n=26)	32%
Word of mouth (n=26)	22%
Utility representative appearance (n=26)	21%

Most respondents (72%) had visited NWE’s website. This is somewhat higher than many of the other residential program participants we surveyed. One-half of those who had not visited the website reported they “don’t have access” (Table 372).

Table 372: Reasons Website Not Used, among E+ Residential Existing Electric Rebate Participants

Reason	Weighted Percent (n=7)
Don’t have access	50%
Don’t like to use it much	27%
Didn’t know they had one	11%
No need or no reason	11%

For respondents who did use the website, there were two primary motivations: over 85% went to the site to learn about rebates or audits, and a similar 83% segment wanted utility contact information. The next most common use (57%) was online bill payment (Table 373).

Table 373: Website Use, among E+ Residential Existing Electric Rebate Participants

(Allowed Multiple)	Weighted Percent
Learn about rebates or audits (n=19)	87%
Utility contact information (n=19)	83%
Pay utility bill (n=19)	57%

(Allowed Multiple)	Weighted Percent
Money saving tips (n=19)	42%
Look up general information (n=19)	19%
Energy saving educational opportunities (n=19)	13%
Track energy usage (n=19)	9%
How-to videos (n=19)	0%

Nearly all website users (91%) thought the website information was easy to find and helpful (Figure 107).

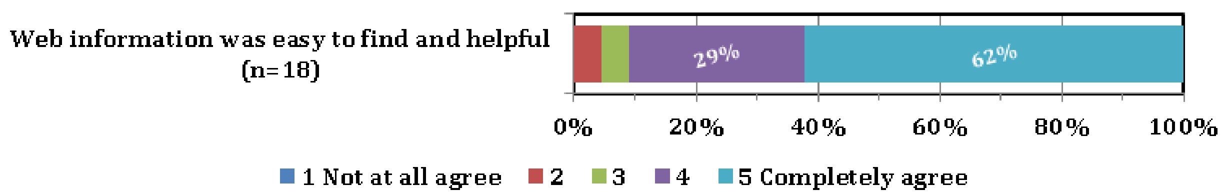

Figure 107: Website Effectiveness, among E+ Residential Existing Electric Rebate Participants

A slim majority of respondents, 54%, do not want more information from NWE on efficiency at this time. Others requested further educational information (Table 374).

Table 374: Further Information Desired, among E+ Residential Existing Electric Rebate Participants

Information (Allowed Multiple)	Weighted Percent
Does not want any (n=26)	54%
Energy saving educational opportunities (n=26)	43%
Energy efficiency programs (n=26)	40%
Workshops or events on energy efficiency (n=26)	24%

Those desiring further information prefer to receive information electronically (73%), followed by face-to-face events such as trainings and workshops (59%; Table 375).

Table 375: Information Delivery Preference, among E+ Residential Existing Electric Rebate Participants

Means (Allowed Multiple)	Weighted Percent
Email (n=12)	73%
Trainings, workshops or seminars (n=12)	59%
US Mail (n=12)	57%

Means (Allowed Multiple)	Weighted Percent
Community event (n=12)	46%
Webinar (n=12)	37%
Phone (n=12)	23%
Other (n=12)	16%

When asked about their reasons for applying for a rebate, respondents did not typically say it was due to contractor recommendation, which they mentioned 25% of the time. The more dominant reasons mentioned were this program's ease of use, saving money and energy, and increasing home comfort (Table 376).

Table 376: Reasons To Participate, among E+ Residential Existing Electric Rebate Participants

Reason (Allowed Multiple)	Weighted Percent
Save money (n=26)	97%
Save energy (n=26)	97%
Easy to use the program (n=26)	91%
Increase home comfort (n=26)	84%
Good experience with other NWE efficiency program (n=24)	66%
Utility vouched for equipment by rebating (n=26)	59%
Wanted to follow audit with action (n=24)	47%
Contractor recommendation (n=14)	25%

When considering whether to participate, 93% of the participants said they had no questions or concerns about participating. Two individuals among the 26 participants hesitated at first, thinking it was confusing to participate.

E+ Residential Existing Gas Rebate program participants gave high ratings to the clarity of early program information offered, as at least 62% of them rated information on the following aspects of program participation "clear" or "very clear" (Figure 108).

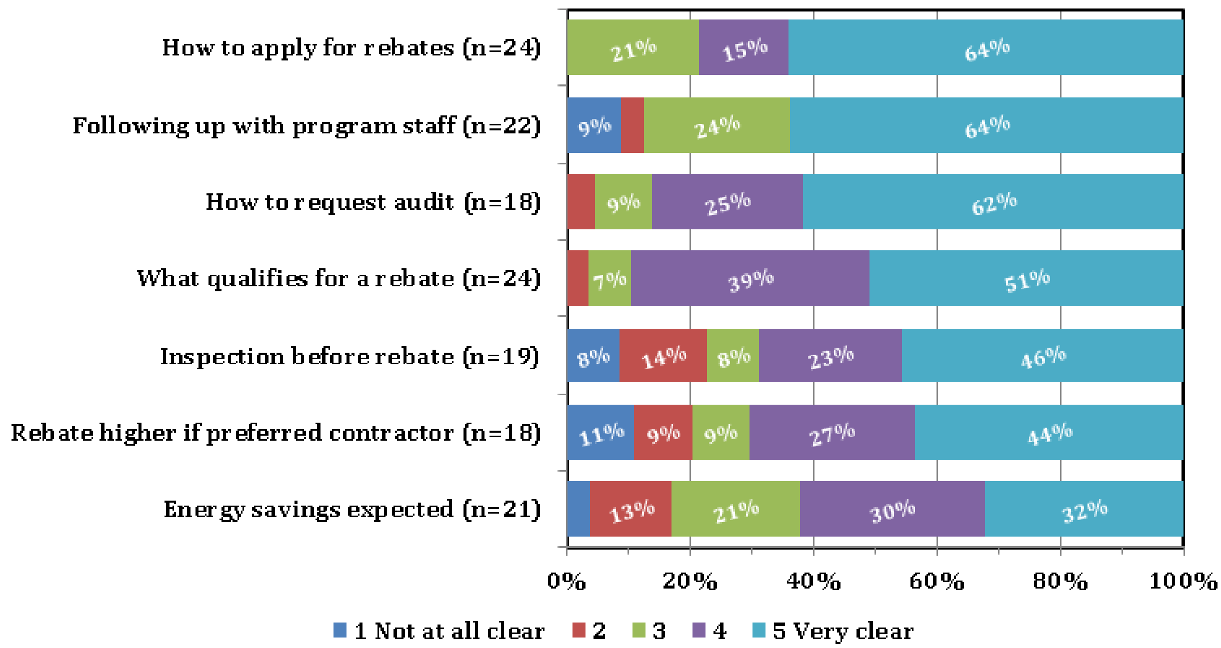

Figure 108: Clarity of Program Information, among E+ Residential Existing Electric Rebate Participants

16.3.3.2. Program Experience

Respondents reported on their program experience after receiving a rebate from NWE, often after visits by installers and inspectors.

The offered rebate items were readily available, reported 97% of the respondents. While only 10 of 26 respondents reported using a contractor to install the rebated equipment, in these cases, a preferred contractor was chosen 77% of the time.

Respondents rated the logistics of applying, choosing, and receiving a rebate. Participants “completely agreed” with positive statements about each stage a minimum of 63% of the time (Figure 109).

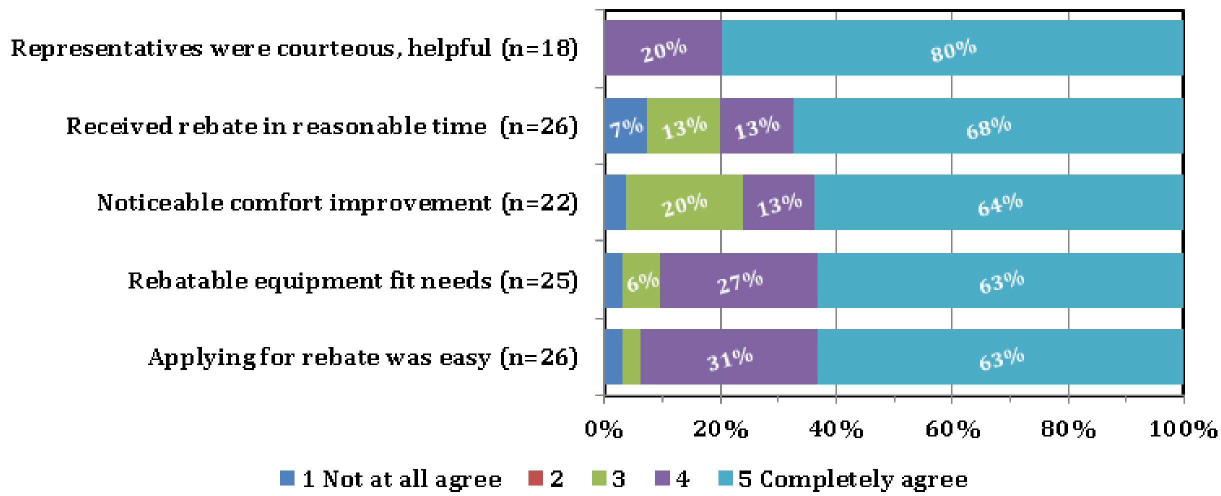

Figure 109: Experience With Project Development, among E+ Residential Existing Electric Rebate

The installed items were inspected by a utility representative 39% of the time, according to respondents.

When asked, respondents tended to be in agreement with positive descriptions about the contractors' performance, installers' explanations, and inspectors' performance (Figure 110).

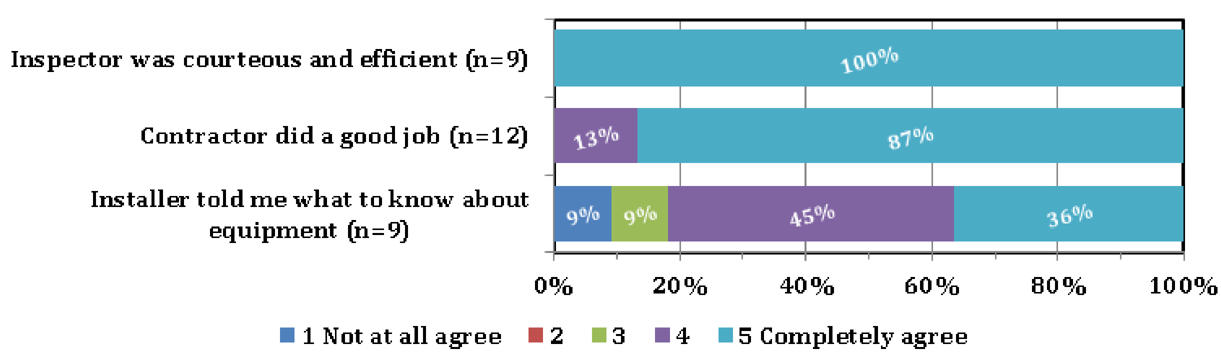

Figure 110: Experience With Installation Process, among E+ Residential Existing Electric Rebate

As a general indication of overall satisfaction with NWE's efficiency activities, the survey asked participants about future participation. Eighty-seven percent were "likely" or "very likely" to participate in future NWE energy efficiency programs (Figure 111).

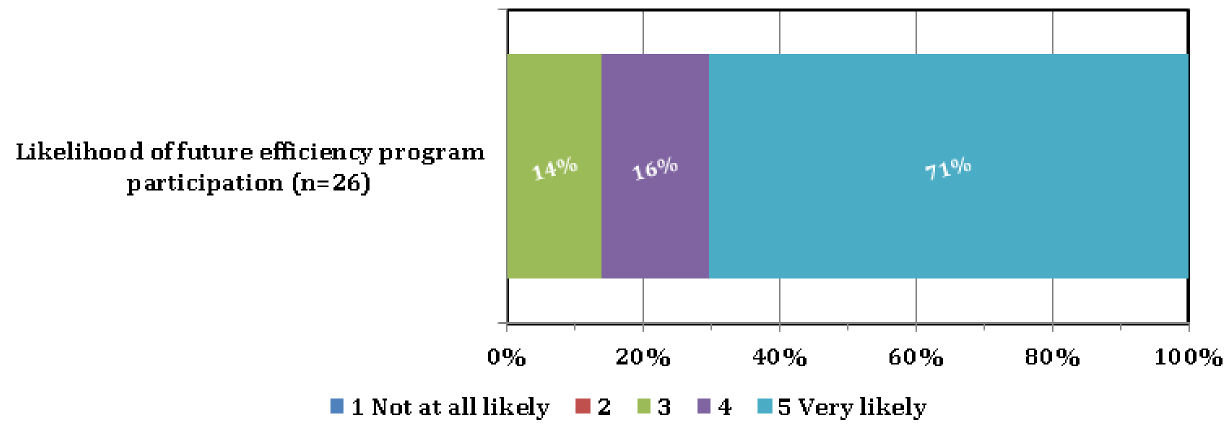

Figure 111: Likelihood of Future Participation, among E+ Residential Existing Electric Rebate Participants

The open-ended comments solicited and collected by the interviewer were often suggestions to improve the rebates (25%) or positive praise (33%).

16.3.4. Trade Ally Findings

As part of the process evaluation of the E+ Residential Existing Electric Rebate program, we surveyed trade allies who installed either insulation or equipment for residential customers through NWE programs.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

16.3.4.1. E+ Residential Existing Electric Rebate Insulation Trade Allies

We surveyed 28 NWE trade allies who installed insulation projects that qualify for rebates through NWE residential programs.

Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE insulation program opportunities chiefly from noticing a utility publication or advertisement (79%), or by directly contacting the utility (75%; Table 377).

Table 377: Means of General Program Awareness, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=28)	79%
Directly contacted utility (n=28)	75%
Utility representative appearance (n=27)	63%
Utility website (n=27)	44%
Associated vendors and contractors (n=28)	39%
Word of mouth (n=28)	39%

Trade ally respondents often learned about specific program requirements from a utility representative (43%) at a meeting or event, or by contacting NWE directly (43%; Table 378).

Table 378: Specific Requirements Awareness, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=28)	43%
Directly contacted utility (n=28)	43%
Utility publication (n=28)	25%
Utility website (n=28)	14%
Associated vendors and contractors (n=28)	11%

A majority (64%) of surveyed trade allies visit NWE's website. Among those website users, most (89%) said they used the site to find rebates or audits, and a majority (78%) had printed rebate forms or in some cases, searched for NWE contact information (Table 379).

Table 379: Website Use, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=18)	89%
Print rebate forms (n=18)	78%
To contact utility (n=18)	61%
Money saving ideas (n=18)	50%
Educational events information (n=18)	50%
How-to videos (n=18)	11%

Over half (57%) of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful, however 12% gave low ratings (Figure 112).

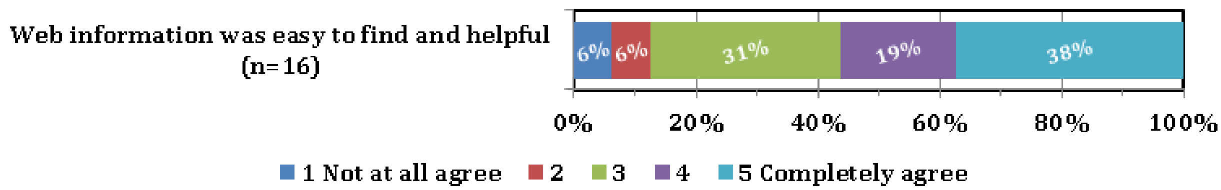

Figure 112: Website Effectiveness, among E+ Residential Existing Electric Rebate Insulation Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. Two-thirds (68%) said they had contacted the utility to learn how the rebate program worked (Table 380).

Table 380: Reasons for Contacting NWE, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=28)	68%
To resolve a problem (n=28)	50%
Investigate status of an application (n=28)	39%
Investigate status of a rebate payment (n=28)	39%
None of these (n=28)	21%

Over 60% of surveyed trade allies would like to receive further information on energy savings programs and opportunities and expressed an interest in additional workshops or events on energy efficiency (Table 381).

Table 381: Further Information Desired, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Energy saving educational opportunities (n=28)	64%
Workshops or events on energy efficiency (n=28)	64%
Energy efficiency programs (n=28)	61%
None (n=28)	21%

Those desiring further information slightly preferred to receive information by mail (46%), and other methods such as email (39%) or trainings and workshops (29%; Table 382).

Table 382: Information Delivery Preference, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
US mail (n=28)	46%
Email (n=28)	39%
Trainings, workshops or seminars (n=28)	29%
Community event (n=28)	21%
Phone (n=28)	18%
Webinar (n=28)	18%

Efficient Equipment Promotion

Trade allies provided general information about their promotion of energy efficiency upgrades.

Respondents reported on what benefits they typically mention to customers about the high-efficiency projects that qualify for rebate. Lower energy costs was the benefit most often mentioned (96%) by respondents (Table 383). The utility rebate and the high quality of the product were mentioned also by close to 80% of these trade allies.

Table 383: Customer Benefits Mentioned, among E+ Residential Existing Electric Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=28)	96%
Comfort (n=28)	82%
Utility rebate (n=28)	79%
High-quality of product (n=28)	71%

Surveyed trade allies reported on whether their customers ever installed levels of insulation that would qualify for the program without pursuing a rebate. Less than half (42%) of respondents said they recalled installing rebate-qualifying insulation in cases when they knew customers did not pursue rebates.

Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Almost two-thirds (61%) of all 28 trade ally respondents say they had trained staff to talk to customers about energy efficiency. About one-third of these respondents (39%) said they “almost always” bring up the discussion about utility rebates for which their customer might qualify (Table 384).

Table 384: Rebate Initiator, among E+ Residential Existing Electric Rebate Insulation Trade Allies

	Percent (n=28)
Almost always trade ally initiated	39%
Mostly trade ally initiated	29%
About half trade ally and half customer	21%
Almost always customer initiated	11%

When a customer is considering insulation projects, almost all (92%) of these respondents suggested insulation in quantities and places that qualify for the rebate program, rather than waiting for the customer to show interest in qualifying for NWE rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Nearly two-thirds of surveyed trade allies (64%) indicated that nothing about the program raised issues or concerns about their customers' participation. Among the 10 respondents who had initial concerns, the reasons given showed no clear pattern. However, meeting R-value requirements and "paperwork" were mentioned by a handful of trade allies.

A minority (25%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" were contacting customers with varied frequency, some (29%) as often as once a month (Table 385).

Table 385: Customer Contact Frequency, among E+ Residential Existing Electric Rebate Insulation Trade Allies

	Percent (n=7)
Once a month	29%
Once a year	29%
Every day	29%
2 times a year	14%

The majority (from 54% to 82%) of these trade ally respondents rated program information they received from NWE on rebates and contacting program staff as "clear" or "very clear." Lower ratings were reported for readability in general, as well as for the clarity of information on qualifying measures (Figure 113).

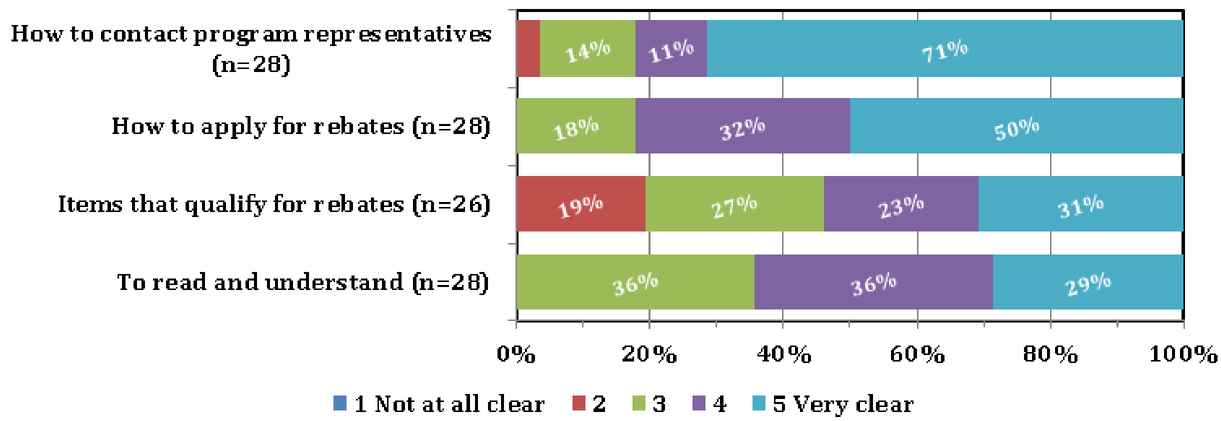

Figure 113: Clarity of Program Information, among E+ Residential Existing Electric Rebate Insulation Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (68%) reported working with the customer in a joint effort to prepare the applications. Another 21% completed all or most of the application themselves.

Table 386: Rebate Application Preparer, among E+ Residential Existing Electric Rebate Insulation Trade Allies

Who prepares the application:	Percent (n=28)
Typically both respondent and customer	68%
Typically trade ally prepares all or most	21%
Typically the customer prepares all or most	11%

About 80% of the 25 trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process was simple to follow (Figure 114).

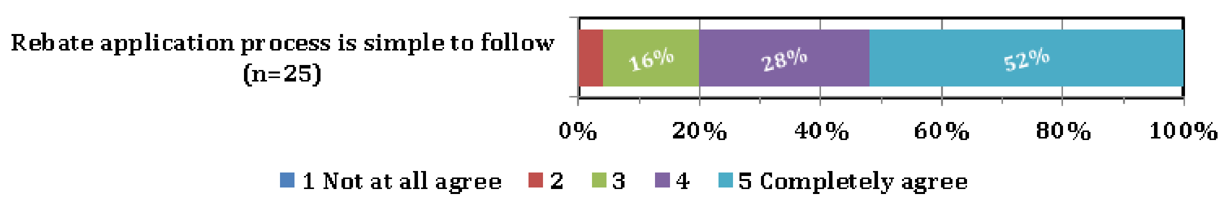

Figure 114: Experience With Application Process, among E+ Residential Existing Electric Rebate Insulation Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes made by NWE. Approximately two-thirds of respondents "agreed" or "completely agreed" that updates were provided in a timely manner, staying current takes little staff time, and that customers benefit from additions (Figure 115).

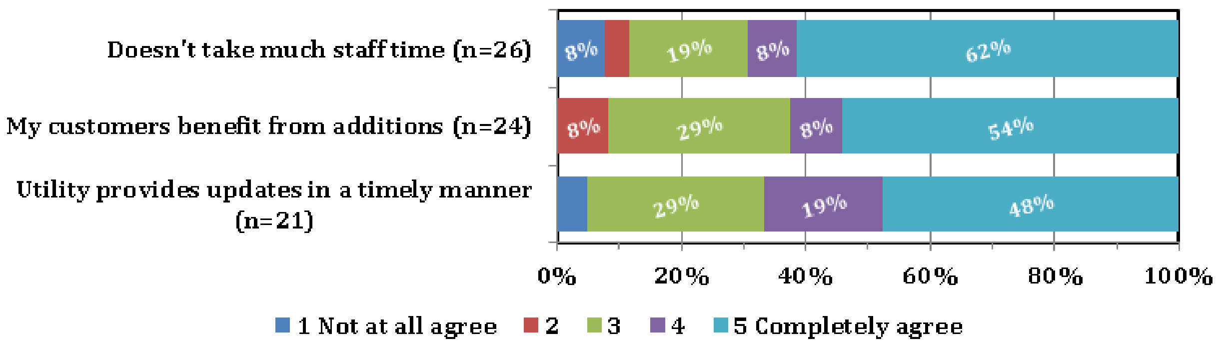

Figure 115: Experience With Program Changes, among E+ Residential Existing Electric Rebate Insulation Trade Allies

Nearly all (93%) of the surveyed residential trade allies reported that they were on NWE's Preferred Contractors list. All respondents "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (88%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." Two-thirds of respondents (66%) agreed or completely agreed that being a preferred contractor had "helped us grow our business" (Figure 116).

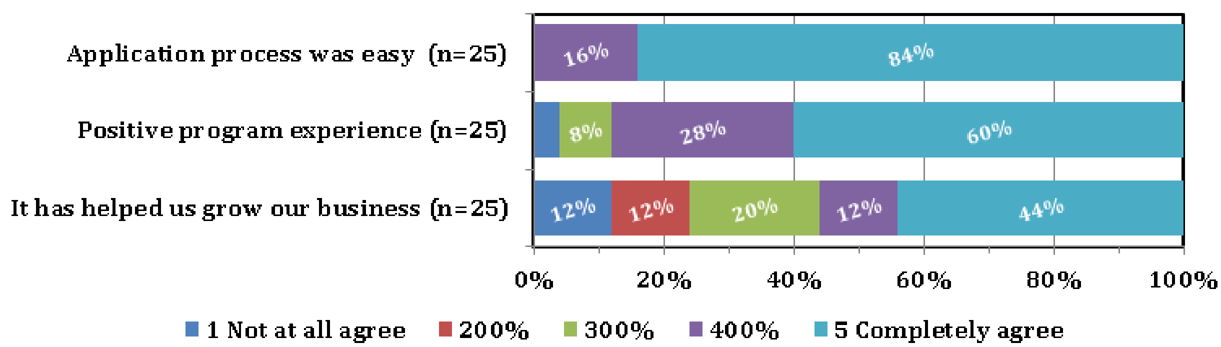

Figure 116: Experience As Preferred Contractor, among E+ Residential Existing Electric Rebate Insulation Trade Allies

The few trade allies reporting ratings of "1" or "2" on the five-point agreement scale on the topics listed in Figure 116 were asked to explain their low ratings. A handful of trade ally organizations mentioned that too few customers took part for participation to have helped their business.

Firmographics

A few of these trade allies (15%) served customers in more than 20 Montana locations. Two-thirds of these allies (66%) served in five or fewer locations.

Table 387: Number of Montana Locations Served, among E+ Residential Existing Electric Rebate Insulation Trade Allies

	Percent (n=27)
1 location	44%
2 to 5 locations	22%
6 to 10 locations	11%
11 to 20 locations	7%
21 to 50 locations	4%
Over 50 locations	11%

Trade allies reported on the maximum number of miles they would travel to serve clients. About one-third would travel less than 100 miles (36%) or would travel between 101 and 200 miles to serve a client (32%). Few (18%) would travel more than 400 miles (Figure 117).

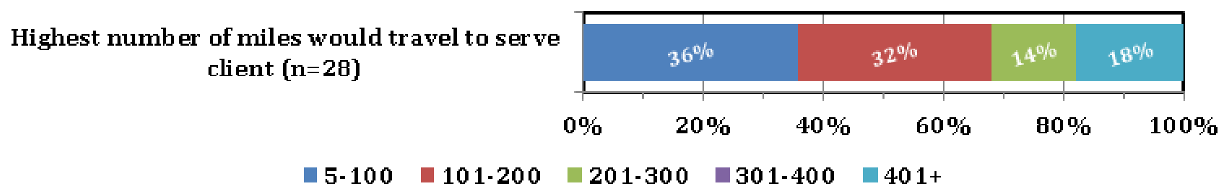

Figure 117: Maximum Miles, among E+ Residential Existing Electric Rebate Insulation Trade Allies

16.3.4.2. E+ Residential Existing Electric Rebate Equipment Trade Allies

We surveyed 50 NWE equipment trade allies who installed HVAC, plumbing, and other equipment that qualified for rebates through NWE residential programs.

Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from noticing a utility publication or advertisement (76%), by directly contacting the utility, or from a utility representative at a meeting or event (Table 388).

Table 388: Means of General Program Awareness, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=50)	76%
Directly contacted utility (n=50)	70%

(Allowed Multiple)	Percent
Utility representative appearance (n=50)	68%
Utility website (n=50)	46%
Word of mouth (n=50)	44%
Associated vendors and contractors (n=50)	38%

Trade ally respondents most frequently learned about specific program requirements from a utility representative at a meeting or event (53%), or by contacting NWE directly (42%; Table 389).

Table 389: Specific Requirements Awareness, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=50)	52%
Directly contacted utility (n=50)	42%
Utility publication (n=50)	28%
Associated vendors and contractors (n=50)	10%
Utility website (n=50)	6%

A majority (66%) of surveyed trade allies had visited NWE's website. Among those website users, approximately three-quarters (76%) said they used the site to find information related to rebates or audits, and smaller majorities had printed rebate forms or searched for NWE contact information (Table 390).

Table 390: Website Use, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Finding rebate or audit information (n=33)	76%
NWE contact information (n=33)	64%
Print rebate forms (n=33)	55%
Educational events information (n=33)	39%
Money saving ideas (n=33)	36%
How-to videos (n=33)	9%

Most (62%) of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful, however 13% gave low ratings (Figure 118).

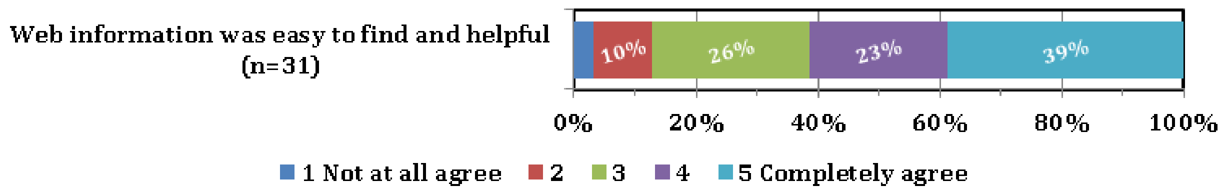

Figure 118: Website Effectiveness, among E+ Residential Existing Electric Rebate Equipment Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority (62%) said they had contacted the utility to learn how the rebate program worked (Table 391).

Table 391: Reasons for Contacting NWE, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=50)	62%
To resolve a problem (n=50)	44%
Investigate status of an application (n=50)	36%
Investigate status of a rebate payment (n=50)	30%
None of these (n=50)	24%
Other (n=50)	16%

About half of surveyed trade allies would like to receive further information on energy savings programs and opportunities, or to attend additional workshops or events (Table 392).

Table 392: Further Information Desired, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=50)	60%
Energy efficiency programs (n=50)	58%
Energy saving educational opportunities (n=50)	54%
None (n=50)	30%

Those desiring further information preferred to receive information by mail (38%) and other methods such as email (30%) or trainings and workshops (26%; Table 393).

Table 393: Information Delivery Preference, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
US mail (n=50)	38%
Email (n=50)	30%
Trainings, workshops or seminars (n=50)	28%
Community event (n=50)	16%
Webinar (n=50)	16%
Phone (n=50)	8%

Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

We asked residential trade allies if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if instead they kept unrated/standard items in stock and *ordered* the high-efficiency items as needed. Just over half (54%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 394 below. Most (84%) kept a range of equipment that varied in quality and prices to offer customers, and 97% agreed that the “Better” and “Best” equipment is usually more energy-efficient than the “Good.” Over half (63%) reported they suggest the “Best” equipment to customers first.

Table 394: Equipment Sales Approach, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option to buy (n=49)	84%
Agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' option (n=39)	97%
Best presented first (n=40)	63%
Better presented first (n=40)	23%
Present all options simultaneously (n=40)	13%
Good presented first (n=40)	3%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. Less than half (42%) of these trade allies reported that over three-quarters of their stock was high-efficiency equipment. A third of these respondents said that no more than 25% of their regular stock was comprised of high-efficiency equipment. Those trade allies who reported that they stocked efficient equipment also estimated the share of sales made in the past two years that were energy-efficient items. A majority (63%) reported that more than three-fourths of the equipment they sold in the past two years as high-efficiency (Figure 119).

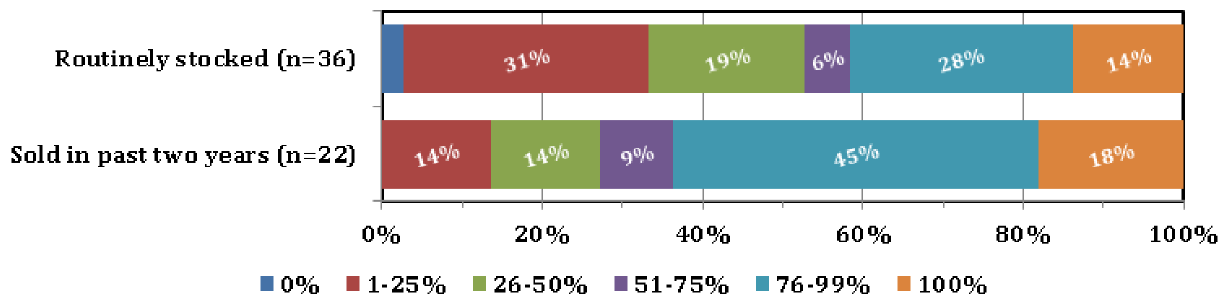

Figure 119: High Efficiency Equipment Share, among E+ Residential Existing Electric Rebate Equipment Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment that qualifies for rebates. The most commonly mentioned benefits, by 88% of these trade allies, were the rebate itself and the lower operation costs of the equipment (Table 395).

Table 395: Customer Benefits Mentioned, among E+ Residential Existing Electric Rebate Equipment Trade Allies

Benefit	Percent
Lower operation costs (n=50)	88%
Utility rebate (n=50)	88%
High-quality of product (n=50)	70%
Lower maintenance costs (n=50)	54%

About 20% of these residential trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these ten respondents mentioned cost half the time (Table 396).

Table 396: Reasons for Discouraging Efficient Equipment Purchase, among E+ Residential Existing Electric Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Cost (n=10)	50%
Installations are too complex (n=10)	20%
Less reliable than standard items (n=10)	20%
Other (n=10)	20%

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. About one-third (35%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. Among the reasons reported in the following table, no single reason stands out as a barrier to rebate applications (Table 397).

Table 397: Circumstances When Rebate Foregone, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent
Trade ally unaware of rebate/program (n=14)	21%
Customer did not apply (n=14)	21%
Customer ineligible (n=14)	14%
Rebate too small (n=14)	14%
Applying takes too long (n=14)	7%
Unspecified or unclear (n=14)	21%

Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (64%) of trade ally respondents say they had trained staff to talk to customers about energy efficient choices. In fact, 46% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 398).

Table 398: Rebate Initiator, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent (n=50)
Almost always trade ally initiated	46%
Mostly trade ally initiated	36%
About half trade ally and half customer	10%
Almost always customer initiated	8%

When a customer is considering an equipment purchase, 94% of these respondents suggest equipment that qualifies for the rebate program, rather than waiting for the customer to show interest in qualifying for rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Most surveyed trade allies (86%) indicated that nothing about the program raised issues or concerns about their customers' participation. Among the seven respondents who had initial concerns, the reasons given showed no pattern. However, problems with the rebate were concerns for two respondents.

A minority (18%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" were contacting customers with varied frequency, some as often as daily and some yearly (Table 399).

Table 399: Customer Contact Frequency, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent (n=9)
Once a year	33%
Every day	33%
Once a month	11%
2 times a year	11%
Varies by customer	11%

A majority of these trade ally respondents rated four aspects of program information they received from NWE about rebate processes as "clear" or "very clear." Slightly lower ratings were given for two of the four: reading and understanding program information, and information about which items qualify for rebate (Figure 120).

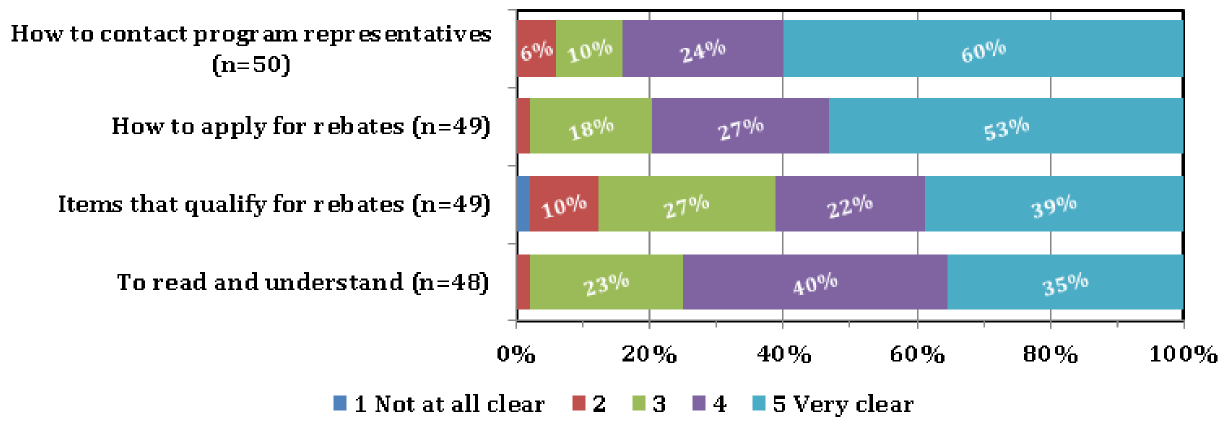

Figure 120: Clarity of Program Information, among E+ Residential Existing Electric Rebate Equipment Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (62%) reported working with the customer in a joint effort to prepare the applications. Another 26% reported doing all or most of the application themselves.

Table 400: Rebate Application Preparer, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent (n=50)
Typically both trade ally and customer - half and half effort	62%
Typically the trade ally prepares all or most of the application	26%
Typically the customer prepares all or most of the application	10%
Depends on the rebate	2%

About three-quarters (72%) of the 43 trade ally respondents involved with completing the rebate application “agreed” or “completely agreed” that the process was simple to follow (Figure 121).

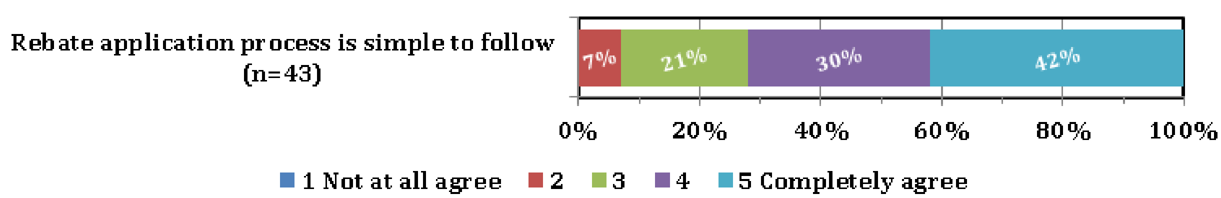

Figure 121: Rebate Application Process, among E+ Residential Existing Electric Rebate Equipment Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes. At least 61% of respondents “agreed” or “completely agreed” that

NWE provided updates in a timely manner, staying current takes little staff time, and that customers benefit from program additions (Figure 122).

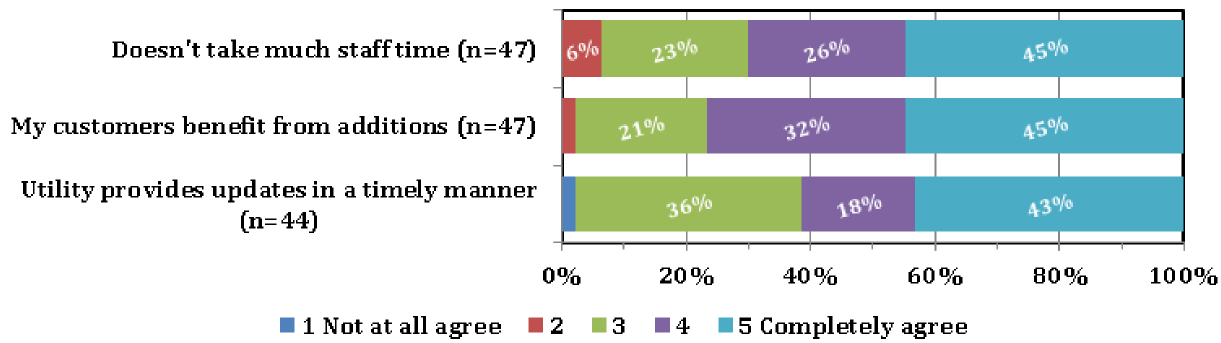

Figure 122: Experience With Program Changes, among E+ Residential Existing Electric Rebate Equipment Trade Allies

Most (83%) of the 46 residential allies surveyed reported that they were on NWE's Preferred Contractors list. Almost all of the preferred contractors (97%) "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (84%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." However, just under half (48%) agreed or completely agreed that being a preferred contractor had "helped grow our business" (Figure 123).

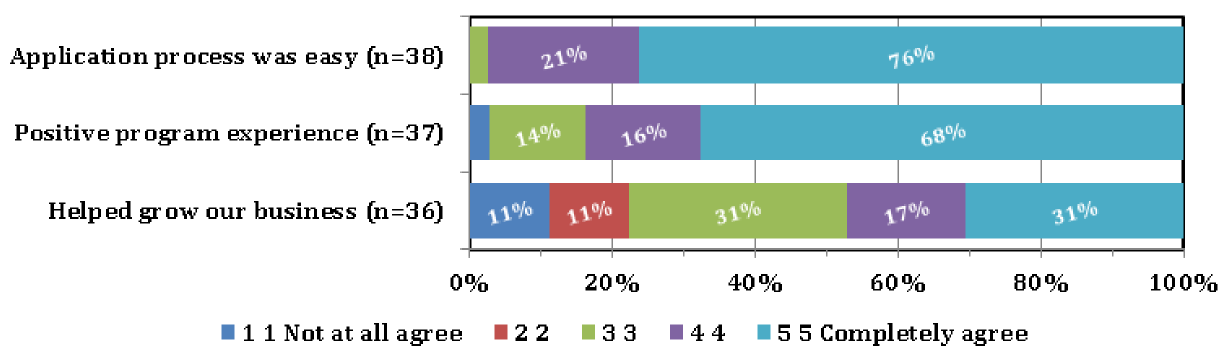

Figure 123: Experience As Preferred Contractor, among E+ Residential Existing Electric Rebate Equipment Trade Allies

We asked the eight trade allies who gave a rating of "1" or "2" on the five-point agreement scale to explain their low ratings. Their answers indicated they did not think being on the preferred list was a reason customers contacted them, and that there is little outreach coordination with NorthWestern.

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. The most common suggestion, made by 40%, was an expanded range of HVAC systems (Table 401). LED lighting and heat pumps were suggested by 20%. These trade

allies indicated they suggested such items primarily because they were "more efficient" (Table 402).

Table 401: High Efficiency Equipment Suggested, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent (n=15)
Other heating systems	40%
LED lighting	20%
Heat pumps	20%
On demand water heaters	13%
Other	7%

Table 402: Reasons Equipment Should Be Added, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent (n=14)
It's more efficient	50%
Cost	14%
Customers request them	14%
Where industry is going	7%
Other	14%

Firmographics

A few trade allies (18%) served customers in more than 20 Montana locations. More than half (60%) of these respondents reported serving five or fewer locations.

Table 403: Number of Montana Locations, among E+ Residential Existing Electric Rebate Equipment Trade Allies

	Percent (n=50)
1 location	36%
2 to 5 locations	24%
6 to 10 locations	12%
11 to 20 locations	10%
21 to 50 locations	4%
Over 50 locations	14%

Trade allies reported on the maximum number of miles they would travel to serve clients. About a quarter (24%) would travel less than 100 miles, while 14% would travel more than 400 miles. The largest portion (46%) would travel between 101 and 200 miles to serve a client (Figure 124).

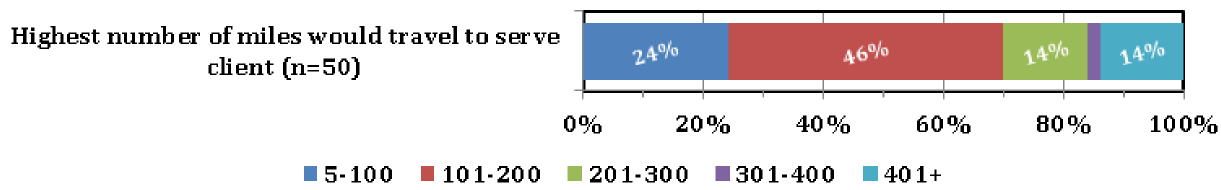

Figure 124: Maximum Miles, among E+ Residential Existing Electric Rebate Equipment Trade Allies

16.4. Recommendations

16.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Increased marketing:** Consider increasing marketing efforts to increase awareness of the efficiency opportunities that NWE offers. During the site inspections, many customers inquired about getting incentives for efficiency improvements that they were considering. Often they were not aware that they could go to the NWE website to get information regarding the efficiency programs.
- **Customer cost data:** The tracking database for this program does not include customer costs for each record in the savings claim. This lack of complete data for this important evaluation item complicates and increases the cost of the evaluation. Quality control measures should be instituted to ensure this information is included for all tracking records.
- **Evaluated values:** Update UES values for the measures included in this program to the evaluation values, which incorporate the findings from recent research.

16.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

According to surveyed E+ Residential Existing Electric participants, NWE marketing played an important role in facilitating program awareness: four-fifths of respondents reported hearing about the program through a utility advertisement or direct mail, compared to just over one-third who heard about the program from their contractor. Nearly half want more information about programs and other efficiency opportunities: many of these were interested in workshops or seminars. Overall, participants reported positive program outcomes, a notable minority of participants reported that some of the program information was unclear, specifically: information about the inspection, about expected energy savings, and about the higher rebates for preferred contractors. (The evaluation team notes that in our estimation, the information on the program website, application instructions, and application form clearly explain the incentive associated with using preferred contractors. In addition, if the contractor completes the application form for the customer, the customer receiving higher rebates for using a preferred contractor may be unaware that this is the case. Program application materials clearly state how to reach program staff.) A vast majority of respondents are very likely to participate in NWE efficiency programs in the future.

Surveyed residential trade allies reported positive program experiences, with no major concerns or suggestions. Many are interested in receiving more efficiency information: nearly two-thirds of trade allies reported interest in efficiency workshops or other events. Just under two-thirds reported that they trained their staff to talk to clients about energy efficiency. Although two-thirds of trade allies have used the website, just one tenth report that they get information about program requirements from the website. Nearly all trade allies report that they proactively mention the program to customers, but reported rates of customer-initiated projects are higher than for other programs. Over one-third of insulation contractors report that they have had concerns about recommending the program to their customers, many because of unclear or changing R-value qualification requirements.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.

- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

17. E+ Residential Existing Gas Rebate

17.1. Program Description

The E+ Residential Existing Gas Rebates program began in 2005 and has two components, Residential Existing Gas Rebate and Residential Existing Gas Free Kits. All NWE residential gas supply customers are eligible to participate in the program. All NWE gas supply residential homes with gas-heat are eligible for both the insulation and equipment components of the program. All NWE gas supply residential homes with gas water heat are eligible for high-efficiency gas water heaters, tank wraps, and pipe wrap.

Residential Existing Gas Rebate

The program offers prescriptive rebates for insulation, high-efficiency gas space-heating and water-heating equipment, and other equipment and services as detailed in the Installed Measures section below.

The program has preferred contractors who perform home weatherization and equipment installation. Preferred contractors are trained in the program standards, must sign a participation agreement, be licensed and insured, and attend annual training sessions. Certain measures require installation by a preferred contractor to be eligible for a rebate. Other measures may be installed by customers or non-preferred contractors. Most measures have two rebate tiers with higher rebates paid for installations by preferred contractors.

Residential Existing Gas Free Kits

Qualifying customers may receive free weatherization kits through distribution events or at the time of a home energy audit. There are four types of kits, which the customer receives free of charge:

- Weatherization kits: door weather stripping, door sweeps, a can of sealing foam, and a packet of outlet and switch-plate gaskets
- Water kits: low-flow showerhead, and kitchen and bathroom low-flow faucet aerators
- Window kits – window shrink wrap kits
- Programmable thermostats at customer appreciation events during the 2008 and 2010 program years

The program is closely associated with the E+ Audit Home or Business as a source of marketing and referrals. Installations of water-saving measures during the home audit are funded and savings are reported separately from this program.

17.1.1. Energy Savings and Measures

Below is an inclusive list of measures offered by the program for program years 2007 - 2011. Measures marked with an “X” in the Program Year columns indicates the measure was offered by the program in all or part of that program year.

Table 404: Measures Offered by E+ Residential Existing Gas Rebate

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
Insulation Measures									
Attic Insulation, R-49	$/FT²	R-0 existing	X	X	X	X	X		
Attic Insulation, R-49	$/FT²	R-1 to R-11 existing	X	X	X	X	X		
Attic Insulation, R-49	$/FT²	R-12 to R-19 existing	X	X	X[3]	X[3]	X		
Attic Insulation, R-38	$/FT²	R-0 existing	X	X	X	X	X		6/1/2011
Attic Insulation, R-38	$/FT²	R-1 to R-11 existing	X	X	X	X	X		6/1/2011
Attic Insulation, R-38	$/FT²	R-12 to R-19 existing	X	X	X	X	X		6/1/2011
Crawl Space Wall Insulation, R-19	$/FT²	R-0 existing	X	X	X	X	X		
Exterior Wall Insulation (above grade), R-13	$/FT²	R-0 existing		X	X	X	X	8/1/2008	
Exterior Wall Insulation (above grade), R-11	$/FT²	R-0 existing	X	X	X[3]	X[3]			6/1/2010
Basement Wall Insulation, R-13	$/FT²	R-0 existing		X	X	X	X	8/1/2008	
Basement Wall Insulation, R-11	$/FT²	R-0 existing	X	X	X[3]	X[3]			6/1/2010
Slab Insulation, R-10	$/FT²	R-0 existing					X	3/1/2011	
Slab Insulation, R-5	$/FT²	R-0 existing		X	X	X	X	8/1/2008	6/1/2011
Equipment Measures									
High Efficiency Condensing Boiler, AFUE ≥ 90%	$/Unit	AFUE ≤ 82% boiler existing		X	X	X	X	8/1/2008	
High Efficiency Condensing Furnace, AFUE ≥ 90%	$/Unit	AFUE ≤ 80% furnace existing		X	X	X	X	8/1/2008	
High Efficiency Room Heater, AFUE ≥ 80%	$/Unit	AFUE ≤ 0.75 room heater furnace existing		X	X	X	X	8/1/2008	
High Efficiency Water Heater, EF ≥ 62%	$/Unit	EF ≤ 0.594 water heater existing		X	X	X	X	8/1/2008	
High Efficiency Water Heater, EF ≥ 71%	$/Unit	EF ≤ 0.594 water heater existing		X[3]				8/1/2008	1/1/2009
Miscellaneous Measures									
Hot Water Pipe Insulation, R-4	$/Linear Ft	R-0 existing, first 10 feet from domestic water heater or any hot water pipe in unheated spaces.		X	X	X	X	8/1/2008	

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
Boiler Pipe Insulation, R-4	$/Linear Ft	R-0 existing, first 10 feet from boiler or any hot water pipe in unheated spaces		X	X	X	X	8/1/2008	
Heat Duct Sealing and Insulation, R-4	$/Linear Ft	R-0 existing, duct in non-conditioned spaces		X[3]				8/1/2008	1/1/2009
Boiler Controls	$/Unit	Heating water temperature reset based on outside air temperature		X	X	X	X	8/1/2008	
Boiler Diagnostics and Maintenance	$/Unit	Limit once every 5 years, rebate requires checklist			X	X	X	1/1/2009	
Boiler Diagnostics and Maintenance – No Savings	$/Unit	Limit once every 5 years, rebate requires checklist			X	X	X	1/1/2009	
Furnace Diagnostics and Maintenance	$/Unit	Limit once every 5 years, rebate requires checklist			X	X	X	1/1/2009	
Furnace Diagnostics and Maintenance – No Savings	$/Unit	Limit once every 5 years, rebate requires checklist			X	X	X	1/1/2009	
Gas Room Heater Diagnostics and Maintenance	$/Unit	Limit once every 5 years, rebate requires checklist			X	X	X	1/1/2009	
Gas Room Heater Diagnostics and Maintenance – No Savings	$/Unit	Limit once every 5 years, rebate requires checklist			X	X	X	1/1/2009	
Programmable Thermostat	$/Unit	Maximum of 2 per account (programmable thermostats had to be Energy Star rated prior to 2010).	X	X	X	X	X		
Programmable Thermostats (trade shows and other distribution events)	$/Unit	-		X[4]		X[4]			
Weatherization Kits (door sweep, rigid door weather-stripping, outlet/switch gasket covers, and, spray insulating foam[5])	Free	At time of home audit or at a Weatherization Event	X	X	X	X	X		
Window Insulation	Free	At time of home	X	X	X	X	X		

	Rebate Type	Qualifier	PY 2007	PY 2008	PY 2009	PY 2010	PY 2011	Effective Date[1]	End Date[2]
Kits[5]		audit or at a Weatherization Event							
Hot Water Weatherization Kits	Free	Weatherization Event only	X	X	X	X	X		
Hot Water Heater Tank Insulation, R-11	$/Unit	R-0 existing		X	X	X	X	8/1/2008	
Gas Convection Oven	$/Unit	-		X[3]				8/1/2008	1/1/2009
Gas Fired Tankless Water Heater, EF ≥ 62%	$/Unit	EF ≤ 0.594 water heater existing		X	X	X	X	8/1/2008	6/1/2011

[1] Effective measure date in the program if it was after the beginning of the program cycle 7/1/2006.

[2] The date the program stopped offering the measure. Customer projects with discontinued measures already in progress could extend past that date. The extensions were part of a catch-up period for customers and contractors.

[3] Measure was part of the program for a limited time.

[4] An arrangement was made with a local home improvement store for Saturday Customer Appreciation Events where, depending upon the year of the event 1) an instant rebate was provided for product(s) that the retailer provided at the event or 2) customers could receive from the retailer at the event a pre-selected programmable thermostat at no cost to the customer for which NWE paid the retailer $30/unit.

[5] Window Insulation Kits and Spray Insulating foam may be provided to qualifying customers each year. All other measures are provided one time only.

Measure unit energy savings are from a third party gas resource assessment study (KEMA 2008 (b)) based on average annual savings specifically for NWE Montana Customers. Each UES must pass a cost/benefit test, based on current gas avoided costs, known as the TRC test. Prior to the 2008 KEMA study, internal savings calculations provided the basis for UES calculations.

17.1.2. History

Program measures and rebates are reviewed and adjusted on an annual basis based on total resource cost and other metrics. At the annual review, measures must be cost-effective to remain in or be added to the program.

As a result of the 2008 NorthWestern Energy Natural Gas Energy Efficiency Potential Study (KEMA 2008 (b)), additional insulation and equipment (boilers, furnaces, etc.) measures were added to the program in 2009. To help meet the increased demand by customers seeking qualified contractors to install these measures, NWE increased outreach to recruit and train contractors to become certified as preferred contractors.

17.1.3. Marketing

The primary avenues of program marketing are customer bill inserts, home improvement shows and customer appreciation/weatherization kit events, during energy audits that find a need for qualifying measures, through preferred contractors, NWE's website, mass media (spot television, radio, newspaper), news releases, and some point-of-purchase materials at preferred contractor retail stores.

Other marketing included Saturday customer appreciation events (2005–2010) held in the fall. The customer appreciation events, to which all NWE residential customers were invited, spurred customer interest in conservation tied to low-cost measures such as air-sealing and water-saving measures through education and distribution of free kits. Contests for customers who signed up at Saturday customer appreciation events were held in 2009 and 2010. Additional customer-appreciation and energy-education-related activities were incorporated and promoted to increase the participation of gas customers.

Promotion of the events in 2007–2010 included press releases, newspaper and radio advertisements, direct mail to customers, flyers in NWE offices, community centers, senior centers, libraries, post offices, and other public bulletin board locations. Live radio remotes during Saturday events were utilized to draw attention to the events and to the E+ programs and rebates available to customers. The distribution trucks at these events were wrapped with signage promoting the 2010 events.

The approach changed for 2011 when promotion was primarily direct mail targeted at natural gas customers who had not participated in the past. No mass media or large customer appreciation events were held in 2011. Distribution trucks were wrapped with signage promoting the 2011 events. Weatherization events in 2006–2011 primarily targeted residential natural gas customers. Only when a customer self-identified as having electric space or electric water heat customer did their weatherization kit count towards the E+ Residential Electric Savings Program.

17.1.4. Program Steps

Customers consult the program guidelines and application form, available on NWE’s website, to determine the eligibility of measures for which they wish to apply. NWE provides assistance through the NWE E+ Hot Line. NWE pre-approval is not required. Customers may immediately solicit bids from contractors or do the work themselves. Rebates are higher for some measures when the customer works with a Preferred Contractor. The customers’ rebate submittal packages include a completed application form, their contractor’s invoice or materials receipts if self-installed, and a recent NWE bill or accurate NWE account number for the residence where the installation occurred.

If gas space-heating or water-heating equipment is installed, a NWE service technician is required to inspect the equipment, approve the installation, and sign the customer application. Invoices from preferred contractors for heating system tune ups must be accompanied by a copy of a prescribed checklist for diagnostic and maintenance measures. All contractor invoices must provide considerable detail on the installation as noted on the application form. Inspections occur on a random basis prior to payment approval as described earlier. Customers receive their rebate checks in four to six weeks.

17.2. Impact Evaluation

17.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (dkt) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free-ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (dkt) savings and perform the economic analysis.

17.2.1.1. Estimation of Gross Savings

We applied nearly the same methodology to both components of this program. We began the impact evaluation for this program with a file review of the E+ Residential Existing Gas Rebate component of this program (files were not available for the E+ Residential Gas Free Kits component) to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (dkt). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings as the basis for measure savings estimates for both components. We performed a review of the UES methods that NWE applied to the twelve measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods (dkt) that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate unit energy savings method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

For both components, we performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and produced energy savings. For the window kits measure, which has a one year EUL, verification included a confirmation that the measure was initially installed. We collected data as necessary to support a re-estimation of energy (dkt) savings, using the UES method that resulted from the UES review, discussed above. Site data collection included installation verification and the collection of data necessary to support an estimate of the inputs to the UES method. We calculated evaluation energy savings (dkt) by applying the final UES method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

17.2.1.2. Free-Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. Also, see section 31.4 for further discussion of how we treated free-ridership in the estimation of net savings for this evaluation.

17.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. Also, see section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

17.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

17.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free-ridership and spillover data collection and analysis.

17.2.2. Energy and Demand Impacts

We estimated gross and net savings (dkt) for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

17.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 74 sampled cases for the E+ Residential Existing Gas Rebate component of this program across the five program years. We did not include a file review for the Residential Gas Free Kits. The results from this review revealed no data entry errors in the program tracking database.

UES review

We reviewed the 12 UES measures installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. For four of these measures, we determined that the NWE methods were reasonable and made no changes. In five cases we applied UES values on a building type basis. For the remaining measures, we determined that changes to the UES methods were appropriate.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 405: Summary of UES Adjustments for E+ Residential Existing Gas Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Hot water kit showerhead	All	1.819	dkt per unit	1.427	dkt per unit
Hot water kit aerator	All	0.139	dkt per unit	0.167	dkt per unit
Thermostat kit	All	4.487	dkt per unit	4.401	dkt per unit
Weatherization Kit	All	2.320	dkt per unit	2.320	dkt per unit
Window Kits	All	2.261	dkt per unit	3.073	dkt per unit
Attic/ceiling insulation R-0 to R-38	Residential, Single-family	0.048	dkt per Sq. Ft.	0.048	dkt per Sq. Ft.
Attic/ceiling insulation R-0 to R-38	Residential, Multi-family	0.048	dkt per Sq. Ft.	0.028	dkt per Sq. Ft.
Attic/ceiling insulation R-0 to R-49	Residential, Single-family	0.050	dkt per Sq. Ft.	0.051	dkt per Sq. Ft.
Attic/ceiling insulation R-0 to R-49	Residential, Multi-family	0.050	dkt per Sq. Ft.	0.029	dkt per Sq. Ft.
Attic/ceiling insulation R-11	Residential, Single-	0.009	dkt per Sq. Ft.	0.009	dkt per Sq. Ft.

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
to R-38	family				
Attic/ceiling insulation R-11 to R-38	Residential, Multi-family	0.009	dkt per Sq. Ft.	0.006	dkt per Sq. Ft.
Attic/ceiling insulation R-11 to R-38	Residential, Manufactured home	0.009	dkt per Sq. Ft.	0.007	dkt per Sq. Ft.
Attic/ceiling insulation R-11 to R-49	Residential, Single-family	0.011	dkt per Sq. Ft.	0.010	dkt per Sq. Ft.
Attic/ceiling insulation R-11 to R-49	Residential, Multi-family	0.011	dkt per Sq. Ft.	0.007	dkt per Sq. Ft.
Attic/ceiling insulation R-11 to R-49	Residential, Manufactured home	0.011	dkt per Sq. Ft.	0.008	dkt per Sq. Ft.
Attic/ceiling insulation R-19 to R-38	Residential, Single-family	0.005	dkt per Sq. Ft.	0.005	dkt per Sq. Ft.
Attic/ceiling insulation R-19 to R-38	Residential, Multi-family	0.005	dkt per Sq. Ft.	0.003	dkt per Sq. Ft.
Attic/ceiling insulation R-19 to R-38	Residential, Manufactured home	0.005	dkt per Sq. Ft.	0.004	dkt per Sq. Ft.
Basement wall insulation R-0 to R-13	All	0.012	dkt per Sq. Ft.	0.008	dkt per Sq. Ft.
Basement Wall Insulation R0-R13	All	0.012	dkt per Sq. Ft.	0.008	dkt per Sq. Ft.
Boiler Controls	All	10.380	dkt per unit	10.380	dkt per unit
Crawl space insulation R-0 to R-19	All	0.025	dkt per Sq. Ft.	0.025	dkt per Sq. Ft.
High Efficiency Condensing Boiler	Residential, Single-family	11.432	dkt per unit	12.225	dkt per unit
High Efficiency Condensing Boiler	Residential, Multi-family	11.432	dkt per unit	7.162	dkt per unit
High Efficiency Condensing Furnace	Residential, Single-family	7.117	dkt per unit	6.941	dkt per unit
High Efficiency Condensing Furnace	Residential, Multi-family	7.117	dkt per unit	4.203	dkt per unit
High Efficiency Condensing Furnace	Residential, Manufactured home	7.117	dkt per unit	10.068	dkt per unit
Exterior Above-Grade Wall Insulation R0-R13	Residential, Single-family	0.018	dkt per Sq. Ft.	0.015	dkt per Sq. Ft.
Exterior Above-Grade Wall Insulation R0-R13	Residential, Multi-family	0.018	dkt per Sq. Ft.	0.011	dkt per Sq. Ft.
Exterior wall insulation R-0 to R-13	Residential, Single-family	0.018	dkt per Sq. Ft.	0.015	dkt per Sq. Ft.
Exterior wall insulation R-0	Residential, Multi-	0.018	dkt per Sq. Ft.	0.011	dkt per Sq. Ft.

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
to R-13	family				
Boiler Diagnostics & Maintenance	Residential, Single-family	8.699	dkt per unit	9.301	dkt per unit
Boiler Diagnostics & Maintenance	Residential, Multi-family	8.699	dkt per unit	5.457	dkt per unit
Furnace Diagnostics & Maintenance	Residential, Single-family	6.864	dkt per unit	7.232	dkt per unit
Furnace Diagnostics & Maintenance	Residential, Manufactured home	6.864	dkt per unit	5.348	dkt per unit
Room Heater Diagnostics & Maintenance	Residential, Single-family	5.013	dkt per unit	5.522	dkt per unit
Room Heater Diagnostics & Maintenance	Residential, Multi-family	5.013	dkt per unit	3.660	dkt per unit
Room Heater Diagnostics & Maintenance	Residential, Manufactured home	5.013	dkt per unit	3.952	dkt per unit
Gas Fired Tankless Water Heater	All	8.306	dkt per unit	8.306	dkt per unit
High Efficiency Water Heater EF=.62	All	2.482	dkt per unit	1.900	dkt per unit
ES Programmable Thermostat	Residential, Single-family	4.487	dkt per unit	4.910	dkt per unit
ES Programmable Thermostat	Residential, Multi-family	4.487	dkt per unit	2.951	dkt per unit
ES Programmable Thermostat	Residential, Manufactured home	4.487	dkt per unit	3.415	dkt per unit

Hot Water Kit. This self-install kit included one low-flow showerhead, one low-flow kitchen aerator, and two low flow bathroom aerators. The savings estimate assumed all components were installed, but NWE tracked the count of actual units given out. Sources for the savings estimates were cited in the 2008 gas potential assessment (KEMA 2008 (b)) as (Koomey, Dunham and Lutz 1994) and (Warwick and Hickman 1994).

Based on our literature review, we determined that the reduction in flow assumed for the showerhead of 0.9 was higher than that found in several other sources (US EPA 2005), (Puget Sound Energy 2008), (SBW Consulting 2007). Based on these sources, we updated the UES using a reduction of 0.7 gpm, along with other assumptions consistent with the original measure. We also re-calculated savings for aerators based on flow reduction findings in these same reports.

Weatherization Kit. This self-install kit included up to two door sweeps, a can of foam sealant, weatherstripping for up to two doors, and a package of electrical outlet gaskets. Savings for the measure were derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software, and verified in the 2007 evaluation (NorthWestern

Energy 2011). In the evaluation, Nexant reran the PEAR simulations, and checked assumptions of infiltration reductions using ASHRAE methods (ASHRAE 2001).

Our literature review determined that other studies have found similar savings values. We confirmed the infiltration reduction assumptions were reasonable using ASHRAE equations. We deconstructed the kit into its components using unit savings for components from the Connecticut TRM (CT Res TRM 2011). Our savings value for the complete kit matched the program value.

Window Kit. This self-install kit provided tight-fitting plastic wrap for up to five 3×5 ft windows. Savings were originally derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software, and verified in the 2007 evaluation (NorthWestern Energy 2011). In the evaluation, Nexant reran the PEAR simulations, and checked assumptions of infiltration reductions using ASHRAE methods (ASHRAE 2001). Nexant found in the 2007 evaluation that savings should be greater due to a reduction in conduction losses in addition to the reduction in infiltration.

Our literature review turned up no savings estimates for this measure. We confirmed the infiltration savings using the ASHRAE equations. We also derived additional savings for the improvement in insulation based on an assumption of a minimal increase in R-value. The UES for a complete kit increased 36% as a result of our adjustment.

Programmable Thermostat. This measure had a variety of delivery mechanisms, including give-away self-install kits and standard rebates. Savings per unit varied by year, but not by delivery mechanism. Savings were originally derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Savings were updated in the 2007 evaluation (NorthWestern Energy 2011), according to the Energy Star calculator and a literature review.

Our literature review found three state TRMs (MA, NY, OH) which cite one report (RLW Analytics 2007) as support for 6.8% savings (the program savings rate was 7.0%). We accepted the existing NWE space heating UEC values and applied a 6.8% savings rate, and applied the UES on a building type basis for the evaluation.

Heating System Diagnostic Testing, Repair and Maintenance. The 2008 gas potential assessment (KEMA 2008 (b)) cited a document from a low-income furnace repair and servicing program in North Dakota, which noted savings from 5-50% for this measure. KEMA selected 10% savings as a conservative value.

We could not find the North Dakota document. Our literature review was inconclusive as far as updating measure savings. We did not change the existing UES values, but applied them on a building type basis for the evaluation.

Attic Insulation. Savings were originally derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Savings were confirmed in the 2007 evaluation (NorthWestern Energy 2011). Savings ranged from 53% of space heating UEC for an upgrade from R-0 to R-49 to 18% for an upgrade from R-11 to R-49.

We compared the NWE gas program savings to the NWE electric program savings, and to other estimates of savings in the region and nationally. This program's savings are high by comparison, but not unreasonably so. We did not change the UES values, but applied them by building type for the evaluation.

Wall Insulation. Savings were originally derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Savings were confirmed in the 2007 evaluation (NorthWestern Energy 2011). Savings were 33% of space heating UEC for an upgrade from R-0 to R-13.

We compared the NWE gas program savings to the NWE electric program savings, and to other estimates of savings in the region and nationally. This program's savings are high by comparison. In the electric residential rebate program we updated the savings for wall insulation based on the RTF (Regional Technical Forum 2012) value for Kalispell. However, NWE audit data found that homes with gas heat were leakier than homes with electric heat, and wall insulation helps reduce infiltration. The RTF measure assumes a non-leaky home as the baseline, which differs from the NWE situation. We updated the UES to the RTF values for Kalispell, but increased the savings percentage from the 22% used in the RTF measure to 27%, and applied the measures by building type for the evaluation.

Efficient Heating System. Program savings were derived based on an efficiency improvement in boiler or furnace from around 80% to greater than 90%. Baseline usage was based on the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Efficient room heaters were also rebated, with an apparent increase in efficiency from 65% to 82%.

We reviewed the methodology and found it reasonable. We re-calculated savings on a building type and heating system type basis for the evaluation.

Basement Wall Insulation. Savings were originally derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Savings were 18.2% of space heating UEC for an upgrade from R-0 to R-10. The measure now requires R-13, but the savings were retained.

We compared the NWE gas program savings to the NWE electric program savings for this measure, and to other estimates of savings in the region. This program's savings are high by comparison. We updated the UES to the RTF (Regional Technical Forum 2012) values for Kalispell, and applied them by building type for the evaluation.

Crawlspace Insulation. Savings were originally derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Savings were 18.2% of space heating UEC for an upgrade from R-0 to R-10. The measure now requires R-19, but the savings were retained.

Our literature review did not turn up savings estimates for this measure. We made no changes to the program value.

Efficient Tankless Water Heater. The 2008 gas potential assessment (KEMA 2008 (b)) cited case studies showing savings from 20–40%. KEMA selected a savings value of 34% of baseline DHW UEC.

Out literature review found other values in the same range. We made no changes to the UES for the evaluation.

Efficient Tank Water Heater. The 2008 gas potential assessment (KEMA 2008 (b)) cited the DOE TSD for residential water heating (US DOE 2009). Savings were modeled as 11% of baseline DHW UEC.

We reviewed the TSD, as well as the RTF measure and the TRM's for OH, WI, and MN. The TSD does not support savings of 11% for an increase in EF from 0.59 to 0.62 (the measure definition). We re-calculated savings based on an adjusted baseline of 0.575 (federal standard for 50-gallon). The UES decreased 23% as a result of our calculations.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. The table covers both the Free Kits and the Rebate segments of the program. "Total Recruited" is the total number of customers who volunteered for an on-site inspection. "Total Completed" is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Residential Existing Gas Rebate program we successfully visited 73 sites encompassing three different strata. We recruited another 20 sites reviewed their program documentation but deemed it unnecessary to make a site visit; these 20 sites are counted as part of the "Onsite Total Completed." We encountered a low response rate (54% "No Reply") when recruiting for this program; and the on-site inspectors experienced a high refusal rate (14% "Onsite Refused") when it came time to schedule the visit or meet at the site. "Onsite Not Needed" indicates successfully recruited sites that we did not visit because the stratum was filled at the time we were conducting site visits in that region. Subsequent refusals may have happened in that stratum that we were by then unable to replace.

Table 406: Site Recruitment Disposition for E+ Residential Existing Gas Rebate

	Stratum			Total n	%
	1	2	9		
Recruitment					
Telephone Lab	92	19	1	112	
Special Effort					
Attempts	0	19	9	28	

	Stratum			Total n	%
	1	2	9		
No Reply	0	12	3	15	54%
Refused	0	0	0	0	0%
Recruited	0	7	6	13	46%
Total Recruited	**92**	**26**	**7**	**125**	
Onsite					
Refused	13	1	3	17	14%
Not Needed	9	5	0	14	11%
Total Completed	**70**	**20**	**4**	**94**	**75%**

Site Inspections

We performed site inspections for a sample of sites in each program component. The results from these inspections are discussed below by program component.

Residential Existing Gas Free Kits. For the 2010–2011 program years we performed 42 site inspections which considered four different measures: Window Kit, Weatherization Kit, Hot Water Reduction Kit, and Thermostat Control Kit.

Across the 42 sites we visited, we found that slightly more than half (22) of the sites had not installed any part of the specified measure or they had since removed the measure.

- 10 out of 14 sites that were given a Window Kit have not installed any part of the kit.
- 4 out of 5 sites that were given a Thermostat Control Kit have not installed any part of the kit.
- 6 out of 9 sites that were given a Hot Water Reduction Kit either have not installed any part of the kit or had since removed it. (Note: the most frequent reason given for removal of low-flow shower heads and faucet aerators was bathroom/kitchen remodel without re-installing low-flow measures).

2 out of 14 sites that were given a Weatherization Kit have not installed any part of the kit.

We calculated savings for each sampled measure by applying the evaluation UES method to the conditions observed during the site visit. For Window Kits, the evaluation UES method factors in the window size (area) and shape (linear perimeter). For Hot Water Reduction Kits, the evaluation UES method accounts for each part of the kit and gives higher energy savings to shower heads than faucet aerators. For Weatherization Kits, again the evaluation UES method accounts for each part of the kit and gives higher energy savings to door sweeps and strips than foam penetrations and gaskets. For Thermostat Control Kits, the evaluation UES value is slightly lower than the claimed UES value (refer to UES Review above).

For the 20 sites that did install some part/all of a kit:

- 4 sites installed *all* parts of the kit. The evaluation savings are slightly less than the claimed savings because of evaluation changes to the UES method.

- 2 sites installed all parts of their Weatherization Kits with the exception of using less than all 20 of the provided outlet gaskets. The evaluation savings for these two cases are slightly less than the program savings due to the evaluation UES method which accounts for each individual part of the kit.
- 13 sites installed some, but not all, of their kit. The evaluation savings range from 15% to 88% of the program savings, depending on how many parts of the kit were installed.
- 1 site installed two thermostats, the same quantity as tracked by NWE, but the evaluation savings is nearly twice the claimed savings because of a missing tracking savings for one of the thermostats in the NWE database.

E+ Residential Existing Gas Rebate. For the 2010–2011 program years we performed 32 site inspections which considered six different measures: Attic Insulation, Exterior Above-Grade Wall Insulation, Basement Wall Insulation, Crawl Space Insulation, Efficient Heating System, and Thermostat Control. We did not conduct site inspections for the 20 sites with the Heating Systems Diagnostic & Maintenance measure because there was no way to verify at the site whether the maintenance was performed; we relied on a review of the program documentation for these cases.

Across the 52 sites we visited or reviewed, we found that 45 of the sites had the specified measure installed and operational exactly as described in the program documentation.

The seven sites where we found discrepancies are as follows:

- Two sites where the area of the Exterior Above-Grade Wall Insulation differed from the program documentation; one site with 12% more area, one site with 11% less area.
- Two sites where the R-value(s) of the Attic Insulation differed from the program documentation: at both sites we found R-values that were slightly lower than documented.
- One site where the area of the Basement Wall Insulation was 37% larger than the documented area.
- One site where the area of the Crawl Space Insulation was 44% smaller than the documented area.
- One site with an error in the tracking database. A quantity of 125 was entered as the number of furnaces at the site (Heating Systems Diagnostic & Maintenance measure); the actual number was one.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit. The evaluation savings varied from 0.56 to 1.41 times the claimed savings; the differences between the evaluation savings and claimed are primarily due to evaluation changes to the UES method.

For the Attic Insulation and Exterior Above-Grade Insulation measures, NWE had developed UES values that varied by building type but only applied a value that was averaged across all building types. We applied the NWE UES values by building type, rather than using the average. For the six sites with Attic Insulation, the evaluation savings is 0.89 to 1.01 times the claimed savings; the change in savings for all four sites is primarily due to the evaluation UES method, the small difference in R-values at two of the sites was a secondary factor.

For the one site with Basement Wall Insulation, despite the increased area of insulation, the evaluation savings are 0.92 times the claimed savings due to the reduction in evaluation UES (see UES Review section above).

For the one site with Crawl Space Insulation, the evaluation savings are 0.56 times the claimed savings due to the lesser area of insulation found on site.

For the 10 sites with an Efficient Heating System measure, the evaluation savings are 0.98 to 1.14 times the claimed savings depending on the program year and type of heating system (boiler or condenser) and the specific building-type (multi-family or single-family). As discussed in the UES Review section, we used UES values developed by NWE for each specific building type rather than using an averaged UES value across all building types.

For the 18 sites with the Heating Systems Diagnostic & Maintenance measure, we did not conduct on site visits because there was no way to verify at the site whether the maintenance was performed. We relied on a review of the program documentation. For one of these sites, the claimed savings was 858 dkt; this value reflects an error in the tracking database (quantity of 125 vs. 1). The evaluation savings for this site are 7 dkt; this one case is the major driver in difference between the claimed savings and evaluation savings for this program.

For the other 17 sites with the Heating Systems Diagnostic & Maintenance measure, the evaluation savings ranges from 0.73 to 1.01 times the claimed savings; the evaluation savings are a direct result of the evaluation UES method. Again, we used a building-type specific UES, not the averaged UES used by NWE.

For the one site with the High Efficiency Water Heater measure, the evaluation savings is 0.77 times the claimed savings in direct proportion to the ratio of evaluation-to-claimed UES values.

For the six sites with the Thermostat Control measure, the evaluation savings are 1.09 to 1.17 times the claimed savings. Again, we used a building-type specific UES, not the averaged UES used by NWE.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 407: File Review and Site Visit Adjustment to Savings for E+ Residential Existing Gas Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Natural Gas									
	Residential Existing Gas Free Kits	dkt	257,089		67,193	149,011		0.26	0.58
	Residential Existing Gas Rebate	dkt	144,169	144,169	136,953	83,561	1.00	0.95	0.58

17.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rates reflects our findings from file reviews and site visits. Free ridership and spillover rate are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 408: Savings Adjustments by Calendar Year for E+ Residential Existing Gas Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Natural Gas Supply - DSM										
	E+ Residential Existing Gas Rebate	dkt	2007	69,427	0.58	-	-	0.58	40,240	
	E+ Residential Existing Gas Rebate	dkt	2008	57,021	0.58	-	-	0.58	33,050	
	E+ Residential Existing Gas Rebate	dkt	2009	89,754	0.58	-	-	0.58	52,022	
	E+ Residential Existing Gas Rebate	dkt	2010	117,874	0.58	-	-	0.58	68,321	
	E+ Residential Existing Gas Rebate	dkt	2011	67,182	0.58	-	-	0.58	38,939	
	E+ Residential Existing Gas Rebate	dkt	All Years	401,258	0.58	-	-	0.58	232,572	
Natural Gas										
	E+ Residential Existing Gas Rebate	dkt	All Years	401,258	0.58	-	-	0.58	232,572	

17.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 409: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Residential Existing Gas Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Natural Gas Supply - DSM								
	E+ Residential Existing Gas Rebate	dkt	2007	40,240	0.91	1.25	0.77	1.00
	E+ Residential Existing Gas Rebate	dkt	2008	33,050	0.92	1.41	1.05	1.01
	E+ Residential Existing Gas Rebate	dkt	2009	52,022	0.66	0.97	0.78	0.73
	E+ Residential Existing Gas Rebate	dkt	2010	68,321	0.89	1.56	1.17	0.98
	E+ Residential Existing Gas Rebate	dkt	2011	38,939	0.35	0.46	0.42	0.39
	E+ Residential Existing Gas Rebate	dkt	All Years	232,572	0.68	1.00	0.80	0.75
Natural Gas								
	E+ Residential Existing Gas Rebate	dkt	All Years	232,572	0.68	1.00	0.80	0.75

17.3. Process Evaluation

17.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with participants from the two components of the E+ Residential Existing Gas Rebate program and a sample of trade allies. We surveyed 89 Residential Existing Gas Rebate participants and 106 Residential Existing Gas Free Kits recipients. Surveyed trade allies include 50 respondents who reported offering HVAC and 28 who reported offering insulation products and services to residential end-users.

17.3.2. Implementation Findings

17.3.2.1. Interview Findings

This program is a combination of two components that are available for residential gas customers. The program offers rebates using the standard delivery method, and it provides free kits of energy-saving measures.

Rebates

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE's website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. Each set of forms and guidelines addresses a group of related measures such as insulation, heating equipment, and water heating among other categories. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

For certain residential measures, there are two tiers of rebates, with higher rebates paid for work performed by preferred contractors, and lower rebates paid for self-installed measures and work done by non-preferred contractors. Some residential measures require use of a preferred contractor for rebate eligibility.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor's invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application.

For all program rebates except those for gas-heating new-home-construction measures, the customer's application must include a current NorthWestern Energy bill for the building where the installation occurred; gas-heating new-home-construction measures require only the customer's account number in lieu of the utility bill.

There are additional documentation requirements for certain measures, as follows: For gas space-heat or water-heating-equipment installations, a NWE service technician must inspect the equipment, approve the installation, and sign the customer application. For gas space-heating tune-up measures (diagnostics and maintenance) a copy of a prescribed checklist must accompany the rebate application.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

Kits

Kits are packages of energy saving measures that were handed out either during a home energy audit, at events, or at NWE offices. These events include farmers markets, customer appreciation events, and gas DSM events. For more information on these delivery methods, see section 31.3.

Four different types of kits were available during the study period: Weatherization kits for doors and outlets, water kits that include showerheads and faucet aerators, window kits, and programmable thermostats. Weatherization kits were the most common type handed out during events.

17.3.2.2. Best Practices Assessment

Table 410 through Table 413 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 410: Program Planning and Design Best Practices for E+ Residential Existing Gas Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round

Practice	NWE Assessment
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 411: Program Management and Administrative Best Practices for E+ Residential Existing Gas Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines

Practice	NWE Assessment
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors and engineers to develop projects

Table 412: Marketing and Outreach Best Practices for E+ Residential Existing Gas Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 413: Program Quality Control Best Practices for E+ Residential Existing Gas Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

17.3.3. Participant Findings

As part of the process evaluation of the E+ Residential Existing Gas Rebate program, we conducted surveys with participants of two separate components of the program: the Residential Existing Gas Rebate component and the Residential Existing Gas Free Kits component.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

17.3.3.1. Residential Existing Gas Rebate Participant Findings

We conducted phone surveys with 89 participants who participated in the Residential Existing Gas Rebate component of NWE’s E+ Residential Existing Gas Rebate program.

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about this program, the kind of additional information they wanted, as well providing information about their decision to purchase appliances or other actions recommended.

Participants became aware of the E+ Residential Existing Gas Rebate program chiefly through a building professional, vendor, or contractor (68%). Another 50% saw a publication or advertisement (Table 414).

Table 414: Means of Program Awareness, among Residential Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Building professional, vendor, or contractor (n=87)	68%
Utility publication or advertisement (n=88)	50%
Word of mouth (n=89)	19%
Utility representative appearance (n=88)	18%
Directly contacted utility (n=88)	13%
Heard of Program Other Ways (n=89)	19%

Few respondents (26%) had visited the utility website. Of those who had not, three-fourths (76%) either “didn’t like to use it” or saw “no need or reason,” to use it. About one in five (19%) of those who did not use the website reported no internet access as the barrier (Table 415).

Table 415: Reasons Website Not Used, among Residential Existing Gas Rebate Participants

	Weighted Percent (n=59)
Don't like to use it much	47%
No need or no reason	29%
Don't have access	19%
Never thought to	2%
Didn't know they had one	1%
Other	2%

For the quarter of participants who did use the website, 86% went there to learn about rebates or audits, followed by 60% searching out how to contact the utility (Table 416).

Table 416: Website Use, among Residential Existing Gas Rebate Participants

Use (Allowed Multiple)	Weighted Percent
Learn about rebates or audits (n=22)	86%

Use (Allowed Multiple)	Weighted Percent
Utility contact information (n=22)	60%
Money saving tips (n=22)	42%
Pay utility bill (n=22)	39%
Track energy usage (n=22)	20%
Energy saving educational opportunities (n=22)	15%
How-to videos (n=22)	5%
Look up general information (n=22)	5%
Other use of website (n=22)	2%

Three-fourths of the website users (72%) agreed that the website information was easy to find and helpful (Figure 125).

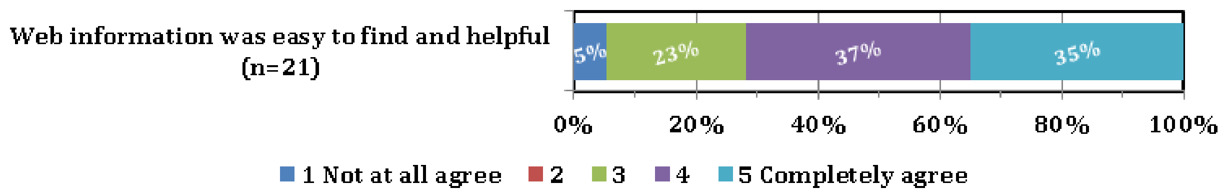

Figure 125: Website Effectiveness, among Residential Existing Gas Rebate Participants

Half of respondents would like further information on energy saving educational opportunities. Nearly half require no further information (Table 417).

Table 417: Further Information Desired, among Residential Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Does not want any (n=89)	42%
Energy saving educational opportunities (n=89)	50%
Energy efficiency programs (n=89)	43%
Workshops or events on energy efficiency (n=89)	21%

Those who would like further information prefer to receive communication by mail (93%; Table 418).

Table 418: Information Delivery Preference, among Residential Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Mail (n=51)	93%
Email (n=51)	34%

(Allowed Multiple)	Weighted Percent
Community event (n=51)	29%
Trainings, workshops or seminars (n=51)	25%
Phone (n=51)	19%
Webinar (n=51)	11%
Other (n=51)	6%

Respondents cited many reasons for participating in the program (Table 419). Almost half of contacts reported a previous good experience with a NWE energy efficiency program and wanting to act on a prior energy audit as a reason for participation.

Table 419: Reasons To Participate, among Residential Existing Gas Rebate Participants

(Allowed Multiple)	Weighted Percent
Save money (n=89)	91%
Save energy (n=89)	91%
Increase home comfort (n=88)	87%
Easy to use the program (n=88)	86%
NWE vouched for equipment by rebating (n=85)	75%
Contractor recommendation (n=80)	62%
Wanted to follow audit with action (n=75)	46%
Good experience with other NWE efficiency program (n=78)	45%

When considering whether to participate, 95% of participants said they had no concerns about participating.

Program Experience

Participants reported on their experience with the Residential Existing Gas Rebate program, installing any equipment, as well as on their overall satisfaction with the process.

The vast majority of the participants (97%) found the rebated items readily available.

Over half of the participants (59%) used a utility-preferred contractor. The main reason the others did not use an associated contractor was that their own, usual contractor was "not on the list" (Table 420). Some participants did not know there was a list of preferred contractors.

Table 420: Reasons Other Contractor Used, among Residential Existing Gas Rebate Participants

Reason	Weighted Percent (n=23)
Didn't know about list	47%
Usual contractor not on list	31%

Reason	Weighted Percent (n=23)
Self-installed	9%
Other	12%

Participants reported a very high level of agreement with positive statements about people who came to the home as part of the rebate process. Customers gave high ratings to the contractors, installers, and inspectors (Figure 126).

A site visit by an inspector from NWE was reported by 54% of the rebate program respondents.

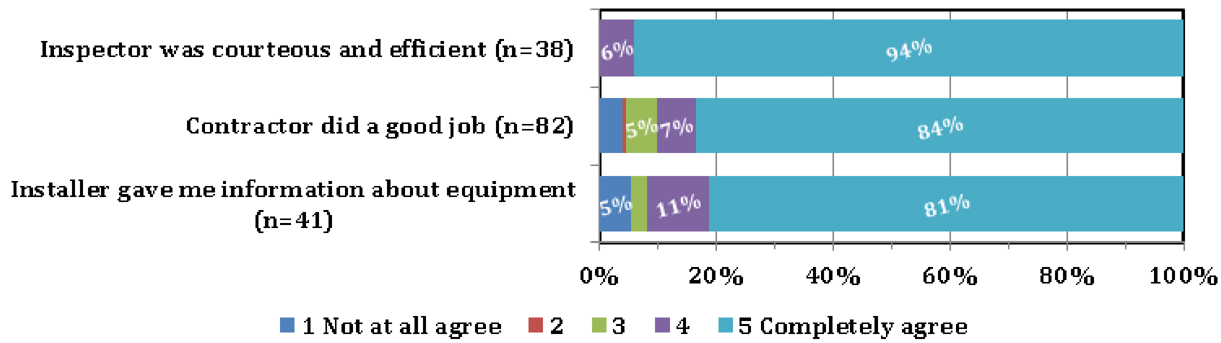

Figure 126: Installation Experience, among Residential Existing Gas Rebate Participants

Gas rebate participants praised the clarity of program information offered, with majorities rating information on most aspects of the rebate process as "very clear" (Figure 127).

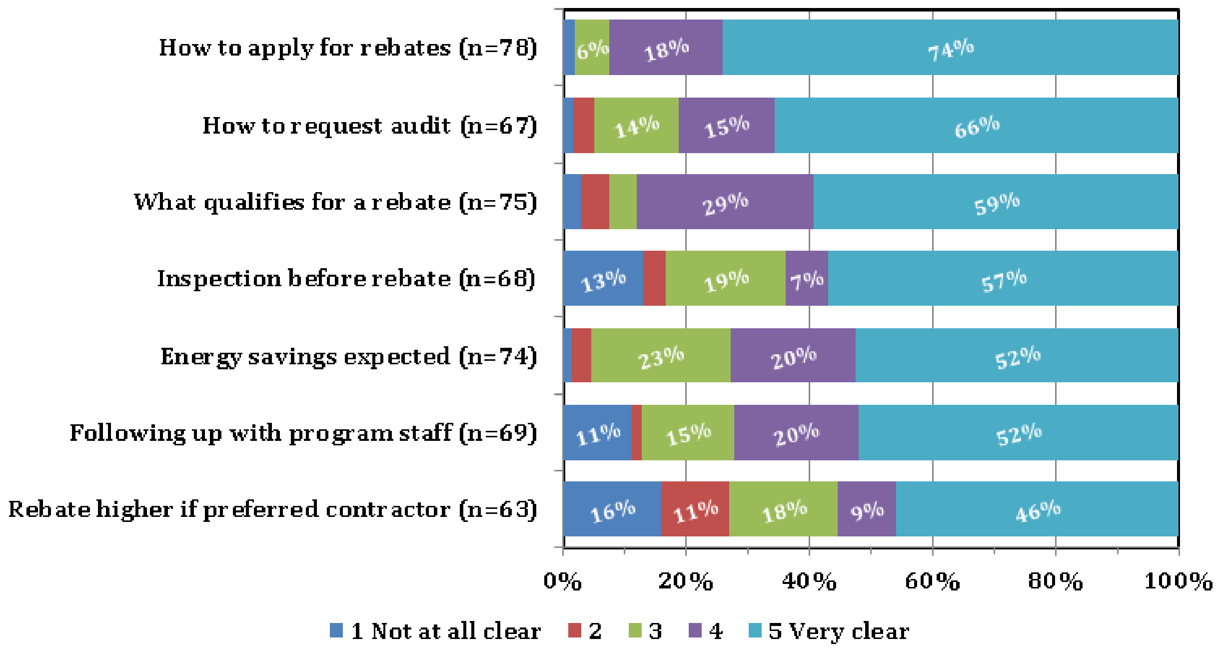

Figure 127: Clarity of Program Information, among Residential Existing Gas Rebate Participants

Consistent with the high ratings given to program information, respondents rated their installation experience very positively. Majorities of respondents “completely agreed” with positive descriptions of each phase of the installation process (Figure 128).

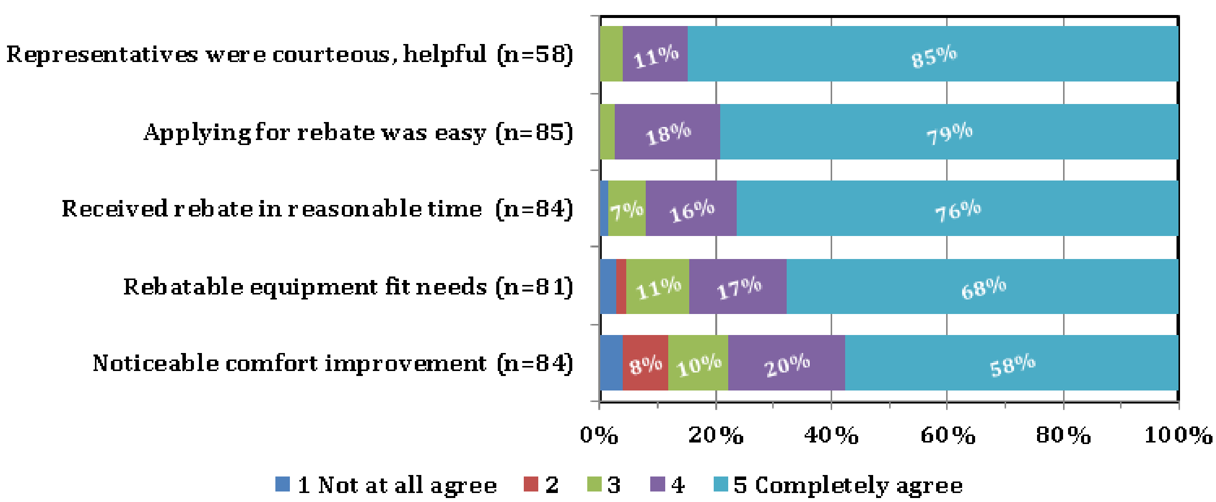

Figure 128: Experience With Installation Process, among Residential Existing Gas Rebate Participants

As an indicator of overall satisfaction with NWE’s efficiency activities, the evaluation team also asked program participants whether they were likely to participate in future programs. The majority (72%) said they would be "likely" or "very likely" to participate in future utility energy efficiency programs (Figure 129).

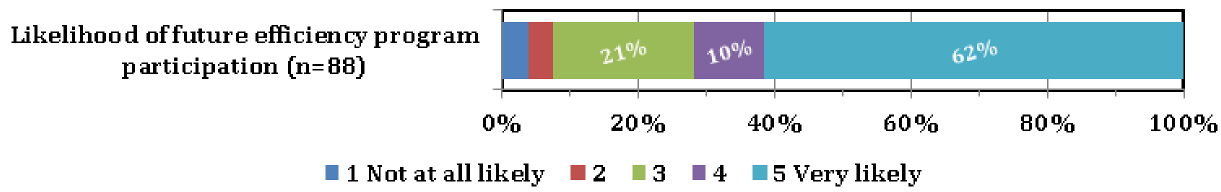

Figure 129: Likelihood of Future Participation, among Residential Existing Gas Rebate Participants

17.3.3.2. Residential Existing Gas Free Kits Participant Findings

As a component of the E+ Residential Existing Gas Rebate program, NWE offered free energy efficiency items to customers. We surveyed 106 respondents who received one or more free items in 2010 or 2011 that were included in NWE's weatherization, water, or window kits. We did not survey participants who received a programmable thermostat because they were counted as a programmable thermostat rebates by receiving an instant rebate covering the cost of the thermostat at weatherization events during the 2008 and 2010 program years. Kit contents varied according to customer characteristics, and were distributed in a variety of venues, including but, not limited to, sponsored events and on-site home audits.

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NWE, the kind of additional information they wanted, as well as providing information about their decisions to participate.

Participants became aware of the NWE's Free Kit offers chiefly through noticing a utility publication or advertisement (95%). Additionally, about 25% heard about these offers from a utility representative appearing in person as well as 26% through word of mouth (Table 421).

Table 421: Means of Program Awareness, among Residential Existing Gas Free Kits Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=104)	95%
Heard of Program Other Ways (n=104)	30%
Word of mouth (n=106)	26%
Utility representative appearance (n=104)	25%
Directly contacted utility (n=106)	11%
Building professional, vendor, or contractor (n=106)	8%

The great majority (81%) of respondents had never visited the utility website. About one-half of the non-users told us they "don't like to use the internet much" (Table 422).

Table 422: Reasons Website Not Used, among Residential Existing Gas Free Kits Participants

Reason	Weighted Percent (n=106)
Don't like to use it much	48%
Don't have access	21%
No need or no reason	15%
Just haven't	7%
Never thought to	5%
Other	2%
Have access but connection is slow	1%
Didn't know they had one	1%

The 19 respondents in this group who had visited NWE's website chiefly mentioned two reasons for using it: 57% wanted utility contact information, and 61% were paying their utility bill (Table 423).

Table 423: Website Use, among Residential Existing Gas Free Kits Participants

(Allowed Multiple)	Weighted Percent
Pay utility bill (n=19)	61%
Utility contact information (n=19)	57%
Learn about rebates or audits (n=19)	23%
Energy saving educational opportunities (n=19)	19%
Money saving tips (n=19)	14%
Track energy usage (n=19)	13%
Look up general information (n=19)	9%
How-to videos (n=19)	3%
View employment information (n=19)	3%

Among the small number of respondents who used NWE's website, over three-quarters, 79%, "agree" or "completely agree" that the web information they were looking for was easy to find and helpful (Figure 130).

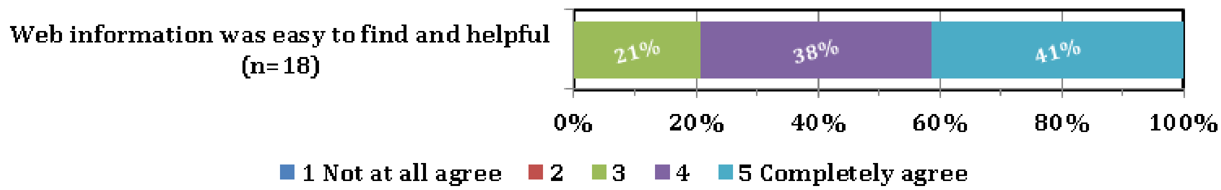

Figure 130: Website Effectiveness, among Residential Existing Gas Free Kits Participants

About one-half of all the program respondents would like more information on energy-saving educational opportunities (51%), and/or energy efficiency programs (46%). Just under half (41%) reported needing no further information from NWE at this time (Table 424).

Table 424: Further Information Desired, among Residential Existing Gas Free Kits Participants

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=106)	51%
Energy efficiency programs (n=106)	46%
Workshops or events on energy efficiency (n=106)	38%
Does not want any (n=106)	41%

Those desiring further information prefer to receive information by mail (83%), followed by community events (39%) and email (39%; Table 425).

Table 425: Information Delivery Preference, among Residential Existing Gas Free Kits Participants

(Allowed Multiple)	Weighted Percent
US Mail (n=60)	83%
Community event (n=60)	39%
Email (n=60)	39%
Trainings, workshops or seminars (n=60)	29%
Phone (n=60)	24%
Webinar (n=60)	6%
Other (n=60)	6%

The majority of respondents in this survey rated the components of program information they received as “clear” or “very clear” (Figure 131).

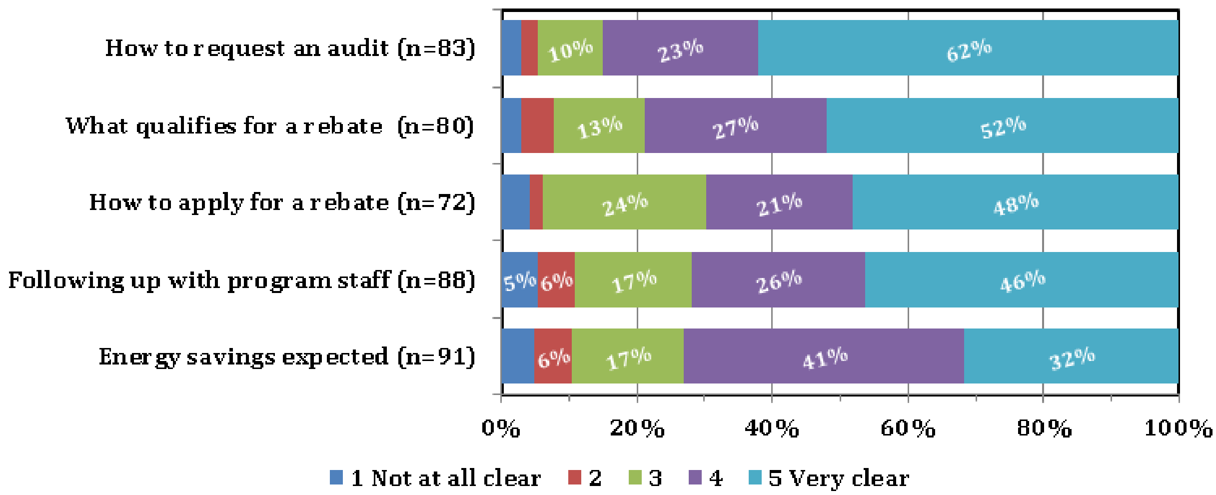

Figure 131: Clarity of Information, among Residential Existing Gas Free Kits Participants

Program Experience

Participants reported on their program experience and rated the kit equipment distributed through NWE's E+ Existing Gas Rebate program.

Virtually all the respondents, 96%, had installed *at least* some of the energy efficiency items they received (Table 426). Interestingly, 41% had installed *all* of the items.

Table 426: Portion of Kit Items Installed, among Residential Existing Gas Free Kits Participants

	Weighted Percent (n=106)
Some	55%
All	41%
None	4%
Didn't Receive Any	1%

Those 59 respondents who had only installed some of their kit items reported on the kit items they *had* installed. Among these respondents, the most often installed kit item was window-insulating shrink-wrap (42%) and the least often installed were bathroom sink aerators (15%; Table 427).[11] Note that the table below likely underestimates equipment installation rates, even among these partial installers, as not all participants received every item. These data below do not account for those respondents who did not install the equipment because they did not receive it.

[11] Window plastic has a useful life of one year.

Table 427: Installed Items, among Residential Existing Gas Free Kits Participants

(Allowed Multiple)	Weighted Percent
Window insulating shrink-wrap (n=59)	42%
Door weather stripping (n=59)	40%
Foam gaskets for outlet/switch covers (n=59)	33%
Low-flow showerhead(s) (n=59)	31%
Insulating spray foam (n=59)	31%
Kitchen sink aerator(s) (n=59)	27%
Programmable thermostat (n=59)	21%
Door sweeps (n=59)	19%
Bathroom sink aerator(s) (n=59)	15%

Among these 59 respondents who had only installed “some” of their kit items, roughly one-half (46%) told us they intended to install the other items soon. We asked respondents who had yet to install all of their kit items what was getting in the way of installing the remaining items. The largest portion of respondents said they simply “haven’t gotten around to it.” From a program perspective, it is useful to see that as few as 5% of respondents either thought installation would be “too difficult” or no longer had the item (Table 428).

Table 428: Barriers to Installation, among Residential Existing Gas Free Kits Participants

Barrier	Weighted Percent (n=59)
Haven't gotten around to it	24%
Takes too much time	20%
No need	16%
Won't fit	15%
Other	12%
Already upgraded	7%
Too difficult	3%
Don't have the items any longer	2%

Kit recipients were asked if they had seen any energy savings on their utility bill. Nearly 80% respondents agreed that installed kit items did save energy (Figure 132).

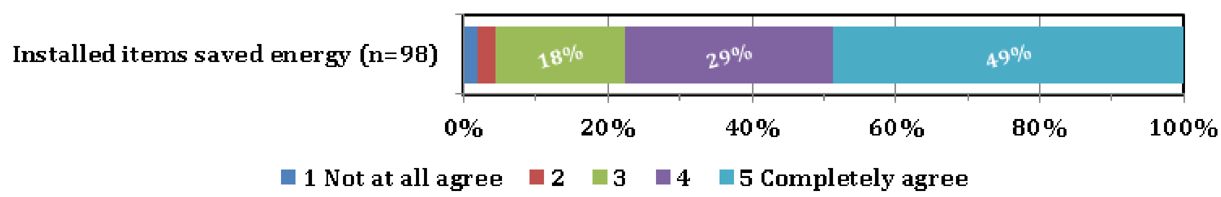

Figure 132: Energy Savings Seen, among Residential Existing Gas Free Kits Participants

About one-half of these program participants (58 of 106 surveyed) had occasion to contact a program representative. All these respondents agreed that, "when contacted, program representatives were both courteous and helpful."

More than 73% of surveyed kit recipients would be likely or "very likely" to participate in energy efficiency programs in the future (Figure 133).

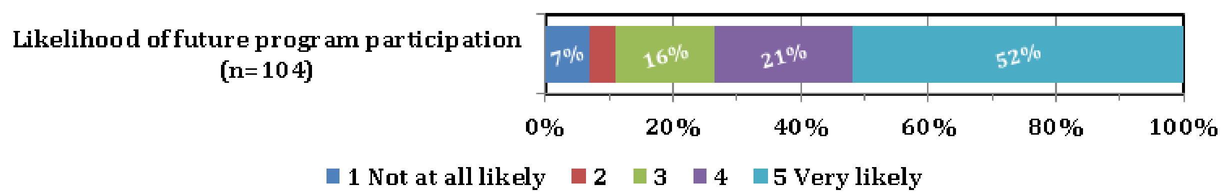

Figure 133: Likelihood of Future Participation, among Residential Existing Gas Free Kits Participants

17.3.4. Trade Ally Findings

As part of the process evaluation of the E+ Residential Existing Gas Rebate program, we surveyed trade allies who installed either insulation or equipment for residential customers through NWE programs.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

17.3.4.1. E+ Residential Existing Gas Insulation Trade Allies

We surveyed 28 NWE trade allies who installed insulation projects that qualify for rebates through NWE residential programs.

Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE insulation program opportunities chiefly from noticing a utility publication or advertisement (79%), or by directly contacting the utility (75%; Table 429).

Table 429: Means of General Program Awareness, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=28)	79%
Directly contacted utility (n=28)	75%
Utility representative appearance (n=27)	63%
Utility website (n=27)	44%
Associated vendors and contractors (n=28)	39%
Word of mouth (n=28)	39%

Trade ally respondents often learned about specific program requirements from a utility representative (43%) at a meeting or event, or by contacting NWE directly (43%; Table 430).

Table 430: Specific Requirements Awareness, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=28)	43%
Directly contacted utility (n=28)	43%
Utility publication (n=28)	25%
Utility website (n=28)	14%
Associated vendors and contractors (n=28)	11%

A majority (64%) of surveyed trade allies visit NWE's website. Among those website users, most (89%) said they used the site to find rebates or audits, and a majority (78%) had printed rebate forms or in some cases, searched for NWE contact information (Table 431).

Table 431: Website Use, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Finding rebates or audits (n=18)	89%
Print rebate forms (n=18)	78%
To contact utility (n=18)	61%

(Allowed Multiple)	Percent
Money saving ideas (n=18)	50%
Educational events information (n=18)	50%
How-to videos (n=18)	11%

Over half (57%) of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful, however 12% gave low ratings (Figure 134).

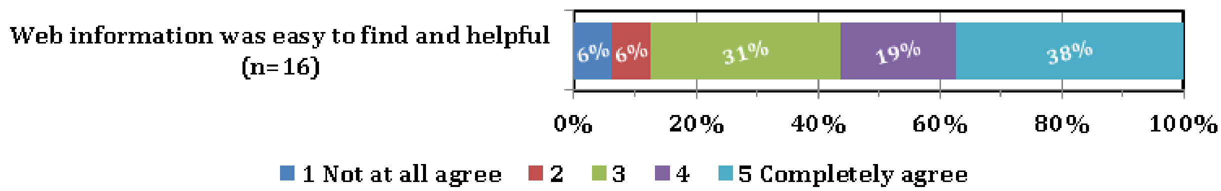

Figure 134: Website Effectiveness, among E+ Residential Existing Gas Rebate Insulation Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. Two-thirds (68%) said they had contacted the utility to learn how the rebate program worked (Table 432).

Table 432: Reasons for Contacting NWE, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=28)	68%
To resolve a problem (n=28)	50%
Investigate status of an application (n=28)	39%
Investigate status of a rebate payment (n=28)	39%
None of these (n=28)	21%

Over 60% of surveyed trade allies would like to receive further information on energy savings programs and opportunities and expressed an interest in additional workshops or events on energy efficiency (Table 433).

Table 433: Further Information Desired, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Energy saving educational opportunities (n=28)	64%
Workshops or events on energy efficiency (n=28)	64%
Energy efficiency programs (n=28)	61%
None (n=28)	21%

Those desiring further information slightly preferred to receive information by mail (46%), and other methods such as email (39%) or trainings and workshops (29%; Table 434).

Table 434: Information Delivery Preference, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
US mail (n=28)	46%
Email (n=28)	39%
Trainings, workshops or seminars (n=28)	29%
Community event (n=28)	21%
Phone (n=28)	18%
Webinar (n=28)	18%

Efficient Equipment Promotion

Trade allies provided general information about their promotion of energy efficiency upgrades.

Respondents reported on what benefits they typically mention to customers about the high-efficiency projects that qualify for rebate. Lower energy costs was the benefit most often mentioned (96%) by respondents (Table 435). The utility rebate and the high quality of the product were mentioned also by close to 80% of these trade allies.

Table 435: Customer Benefits Mentioned, among E+ Residential Existing Gas Rebate Insulation Trade Allies

(Allowed Multiple)	Percent
Lower energy bills (n=28)	96%
Comfort (n=28)	82%
Utility rebate (n=28)	79%
High-quality of product (n=28)	71%

Surveyed trade allies reported on whether their customers ever installed levels of insulation that would qualify for the program without pursuing a rebate. Less than half (42%) of respondents said they recalled installing rebate-qualifying insulation in cases when they knew customers did not pursue rebates.

Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Almost two-thirds (61%) of all 28 trade ally respondents say they had trained staff to talk to customers about energy efficiency. About one-third of these respondents (39%) said they "almost always" bring up the discussion about utility rebates for which their customer might qualify (Table 436).

Table 436: Rebate Initiator, among E+ Residential Existing Gas Rebate Insulation Trade Allies

	Percent (n=28)
Almost always trade ally initiated	39%
Mostly trade ally initiated	29%
About half trade ally and half customer	21%
Almost always customer initiated	11%

When a customer is considering insulation projects, almost all (92%) of these respondents suggested insulation in quantities and places that qualify for the rebate program, rather than waiting for the customer to show interest in qualifying for NWE rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Nearly two-thirds of surveyed trade allies (64%) indicated that nothing about the program raised issues or concerns about their customers' participation. Among the 10 respondents who had initial concerns, the reasons given showed no clear pattern. However, meeting R-value requirements and "paperwork" were mentioned by a handful of trade allies.

A minority (25%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" were contacting customers with varied frequency, some (29%) as often as once a month (Table 437).

Table 437: Customer Contact Frequency, among E+ Residential Existing Gas Rebate Insulation Trade Allies

	Percent (n=7)
Once a month	29%
Once a year	29%
Every day	29%
2 times a year	14%

The majority (from 54% to 82%) of these trade ally respondents rated program information they received from NWE on rebates and contacting program staff as "clear" or "very clear." Lower ratings were reported for readability in general, as well as for the clarity of information on qualifying measures (Figure 135).

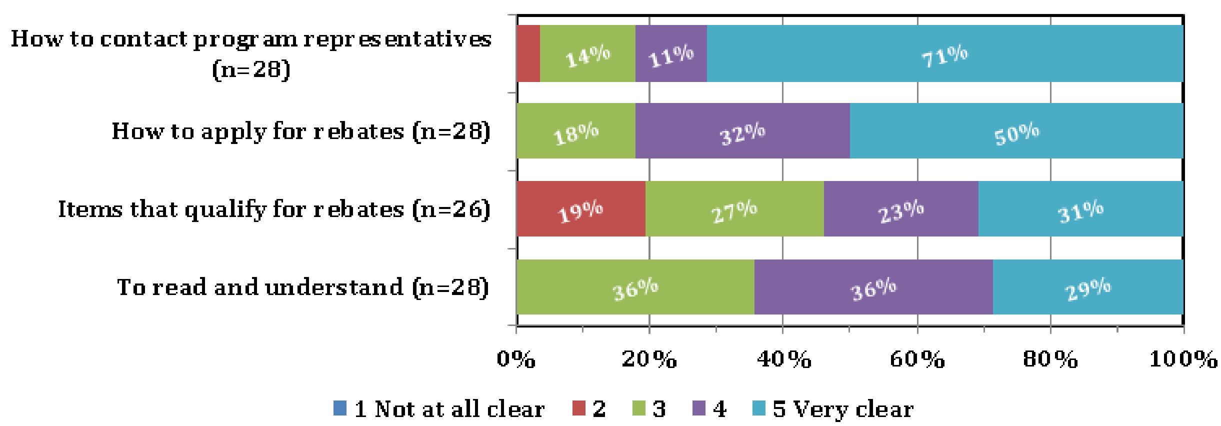

Figure 135: Clarity of Program Information, among E+ Residential Existing Gas Rebate Insulation Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (68%) reported working with the customer in a joint effort to prepare the applications. Another 21% completed all or most of the application themselves.

Table 438: Rebate Application Preparer, among E+ Residential Existing Gas Rebate Insulation Trade Allies

Who prepares the application:	Percent (n=28)
Typically both respondent and customer	68%
Typically trade ally prepares all or most	21%
Typically the customer prepares all or most	11%

About 80% of the 25 trade ally respondents who typically helped complete the rebate application "agreed" or "completely agreed" that the process was simple to follow (Figure 136).

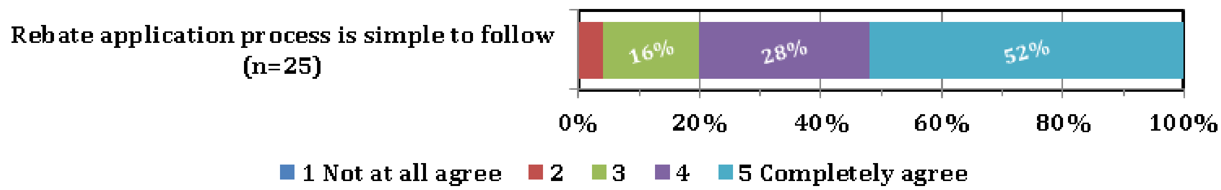

Figure 136: Experience With Application Process, among E+ Residential Existing Gas Rebate Insulation Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes made by NWE. Approximately two-thirds of respondents "agreed" or "completely agreed" that updates were provided in a timely manner, staying current takes little staff time, and that customers benefit from additions (Figure 137).

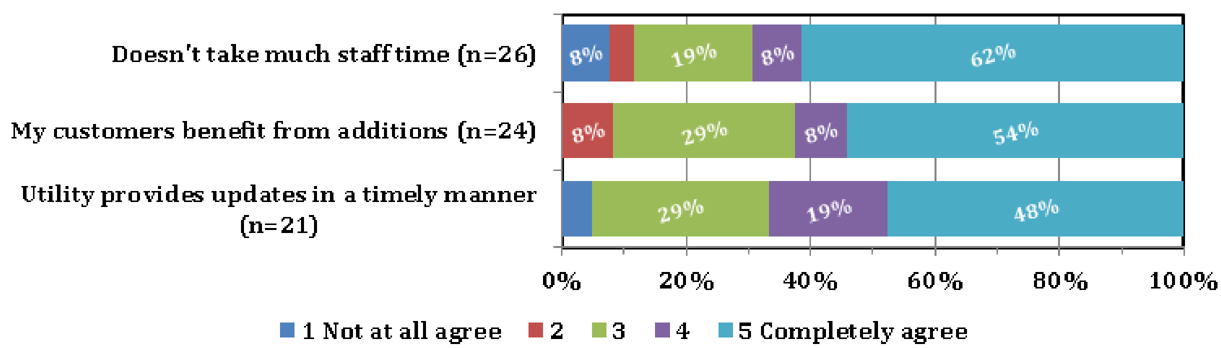

Figure 137: Experience With Program Changes, among E+ Residential Existing Gas Rebate Insulation Trade Allies

Nearly all (93%) of the surveyed residential trade allies reported that they were on NWE's Preferred Contractors list. All respondents "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (88%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." Two-thirds of respondents (66%) agreed or completely agreed that being a preferred contractor had "helped us grow our business" (Figure 138).

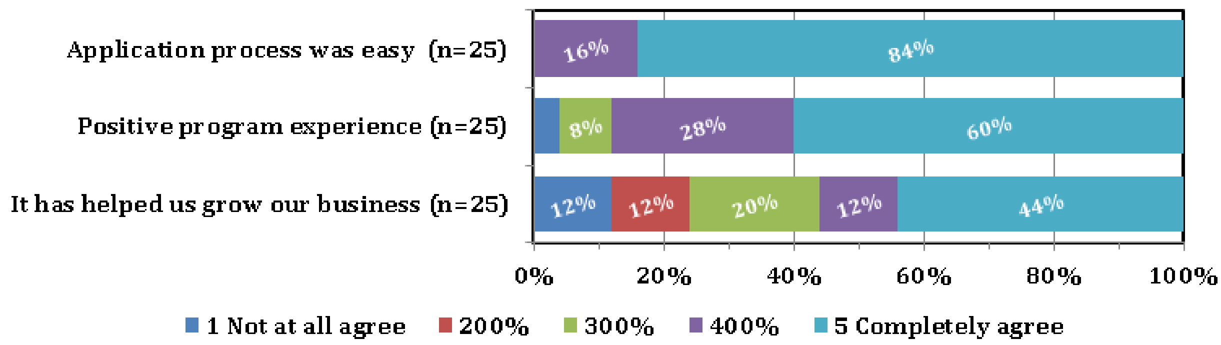

Figure 138: Experience As Preferred Contractor, among E+ Residential Existing Gas Rebate Insulation Trade Allies

The few trade allies reporting ratings of "1" or "2" on the five-point agreement scale on the topics listed in Figure 138 were asked to explain their low ratings. A handful of trade ally organizations mentioned that too few customers took part for participation to have helped their business.

Firmographics

A few of these trade allies (15%) served customers in more than 20 Montana locations. Two-thirds of these allies (66%) served in five or fewer locations.

Table 439: Number of Montana Locations Served, among E+ Residential Existing Gas Rebate Insulation Trade Allies

	Percent (n=27)
1 location	44%
2 to 5 locations	22%
6 to 10 locations	11%
11 to 20 locations	7%
21 to 50 locations	4%
Over 50 locations	11%

Trade allies reported on the maximum number of miles they would travel to serve clients. About one-third would travel less than 100 miles (36%) or would travel between 101 and 200 miles to serve a client (32%). Few (18%) would travel more than 400 miles (Figure 139).

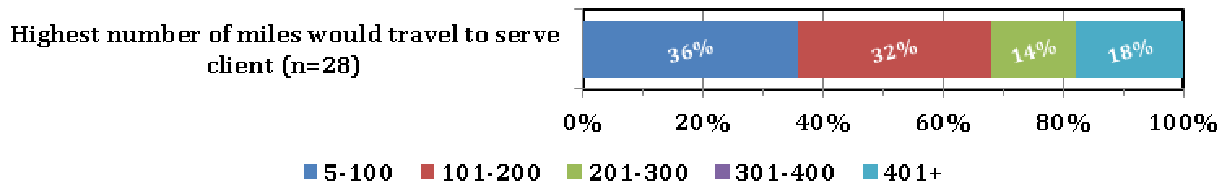

Figure 139: Maximum Miles, among E+ Residential Existing Gas Rebate Insulation Trade Allies

17.3.4.2. E+ Residential Existing Gas Rebate Equipment Trade Allies

We surveyed 50 NWE equipment trade allies who installed heating, ventilation, and air conditioning (HVAC), plumbing, and other equipment that qualified for rebates through NWE residential programs.

Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from noticing a utility publication or advertisement (76%), by directly contacting the utility, or from a utility representative at a meeting or event (Table 440).

Table 440: Means of General Program Awareness, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=50)	76%
Directly contacted utility (n=50)	70%
Utility representative appearance (n=50)	68%
Utility website (n=50)	46%
Word of mouth (n=50)	44%
Associated vendors and contractors (n=50)	38%

Trade ally respondents most frequently learned about specific program requirements from a utility representative at a meeting or event (53%), or by contacting NWE directly (42%; Table 441).

Table 441: Specific Requirements Awareness, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=50)	52%
Directly contacted utility (n=50)	42%
Utility publication (n=50)	28%
Associated vendors and contractors (n=50)	10%
Utility website (n=50)	6%

A majority (66%) of surveyed trade allies had visited NWE's website. Among those website users, approximately three-quarters (76%) said they used the site to find information related to rebates or audits, and smaller majorities had printed rebate forms or searched for NWE contact information (Table 442).

Table 442: Website Use, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Finding rebate or audit information (n=33)	76%
NWE contact information (n=33)	64%
Print rebate forms (n=33)	55%
Educational events information (n=33)	39%
Money saving ideas (n=33)	36%
How-to videos (n=33)	9%

Most (62%) of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful, however 13% gave low ratings (Figure 140).

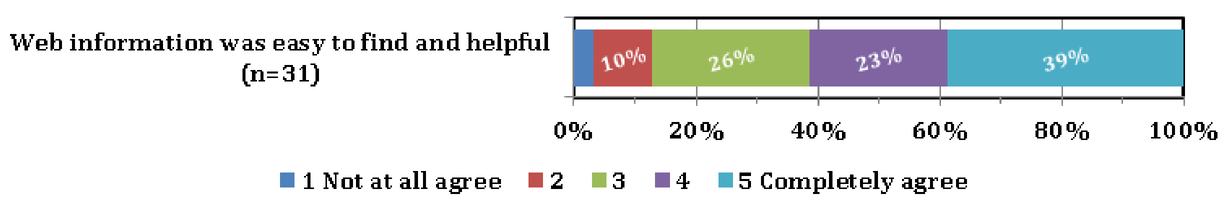

Figure 140: Website Effectiveness, among E+ Residential Existing Gas Rebate Equipment Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority (62%) said they had contacted the utility to learn how the rebate program worked (Table 443).

Table 443: Reasons for Contacting NWE, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=50)	62%
To resolve a problem (n=50)	44%
Investigate status of an application (n=50)	36%
Investigate status of a rebate payment (n=50)	30%
None of these (n=50)	24%
Other (n=50)	16%

About half of surveyed trade allies would like to receive further information on energy savings programs and opportunities, or to attend additional workshops or events (Table 444).

Table 444: Further Information Desired, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=50)	60%
Energy efficiency programs (n=50)	58%
Energy saving educational opportunities (n=50)	54%
None (n=50)	30%

Those desiring further information preferred to receive information by mail (38%) and other methods such as email (30%) or trainings and workshops (26%; Table 445).

Table 445: Information Delivery Preference, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
US mail (n=50)	38%
Email (n=50)	30%
Trainings, workshops or seminars (n=50)	28%
Community event (n=50)	16%
Webinar (n=50)	16%
Phone (n=50)	8%

Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

We asked residential trade allies if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if instead they kept unrated/standard items in stock and *ordered* the high-efficiency items as needed. Just over half (54%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 446 below. Most (84%) kept a range of equipment that varied in quality and prices to offer customers, and 97% agreed that the “Better” and “Best” equipment is usually more energy-efficient than the “Good.” Over half (63%) reported they suggest the “Best” equipment to customers first.

Table 446: Equipment Sales Approach, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option to buy (n=49)	84%
Agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' option (n=39)	97%
Best presented first (n=40)	63%
Better presented first (n=40)	23%
Present all options simultaneously (n=40)	13%
Good presented first (n=40)	3%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. Less than half (42%) of these trade allies reported that over three-quarters of their stock was high-efficiency equipment. A third of these respondents said that no more than 25% of their regular stock was comprised of high-efficiency equipment. Those trade allies who reported that they stocked efficient equipment also estimated the share of sales made in the past two years that were energy-efficient items. A majority (63%) reported that more than three-fourths of the equipment they sold in the past two years as high-efficiency (Figure 141).

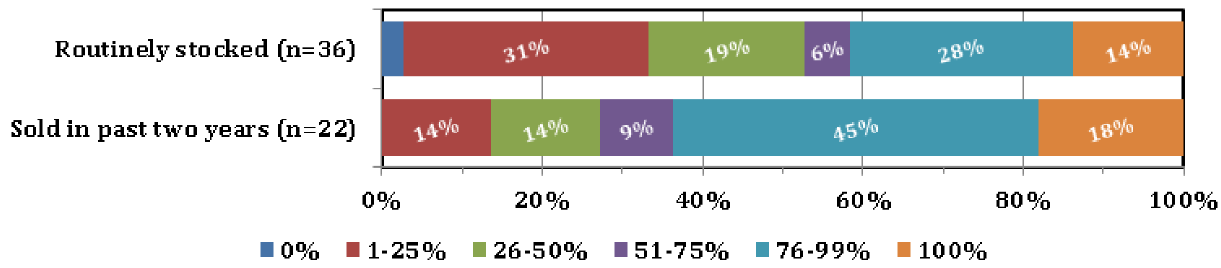

Figure 141: High Efficiency Equipment Share, among E+ Residential Existing Gas Rebate Equipment Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment that qualifies for rebates. The most commonly mentioned benefits, by 88% of these trade allies, were the rebate itself and the lower operation costs of the equipment (Table 447).

Table 447: Customer Benefits Mentioned, among E+ Residential Existing Gas Rebate Equipment Trade Allies

Benefit	Percent
Lower operation costs (n=50)	88%
Utility rebate (n=50)	88%
High-quality of product (n=50)	70%
Lower maintenance costs (n=50)	54%

About 20% of these residential trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these ten respondents mentioned cost half the time (Table 448).

Table 448: Reasons for Discouraging Efficient Equipment Purchase, among E+ Residential Existing Gas Rebate Equipment Trade Allies

(Allowed Multiple)	Percent
Cost (n=10)	50%
Installations are too complex (n=10)	20%
Less reliable than standard items (n=10)	20%
Other (n=10)	20%

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. About one-third (35%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. Among the reasons reported in the following table, no single reason stands out as a barrier to rebate applications (Table 449).

Table 449: Circumstances When Rebate Foregone, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent
Trade ally unaware of rebate/program (n=14)	21%
Customer did not apply (n=14)	21%
Customer ineligible (n=14)	14%
Rebate too small (n=14)	14%
Applying takes too long (n=14)	7%
Unspecified or unclear (n=14)	21%

Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (64%) of trade ally respondents say they had trained staff to talk to customers about energy efficient choices. In fact, 46% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 450).

Table 450: Rebate Initiator, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent (n=50)
Almost always trade ally initiated	46%
Mostly trade ally initiated	36%
About half trade ally and half customer	10%
Almost always customer initiated	8%

When a customer is considering an equipment purchase, 94% of these respondents suggest equipment that qualifies for the rebate program, rather than waiting for the customer to show interest in qualifying for rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Most surveyed trade allies (86%) indicated that nothing about the program raised issues or concerns about their customers’ participation. Among the seven respondents who had initial concerns, the reasons given showed no pattern. However, problems with the rebate were concerns for two respondents.

A minority (18%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by

NWE. These "regular communicators" were contacting customers with varied frequency, some as often as daily and some yearly (Table 451).

Table 451: Customer Contact Frequency, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent (n=9)
Once a year	33%
Every day	33%
Once a month	11%
2 times a year	11%
Varies by customer	11%

A majority of these trade ally respondents rated four aspects of program information they received from NWE about rebate processes as "clear" or "very clear." Slightly lower ratings were given for two of the four: reading and understanding program information, and information about which items qualify for rebate (Figure 142).

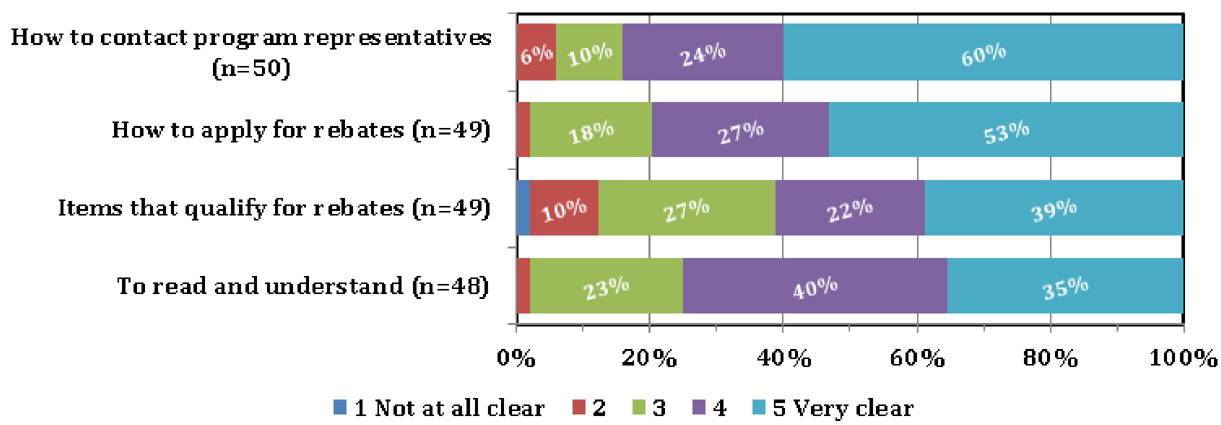

Figure 142: Clarity of Program Information, among E+ Residential Existing Gas Rebate Equipment Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (62%) reported working with the customer in a joint effort to prepare the applications. Another 26% reported doing all or most of the application themselves.

Table 452: Rebate Application Preparer, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent (n=50)
Typically both trade ally and customer - about half and half effort	62%
Typically the trade ally prepares all or most of the application	26%
Typically the customer prepares all or most of the application	10%
Depends on the rebate	2%

About three-quarters (72%) of the 43 trade ally respondents involved with completing the rebate application "agreed" or "completely agreed" that the process was simple to follow (Figure 143).

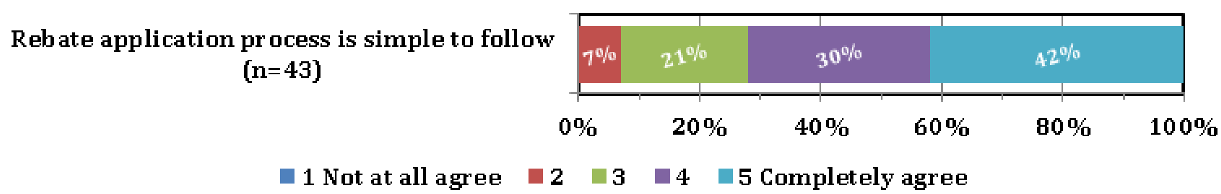

Figure 143: Rebate Application Process, among E+ Residential Existing Gas Rebate Equipment Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes. At least 61% of respondents "agreed" or "completely agreed" that NWE provided updates in a timely manner, staying current takes little staff time, and that customers benefit from program additions (Figure 144).

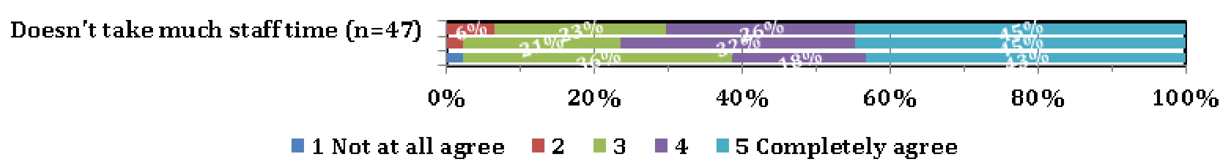

Figure 144: Experience With Program Changes, among E+ Residential Existing Gas Rebate Equipment Trade Allies

Most (83%) of the 46 residential allies surveyed reported that they were on NWE's Preferred Contractors list. Almost all of the preferred contractors (97%) "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (84%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." However, just under half (48%) agreed or completely agreed that being a preferred contractor had "helped grow our business" (Figure 145).

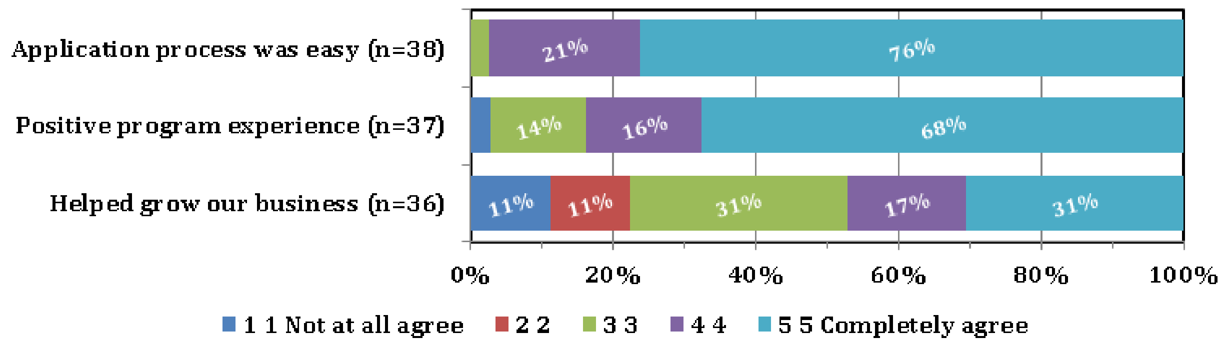

Figure 145: Experience As Preferred Contractor, among E+ Residential Existing Gas Rebate Equipment Trade Allies

We asked the eight trade allies who gave a rating of "1" or "2" on the five-point agreement scale to explain their low ratings. Their answers indicated they did not think being on the preferred list was a reason customers contacted them, and that there is little outreach coordination with NorthWestern.

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. The most common suggestion, made by 40%, was an expanded range of HVAC systems (Table 453). LED lighting and heat pumps were suggested by 20%. These trade allies indicated they suggested such items primarily because they were "more efficient" (Table 454).

Table 453: High Efficiency Equipment Suggested, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent (n=15)
Other heating systems	40%
LED lighting	20%
Heat pumps	20%
On demand water heaters	13%
Other	7%

Table 454: Reasons Equipment Should Be Added, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent (n=14)
It's more efficient	50%
Cost	14%
Customers request them	14%
Where industry is going	7%
Other	14%

Firmographics

A few trade allies (18%) served customers in more than 20 Montana locations. More than half (60%) of these respondents reported serving five or fewer locations.

Table 455: Number of Montana Locations, among E+ Residential Existing Gas Rebate Equipment Trade Allies

	Percent (n=50)
1 location	36%
2 to 5 locations	24%
6 to 10 locations	12%
11 to 20 locations	10%
21 to 50 locations	4%
Over 50 locations	14%

Trade allies reported on the maximum number of miles they would travel to serve clients. About a quarter (24%) would travel less than 100 miles, while 14% would travel more than 400 miles. The largest portion (46%) would travel between 101 and 200 miles to serve a client (Figure 146).

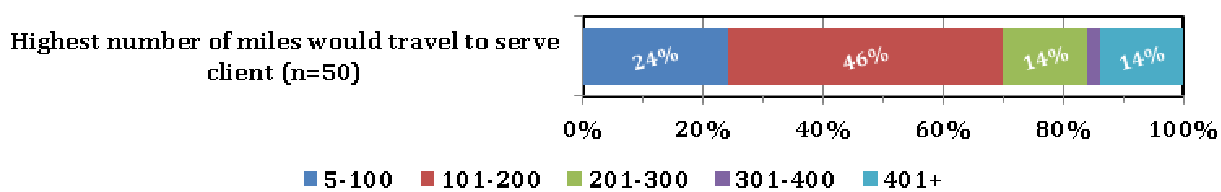

Figure 146: Maximum Miles, among E+ Residential Existing Gas Rebate Equipment Trade Allies

17.4. Recommendations

17.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Evaluated values:** Update UES values for the measures included in this program to the evaluation values, which incorporate the findings from recent research.

17.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Two-thirds of surveyed E+ Residential Existing Gas rebate participants reported hearing about the program through their contractor. Although half of participants reported as well that they heard of the program through NWE, this proportion is less than that for the electric rebate program, where a majority of contacts heard about the program from NWE. Overall, participants reported positive program outcomes. Over half of participants (59%) reported using a preferred contractor; among those who did not, the most common reason cited was that they did not know about the preferred contractor list. Consistent with this finding, one-fourth of participants described as unclear information that projects using preferred contractors may qualify for higher rebates. (The evaluation team notes that in our estimation, the information on the program website, application instructions, and application form clearly explain the incentive associated with using preferred contractors. In addition, if the contractor completes the application form for the customer, the customer receiving higher rebates for using a preferred contractor may be unaware that this is the case. A small yet notable number of participants reported that information about the inspection process, and about following up with program staff, was not at all clear. (Program application materials clearly state how to reach program staff.)

Among surveyed kit recipients, over half would like to receive more efficiency information from NWE. Nearly all recipients (95%) reported they had installed at least some of the items in their kit, and 41% reported installing all of the items. Overall, one-third of recipients had not installed some of their kit items and did not intend to do so in the next few months. The most common explanations for not installing items were that recipients hadn't gotten around to it, or that it took too much time. Kit recipients reported understanding potential next steps: how to apply for a rebate, how to request an audit, and how to follow up with program staff.

Surveyed residential trade allies reported positive program experiences, with no major concerns or suggestions. Many are interested in receiving more efficiency information: nearly two-thirds of trade allies reported interest in efficiency workshops or other events. Just under two-thirds reported that they trained their staff to talk to clients about energy efficiency. Although two-thirds of trade allies have used the website, just one tenth report that they get information about program requirements from the website. Nearly all trade allies report that they proactively mention the program to customers, but reported rates of customer-initiated projects are higher than for other programs. Over one-third of insulation contractors report that they have had concerns about recommending the program to their customers, many because of unclear or changing R-value qualification requirements.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.

- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback**: Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

18. E+ Residential Lighting

18.1. Program Description

The E+ Residential Lighting program began in 2005. All NWE residential electric supply customers are eligible to participate in the program. All program activities are funded through DSM.

The six program components are listed in the table below with the delivery methods by which customers acquire the efficient lighting products. All lighting products must be Energy Star rated and have electronic ballasts, with the exception of outdoor CFL fixtures.

Table 456: Program Components and Delivery Methods for E+ Residential Lighting

Program Component	Program Delivery Method
In-Store Coupons	Point of sale rebate with NWE coupon mailed to customers twice a year
Trade Show	Free CFLs at community events
Mail-In	Rebate with customer application
Mail-Out	Free CFL (1) with submittal of mail-in audit for electric customers not eligible for an in-home audit
Residential CFL Direct Install	E+ Energy Audit Program, free CFLs to replace incandescent lamps operating ≥ 3 hours/day
Upstream CFL Buy-Down	Regional retail CFL cost markdown

In-Store Coupon

Twice a year, spring and fall, customers receive a coupon in the mail for up to ten CFLs at participating retailers. The coupons provide customers with an instant rebate at the time of sale. The coupons have a unique bar code identifying the customer. Qualifying retailers submit the coupons along with associated transaction and product information to NWE for reimbursement. Retailers sign an agreement to participate in the program and to be listed on the coupon and in advertising.

Trade Show

Customers receive up to four 13- or 14-Watt CFLs per calendar year at special events such as home and garden shows, farmers' markets, and community fairs. After their customer status is verified, customers are given a brief educational presentation on how to get the most savings from their CFLs. Customers also receive the Mail-In lighting rebate brochure/application form for additional CFL product rebates.

Mail-In

Customers receive rebates for 5 to 15 screw-in or hardwired CFLs. Starting in 2011, rebates are available for replacing wall switches with switch plate mounted occupancy sensors, provided the controlled load is ≥ 359 Watts. Customers choose qualifying products at retailers of their choice. Customers submit an application with purchase and product documentation.

Mail-Out

Electric Customers who do not qualify for an in-home audit can complete the E+ Energy Audit mail-in audit questionnaire to receive one 13- Watt CFL (Wattages may vary slightly over program years) along with their audit report. Customer education and promotion of the rebate offer is included.

CFL Direct Install

The E+ Energy Audit team installs CFLs as part of the in-home audit. The customers identify incandescent lighting operating ≥3 hours per day and, along with the auditors, decide which to convert to CFLs. Auditors provide the customer with CFL educational information and replace the selected incandescent lighting with 13- to 26-Watt CFLs. The homeowner approves each installation before the CFL is left in place. The customers also receive education about appropriate use/selection of CFLs and the Mail-In lighting rebate program brochure should they want to purchase additional CFL products.

Upstream CFL Buy-down

The CFL Upstream Buy-down is a regional retail CFL cost markdown program coordinated by BPA and administered by a third party contractor. The administrator negotiates regional Buy-down rates with manufacturers and participating retailers for specific Energy Star certified CFL products. Regional utilities and retailers choose to opt into the program.

As a participating utility, NWE contracts directly with the management company and is billed for each qualifying product SKU code at participating stores. NWE applies an allocation factor to SKU units for most areas in their service territory because a portion of their customers are presumed to be served by electric utilities other than NWE. In western Montana, the share of sales allocated to BPA utility customers is not funded by NWE. In non-BPA markets, NWE pays based upon total sales as there is no funding partner, but NWE does claim the energy savings based upon its allocated portion of the market. In-store field support (Point-of-Purchase (POP), and retailer education) is managed by KEMA, NWE’s contractor for implementing other CFL programs.

The CFL Buy-down is considered to be primarily a market transformation program. While the program covers a broad range of CFL products, the Buy-down program’s emphasis is on promoting specialty products other than the standard 60-Watt equivalent twist style screw-in CFLs.

18.1.1. Energy Savings

For all programs, measure savings are calculated by subtracting pre from post fixture Wattage, then multiplying by the annual hours of operation. There are variations between program components in the use of deemed values as described below.

In-Store Coupons, Trade Shows, and Mail-Out

Customers receive 13 or 14 Watt CFLs. The deemed values are 60 Watts for the incandescent lamp being replaced and 3.7 operating hours per day.

Mail-In Rebates

A wide variety of CFL product types are covered by this program. The customer submits product documentation to document the Wattage for each CFL. Deemed Watts for the retired incandescent lamps are based on the Energy Star Lumen Table. Operating hours are a deemed 3.7 hours per day.

Direct Install

The E+ Energy Audit team carries a variety of CFL product types between 13 and 26 Watts. Auditors record the Watts of the incandescent lamps removed, the Wattage of the replacement CFLs and, although customer reported operating hours are recorded, claimed savings use a deemed 3.0 operating hours per day.

Upstream CFL Buy-down

The following methodology is used to calculate CFL energy savings:

- CFL Energy Star Wattages are obtained from SKU sales data submitted by the retailers.
- Allocation factors are used by NWE to account for a percentage of the purchased CFLs being installed outside of their service territory, for instance, a store in Bozeman is considered to have 85% of CFL sales to NWE customers, Billings 75%, etc.
- Deemed Wattages for the incandescent lamps being replaced are derived from values in the Energy Star Lumen Table. For instance, an 18 Watt CFL is purchased with a lumen output rating of 1100. The corresponding Wattage for an incandescent lamp producing 1100 lumens is 75 Watts, so the savings is 57 Watts.
- Deemed hours of operation per day are 3.7.

Currently, NWE considers all CFL sales to be replacing incandescent lamps. Given that most CFLs have a mean life of 10,000 hours and the program has been in operation since 2005, the number of new CFL purchases to replace failed CFLs should be small.

18.1.2. History

The residential CFL programs are stable with little change from year to year. The Mail-In program added a measure in April 2011, replacing wall switches with an occupancy sensor controlled switch, provided each circuit controls a minimum of 359 Watts.

The CFL Buy-down component has been marketed in conjunction with NEEA under a number of names, e.g., Savings with a Twist (SWAT), Change a Light/Change the World (CAL), etc. Name variations aside, the structure of the CFL Upstream Buy-down program has remained the same. The mix of CFL products in the program does change from year to year.

18.1.3. Marketing

The primary means for program marketing are customer bill inserts, home improvement shows, Farmers' Markets, NWE distribution events, energy audits, NWE's website, mass media (spot television, radio, newspaper), point of purchase materials at retailers, and news releases.

Other marketing included Saturday and weekday customer appreciation events (2005–2010) held in the fall. The customers appreciation events, to which all NWE residential customers were invited, provided CFLs directly to customers at these events (maximum four Free CFLs per calendar year per customer at events).

Weatherization events in 2006–2011 primarily targeted residential natural gas customers. NWE event promotion in 2007–2010 included press releases, newspaper and radio advertisements, direct mail to customers, flyers in NWE offices, community centers, senior centers, libraries, post offices, and other public bulletin board locations. Live radio remotes during Saturday events were utilized to both draw attention to the events as well as the E+ programs and rebates available to customers to save energy. The 2009 and 2010 Customer Appreciation Saturday Events included contests for Home Energy Prizes. Distribution trucks (U-Hauls) were wrapped with signage promoting events for the 2010 events. The approach changed for 2011 when promotion was primarily direct mail targeting natural gas customers without a history of program participation. Mass media and Customer Appreciation events were discontinued in 2011 while other marketing efforts continue

Twice each year, spring and fall, in-store coupon campaigns take place which include the direct mailing of coupons to each residential electric account. Ads are placed in daily and weekly newspapers to promote the event and the participating retailers. Additionally promotional activities include limited radio and television ads, news releases, and NWE's Facebook page.

For the CFL Buy-down, promotional materials are managed by NWE and implemented by KEMA. Promotional materials are supplied by BPA's contract administrator.

18.1.4. Program Steps

The participation process varies depending on the program.

In-Store Coupons:

Twice a year, customers receive a coupon in the mail for up to ten CFLs at participating retailers. They select qualifying Energy Star CFL products, present the coupon at the cashier and receive their instant rebate in the form of a reduced cost.

Distribution Events:

Customers receive up to four CFLs at special events such as home and garden shows and farmers' markets. After their customer status is verified, customers are given a brief educational presentation on how to get the most savings from their CFLs before receiving the free CFLs.

Mail-In:

Customers receive rebates for CFLs and occupancy sensors by mailing in an application with purchase and product documentation.

Mail-Out:

Customers who request but do not qualify for in an in-home audit receive an E+ Energy Audit questionnaire. They complete and return the questionnaire to receive a CFL via return mail.

Direct Install:

The E+ Energy Audit team installs CFLs as part of the in-home audit. The customer and the auditors mutually select locations in the home appropriate for CFLs. After installation by the auditors, the owner approves each installation before the CFL is left in place.

Upstream CFL Buy-down

Customers purchase the CFL products and automatically receive the discounted price; no other effort is required on the customer's part.

CFL product SKUs in the Buy-down program are not eligible for other NWE CFL rebates.

18.2. Impact Evaluation

18.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that participated in the program during the 2010–2011 program years. The methodologies used in the evaluation varied somewhat across the six program components. The gross savings assessment methods used for the Residential CFL Direct Install, In-Store Coupon, Mail-In and Mail-Out components were based on a combination of file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision. We did not include a file review (site inspection only) for the Trade Show component because project files were not available. We used a separate and distinct methodology for the Upstream CFL Buy-down program, which included an analysis of results from the participant survey, site inspections and the residential CFL operating hours study (see section 27).

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

18.2.1.1. Estimation of Gross Savings

All Components Except Upstream CFL Buy-Down

We applied a similar gross savings methodology to all components of this program, except the Upstream CFL Buy-Down. With the exception of the Trade Show component, we began the impact evaluation for this portion of the program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. We excluded the Trade Show component because no site-related documentation was created for this component. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

This program used simplified, measure-specific, engineering calculations to estimate NWE program savings. We performed a review of the program algorithms for each sampled site. For measures where the NWE methods were determined to be reasonable, we recalculated savings using the initial installation conditions, which were confirmed during the site visit. For measures where the NWE method was not adequate, we recalculated energy (kWh) and demand (kW) savings using the more reliable techniques.

We performed site visits on the sampled sites (including Trade Show sites) to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, in storage, or had previously been installed and saved energy. We collected data as necessary to support a re-estimation of energy (kWh) and demand (kW) savings, using the calculation method that resulted from the algorithm review, discussed above. We calculated evaluation energy (kWh) and demand (kW) by applying the final calculation method to the data confirmed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

Hours of Operation

The metering subsample of E+ Residential Lighting installations (see section 27) provided the data needed to estimate average residential hours of operation for 2010 and 2011. We adjusted operating hours for the years from 2006 – 2009 as follows.

Researchers have found a likelihood that the first CFLs installed in a house are put in high-use locations. In a review (Jennings 1996) of a study for Tacoma Public Utilities and other parties (Tribwell 1996), researchers found “We also broke down the mean usage hours by lamp type, yielding 1.82 for non-fluorescent (primarily incandescent), 4.39 for compact fluorescent, and 2.83 for standard fluorescent. Evidently these subjects chose appropriate (high-use) places to install their high-efficacy lamps.” Since the NWE CFL programs did not start until after 2005, there is reason to believe that the bulbs installed in earlier years would have gone in higher use locations.

We examined studies going back to 1996 to see how reported hours of use have changed through the years. We restricted our examination to studies in which lighting hours were actually metered. Table 457 shows the results of our review.

Table 457: Residential CFL hours of use found in metering studies

Year of Study	Region	Hours per Day
1996	Northwest[1]	4.4
2001	Northeast[2]	2.2
2003	Northeast[3]	3.0
2003	Northeast[4]	2.4
2004	Northeast[5]	3.2
2005	California[6]	2.3
2010	California[7]	1.9
2012	Montana[8]	2.0

[1] Baseline Residential Lighting Energy Use Study Final Report Prepared by Lyle S. Tribwell and David I. Lerman Tacoma Public UtilitiesTacoma, Washington Bonneville Power Administration May 1996

[2] Impact Evaluation of the Spectrum Smart Living Catalog and Retail Lighting Programs by XENERGY, Inc. (Cited in the Northeast Utilities 2003 Study).

[3] Northeast Utilities and United Illuminating Company Lighting Catalog/Smart Living™ Program Impact Evaluation Final Report by RLW Analytics. April 2003

[4] NSTAR Residential High Use Program Operating Hours Realization Rate Study by XENERGY, Inc. January 27, 2003

[5] Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs Final Report by Nexus Market Research, Inc. and RLW Analytics, Inc. October 1, 2004

[6] CFL METERING STUDY FINAL REPORT Prepared for Pacific Gas & Electric Company, San Diego Gas & Electric Company, Southern California Edison Company. Prepared by KEMA Inc. Feb. 2005

[7] KEMA and The Cadmus Group, Inc. Final Evaluation Report: Upstream Lighting Program, Volume 1. Prepared for the California Public Utilities Commission, Energy Division, San Francisco, CA, 2010.

[8] SBW, Evaluation of NWE Residential CFL lighting, 2012

Graphing these values and adding a trend line shows that studies have tended to find fewer hours through the years. We used professional judgment to estimate that residential CFL operating hours in NWE territory were most likely greater in the earlier program years than the value we found in 2012. We estimated the values to use for the earlier years based on the trendline shown in Figure 147. Since the NWE programs started much later than programs in the other regions, we estimated NWE hours of use for 2006-07 as the value estimated by the linear regression trendline for 2004.

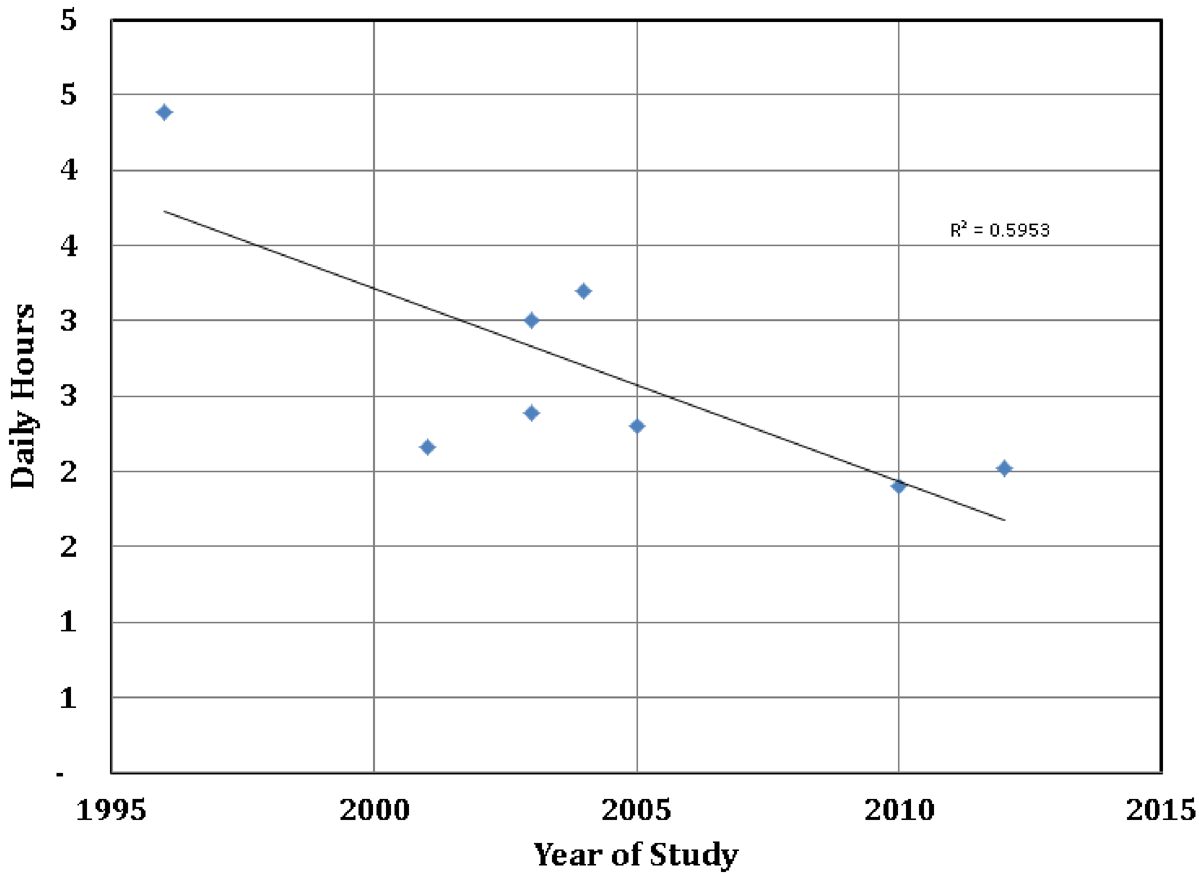

Figure 147: Residential CFL daily hours of use according to metered studies

Table 458 shows the results analysis.

Table 458: Residential CFL daily hours derived for Evaluation

Year	Evaluation Hours per Day
2006	2.70
2007	2.57
2008	2.45
2009	2.32
2010	2.02
2011	2.02

The daily hour's values were then used to calculate savings as follows. For each program we calculated a weighted average daily hours. We weighted the yearly values shown above by the count of bulbs rebated in that year, except in the New Homes program, where the yearly values were weighted by savings (bulb counts were not available). Overall average CFL daily hours calculated by program are shown Table 458. These average hourly values were used in the calculations of savings for the 2010-2011 site visits. We applied the resultant realization rates to earlier years, as with the other programs.

Table 459: Final Average CFL daily hours by Program

Program	Average Hours per Day
E+ New Homes	2.24
E+ Residential Lighting	2.30
NEEA Initiatives	2.41

Upstream CFL Buy-Down

We estimated the energy (kWh) and demand (kW) savings for this component by drawing on the results from three other elements of the evaluation work.

- **Proportion Non-residential.** A critical factor in this evaluation was the fraction of Upstream CFL Buy-Down bulbs that were purchased and installed by non-residential customers. The number of operating hours for non-residential bulbs is typically much greater than observed for residential customers, thus the savings for buy-down component is very sensitive to the assumed split between residential and non-residential applications of the bulbs. We could not directly determine the disposition of each buy-down bulb. Therefore, we obtained information on the sector split from the telephone survey of trade allies (CFL Buy-Down Retailers). We analyzed responses to support an estimate of the proportion of bulbs that went to non-residential applications.
- **Installation Rate** We conducted site visits for samples of E+ Residential Lighting and E+ Commercial Lighting installations. During these site visits, we compared the number of bulbs purchased to those verified to have been installed or in storage. Since CFLs have a low effective useful life of six years and the site inspections occurred up to two years after initial installation, our verification was based upon confirmed initial installation (rather than observed to be in place and operational). Our analysis of these data yielded the installation rate for both residential and non-residential applications.
- **Hours of Operation.** We estimated residential hours of operation as described above. The site visit data collection from the Commercial CFL Direct Install component of E+ Commercial Lighting provided the average non-residential hours of operation.

We combined the data above with program tracking data on bulb counts by bulb Wattage to compute energy (kWh) and demand (kW) savings for this program.

18.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

18.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

18.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

18.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

18.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

18.2.2.1. Estimation of Gross Savings

File Review

We completed a file review for all components except Trade Show and Upstream CFL Buy-Down. We reviewed a total of 285 sampled cases for this program across the five program years. The results from this review revealed a total of 18 data entry errors identified in eight of the 90 reviewed cases for the Direct Install component of the program tracking database, but a total of 161 errors were found among 48 cases of the 195 that were reviewed for the In-Store Coupon, Mail-in and Mail-Out components of the program. Some of the cases for these three components had multiple records, thus allowing for multiple data entry errors for a single type of error within a single case. The data entry errors that were found included:

- Errors affecting the difference between existing lamp and CFL Wattages
- Errors in CFL counts
- Errors in hours of operation

All three errors listed above were found to apply to the Direct-Install component of the program, although different combinations of errors occurred across the eight cases in which errors were found. Six cases had errors in tracked Wattages, three of which had errors for both pre- and post-installation values, five cases had errors in counts and four cases had errors in hours of operation. The net impact was to increase savings by 81 percent across the eight affected cases.

Data entry errors were found in 47 cases for the In-Store Coupon, Mail-in and Mail-Out components of the program combined. Because installations were performed by the customer, the hours of operation were not known and the errors were confined to the first two categories listed above. Errors in the count of CFLs were found in 17 of the reviewed cases, four of which served to increase savings while the other 13 cases served to reduce the savings. The net impact of differences in counts was a 39 percent reduction in savings for these 17 cases. Errors in Wattage entries led to an increase in estimated tracking savings for 17 cases whereas decreases resulted for another 17 cases. The net impact of the errors in CFL Wattages resulted in an average savings reduction of 2.3 percent for these 34 cases.

Four of the cases with errors had errors for both the quantity and wattage categories. The overall impact among all 47 cases with errors was to reduce savings by 14 percent.

Program Algorithm Review (excluding Upstream CFL Buy-Down)

We reviewed the algorithms used by the program to estimate program savings. For all of these measures, we determined that the NWE methods were reasonable with respect to the Wattages of the installed CFLs. We used actual baseline and installed bulb Wattages for the Residential CFL Direct Install component. For the remaining components, we took baseline bulb Wattages from lookup tables of equivalent-lumen output for incandescent bulbs[12]. This approach was necessary as the purchased CFLs could be tracked through store receipts, uniform product code bar codes or rebate coupons, but their installation could not be directly observed to verify baseline bulb Wattages. Using the equivalent lumen strategy is a reasonable method for addressing this issue.

All components of this program, with the exception of the Upstream CFL Buy-Down component, incorporated a consistent deemed operating hours value into the calculation of

[12] NWE provided an equivalent-lumen lookup table identifying an incandescent bulb wattage that would provide lumens commensurate with the lumens provided by a CFL of a specific wattage rating. The values in the table are based on a similar table created by US DOE and US EPA as part of their Energy Star program.

energy savings (kWh). We conducted a study of CFL operating hours (see section 27) incorporating monitored data for a randomly-selected sample of sites included in the E+ Residential Lighting program. We applied the resulting average operating hours to each measure installed under these programs in lieu of the program-specified value.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Residential Lighting program, we successfully visited 129 sites encompassing six different strata. We encountered a low response rate (63% “No Reply”) when recruiting for this program; and the on-site inspectors experienced a high refusal rate (22% “Onsite Refused”) when it came time to schedule the visit or meet at the site.

Table 460: Site Recruitment Disposition for E+ Residential Lighting

	Stratum						Total n	%
	1	2	3	4	5	9		
Recruitment								
Telephone Lab	105	18	20	1	0	0	144	
Special Effort								
Attempts	0	0	17	51	23	17	108	
No Reply	0	0	12	39	11	6	68	63%
Refused	0	0	0	5	5	1	11	10%
Recruited	0	0	5	7	7	10	29	27%
Total Recruited	**105**	**18**	**25**	**8**	**7**	**10**	**173**	
Onsite								
Refused	23	4	6	2	1	2	38	22%
Not Needed	0	0	5	1	0	0	6	3%
Total Completed	**82**	**14**	**14**	**5**	**6**	**8**	**129**	**75%**

Site Inspections (excluding Upstream CFL Buy-Down)

We performed site inspections for a sample of 129 measures that were assigned to the 2010–2011 program years. We completed site inspections for all components except Upstream CFL Buy-Down. In general we found that the measures were initially installed and operational. Only a small portion (8.6%) were observed to be in storage. Because the storage rate was low and the stored bulbs were likely to be installed in the near future, we did not make a correction to the evaluation savings for this effect. CFLs have a low effective useful life of six years and the site inspections occurred up to two years after initial installation, resulting in some of the CFLs having been removed since the initial installation because of bulb failure or customer dissatisfaction with the bulb performance. Since this is a result of equipment failure, and not a failure on the part of the utility, we decided to base the verification upon confirmed initial installation (rather than observed to be in place and operational).

There was only one instance where the customer claimed definitively that no bulbs had ever been purchased or directly installed. There were an additional 11 cases where the bulb count found onsite was slightly less than the claimed quantity. Despite best efforts, we could not account for the discrepancy in bulb counts at the site and we therefore attributed to errors in the program documentation. In every other site inspection, we found the bulbs to be installed as claimed, in storage, or the customer had indicated that the bulbs had burned out and been removed or simply replaced.

We calculated savings for each sampled measure by applying the evaluation calculation method to the initial installation conditions confirmed during the site visit. In all but seven cases, we determined the site-specific savings to be less than the program estimate. In five of these cases, the results were due to errors in the program tracking, where not all of the direct installed bulbs were recorded in NWE's tracking database. The other two cases were caused by the pre-existing bulb having a larger Wattage than claimed by NWE. There was only one zero saver found in the residential owner install program, where the customer said they had never purchased CFL bulbs with an NWE coupon.

For the remaining 121 sites, we found the evaluation site-specific savings to be less than the program claimed savings. As expected, we observed a reduction in savings for the 11 sites with an installation quantity less than claimed quantity. In addition, we observed reduced savings for a few sites because of a lower-than-claimed pre-existing bulb Wattage. However, the reduction in savings is primarily due to the 45% reduction in operating hours identified in our measurement-based study of CFL operating hours (see section 27) as compared to the deemed hours assumed for the program

Savings Analysis for the Upstream CFL Buy-Down Component

Site-specific data was not available to support the savings analysis of the Upstream CFL Buy-Down program component. Therefore, the evaluation of this component utilized site-specific data collected under the Commercial CFL Direct Install, Residential CFL Owner Install and Residential Direct Install studies. We used data from these three studies to estimate residential versus non-residential split, installation rate and hours of operation.

RIA conducted a survey of retailers in Montana who participated in NWE's in-store coupon or buy-down promotions of CFL bulbs. We asked the respondents who had participated in a buy-down promotion what percentage of all CFL bulbs were sold during the 2010–2011 period and then what proportion of buy-down CFL bulbs were sold to residential and business customers. Across the eight total respondents, the average proportion of promotional bulbs sold to residential customers was 81% and the proportion of bulbs sold to non-residential customers was 19%. We applied this residential/non-residential split to all the Upstream CFL Buy-down records.

We calculated the installation rate from the results of the Residential CFL Owner Install study, since it had the most similar delivery mechanism to the CFL Buy-down and a large sample of participants. We did not use results from the residential and non-residential direct install studies because the direct install delivery mechanism was not relevant to the CFL Buy-down study. We also did not use results from the Commercial Lighting Rebate study because very few participants installed CFLs.

The evaluation installed quantity included every bulb that was confirmed to be initially installed during program implementation. We did not exclude bulbs observed to be in storage because the storage rate was computed to be a low 8.6%. Our analysis assumed that the stored bulbs will be installed in the near future. We estimated the site level installation rate by dividing the verified installation quantity for each site by the total number of bulbs claimed by the utility for that site. We weighted the site level data by claimed quantity per site to get an average strata level installation rate and then a strata-weighted average installation rate was calculated for the entire study. The result was an installation rate of 97.7%.

We determined the hours of operation for the residential portion of the Upstream CFL Buy-down program records in the Residential CFL Operating Hours Study (see section 27) to be 2.02 hours per day. We adjusted this value as described in section 18.2.1.1. We used data from the evaluation of the Commercial CFL Direct Install study to determine hours of operation for the commercial portion of the Upstream CLF Buy-down program records. Operating hours data was available from both the project files and observations made during the site inspection. We used the installed quantity weighted average per record to calculate the strata average hours of operation per week and then a strata weighted average to calculate the installation rate for the program component. The result was an average of 42.95 operating hours per week, or 6.14 hours per day.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table shows the adjustment rates associated with file reviews, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 461: File Review and Site Visit Adjustment to Savings for E+ Residential Lighting

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
	Residential CFL Owner Install	kWh	41,432,692	41,131,927	24,703,246	32,185,244	0.99	0.60	0.78
	Residential CFL Direct Install	kWh	2,070,032	2,146,831	1,746,337	1,608,017	1.04	0.84	0.78
	Upstream CFL Buy-down	kWh	83,476,152			64,844,938			0.78

18.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rate are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 462: Savings Adjustments by Calendar Year for E+ Residential Lighting

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Residential Lighting	kWh	2007	16,737,612	0.78	-	-	0.78	13,001,910	1,484
	E+ Residential Lighting	kWh	2008	22,780,614	0.78	-	-	0.78	17,696,162	2,020
	E+ Residential Lighting	kWh	2009	22,020,371	0.78	-	-	0.78	17,105,599	1,953
	E+ Residential Lighting	kWh	2010	30,544,267	0.78	-	-	0.78	23,727,029	2,709
	E+ Residential Lighting	kWh	2011	34,896,011	0.78	-	-	0.78	27,107,499	3,094
	E+ Residential Lighting	kWh	All Years	126,978,876	0.78	-	-	0.78	98,638,200	11,260
Electric										
	E+ Residential Lighting	kWh	All Years	126,978,876	0.78	-	-	0.78	98,638,200	11,260

18.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 463: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Residential Lighting

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Residential Lighting	kWh	2007	13,372,738	2.37	2.96	0.85	2.61
	E+ Residential Lighting	kWh	2008	18,958,438	3.16	3.90	1.09	3.48
	E+ Residential Lighting	kWh	2009	17,108,973	2.63	2.61	1.09	2.90
	E+ Residential Lighting	kWh	2010	22,689,553	2.51	3.08	1.25	2.77
	E+ Residential Lighting	kWh	2011	25,976,253	2.48	3.77	1.65	2.72
	E+ Residential Lighting	kWh	All Years	98,105,956	2.62	3.26	1.20	2.88
Electric								
	E+ Residential Lighting	kWh	All Years	98,105,956	2.62	3.26	1.20	2.88

18.3. Process Evaluation

18.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with residential and commercial participants and trade allies from the three components of the E+ Residential Lighting program. We surveyed 173 Residential CFL Owner Install participants and 65 Residential CFL Direct Install participants. As Upstream CFL Buy-down participants were unknown to NWE, we asked all surveyed residential participants (n=699), commercial participants (n=240), residential nonparticipants (n=67), and commercial nonparticipants (n=164) about their CFL purchases through the Upstream CFL Buy-down program. Surveyed trade allies include 40 retailers who participated in NWE CFL coupon promotions and 18 retailers who participated in NWE's CFL Buy-down promotion.

18.3.2. Implementation Findings

18.3.2.1. Interview Findings

The residential lighting program provides CFLs through multiple delivery methods. Typically, residential lighting programs focus on upstream, mid-stream, or downstream direct-to-customer delivery methods. NWE incorporates both upstream buy-down with mid-stream in-store coupons and a wide range of delivery methods directly to customers to create a comprehensive lighting program. The specific equipment covered by this program changes based on availability from season to season. NWE looks for the most cost-effective energy efficient lighting options available and changes from one SKU to another to best leverage available funds.

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms that are distributed during audits and available on NWE's website. Audit recommendations include specific rebate opportunities and programs for the audited premises, while the website lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website, including a set for CFLs. Program staff provide assistance for questions about the process through a customer help line.

Residential lighting products require only the customer's account number rather than a utility bill with the application. For qualifying residential lighting products, the customer must also include the products' UPC bar codes. While it is an additional hassle for customers to mail in the UPC codes, this requirement enables program staff to address any issues of overlap between different program activities, ensuring that NWE does not issue multiple rebates for a single item.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

The CFL Upstream Buydown program includes one-on-one training for retailers to help them promote the CFLs. Because there is overlap between those retailers, in-store coupons, and mail-in rebates, NWE negotiated a lower administration fee with retailers.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

18.3.2.2. Best Practices Assessment

Table 464 through Table 467 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 464: Program Planning and Design Best Practices for E+ Residential Lighting

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic

Practice	NWE Assessment
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 465: Program Management and Administrative Best Practices for E+ Residential Lighting

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies

Practice	NWE Assessment
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 466: Marketing and Outreach Best Practices for E+ Residential Lighting

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 467: Program Quality Control Best Practices for E+ Residential Lighting

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

18.3.3. Participant Findings

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

18.3.3.1. Residential CFL Owner Install

We surveyed 172 respondents who received CFLs through one of four E+ Residential Lighting program components: In-Store Coupon, Mail-In, Mail-Out, or Trade Show.

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NorthWestern Energy, the kind of additional information they wanted, as well as providing information about their decision to install CFLs.

The great majority (86%) of respondents had never visited the utility website. Two-thirds (66%) of the reasons they offered fell into two categories: either they don't like to use it or have no need to visit the site (Table 468).

Table 468: Reasons Website Not Used, among Residential CFL Owner Install Participants

	Weighted Percent (n=143)
Don't like to use it much	33%
No need or no reason	33%
Don't have access	17%

	Weighted Percent (n=143)
Never thought to	8%
Just haven't	3%
Didn't know they had one	2%
Other	3%

Three main reasons were offered by the 23 respondents who had visited NWE's website. Forty percent were looking for utility contact information, almost the same percentage were paying their utility bill, and 34% were learning about rebates or audits (Table 469).

Table 469: Website Use, among Residential CFL Owner Install Participants

(Allowed Multiple)	Weighted Percent
Utility contact information (n=23)	40%
Pay utility bill (n=23)	37%
Learn about rebates or audits (n=23)	34%
Look up general information (n=23)	16%
Money saving tips (n=23)	12%
Energy saving educational opportunities (n=23)	11%
Other use of website (n=23)	11%
Track energy usage (n=23)	6%
How-to videos (n=23)	1%

One-half of the website users "completely agreed" that the web information was easy to find and helpful (Figure 148).

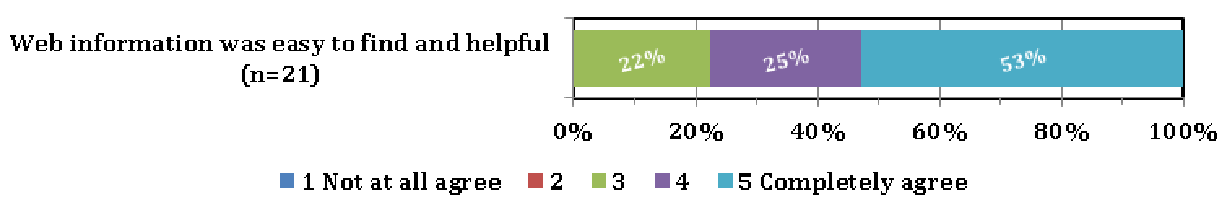

Figure 148: Website Effectiveness, among Residential CFL Owner Install Participants

At least half of all the program respondents would like more information on energy-saving educational opportunities (56%), and/or energy efficiency programs (50%). Four in ten needed no further information from NWE (Table 470).

Table 470: Further Information Desired, among Residential CFL Owner Install Participants

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=173)	56%
Energy efficiency programs (n=173)	50%
Does not want any (n=173)	41%
Workshops or events on energy efficiency (n=173)	23%

Those desiring further information prefer to receive information by mail (95%), followed primarily by community events (44%) and email (34%; Table 471).

Table 471: Information Delivery Preference, among Residential CFL Owner Install Participants

(Allowed Multiple)	Weighted Percent
US Mail (n=102)	95%
Community event (n=102)	44%
Email (n=102)	34%
Trainings, workshops or seminars (n=102)	25%
Phone (n=102)	23%
Webinar (n=102)	8%

Just 6%, or 11 respondents had issues or concerns prior to installing their CFLs. When we asked them to explain their concerns, they indicated it might be too difficult to participate, or too confusing, but mainly they offered individual reasons.

Respondents became aware of CFL program opportunities chiefly through noticing a utility publication or advertisement (83%). Additionally, 39% heard about it from a utility representative appearing in person at an event or meeting (Table 472).

Table 472: Means of Program Awareness, among Residential CFL Owner Install Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=168)	83%
Utility representative appearance (n=172)	39%
Other (n=171)	19%
Word of mouth (n=169)	18%
Building professional, vendor, or contractor (n=169)	11%
Directly contacted utility (n=171)	7%

Program Experience

Participants reported on their experience with program components or phases, and they rated the incentives and equipment acquired through NWE program activities.

The majority of these CFL respondents rated components of information they received about the program as “clear” or “very clear,” ranging from 58% to 75% of the time (Figure 149).

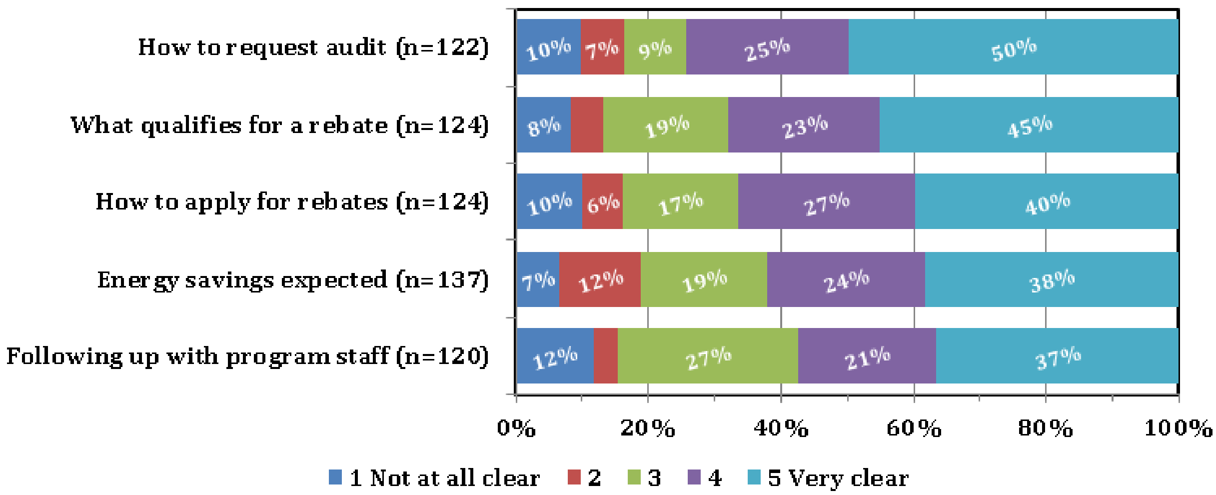

Figure 149: Clarity of Program Information, among Residential CFL Owner Install Participants

Respondents largely agreed that the CFL bulbs fit their needs and performed well. In about one-third of cases, when respondents had met a utility representative, they also rated these representatives as courteous and helpful (Figure 150).

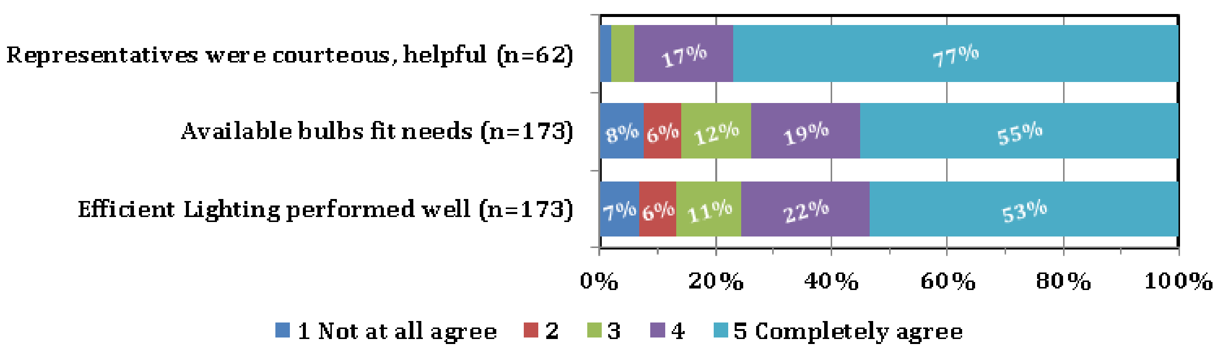

Figure 150: Experience With Installation Process, among CFL Owner Install Participants

Based on data for 161 of 172 the households we surveyed as participants of the CFL Owner Install program components, an average of eight CFLs were bought or received by each participant. The NWE lighting program recommends that these residential customers replace incandescent bulbs that typically operate more than three hours per day with CFLs.

Slightly more than one-half of the respondents (59%) reported that *all* of their program bulbs were still in use. At least some of the program's CFL bulbs were still in use in 93% of the respondents homes (Table 473).

Table 473: Program CFLs Still In Use, among Residential CFL Owner Install Participants

	Weighted Percent (n=173)
All	59%
Some	34%
None	7%

More than seven in ten (71%) respondents would be likely or "very likely" to participate in NWE's energy efficiency programs in the future (Figure 151).

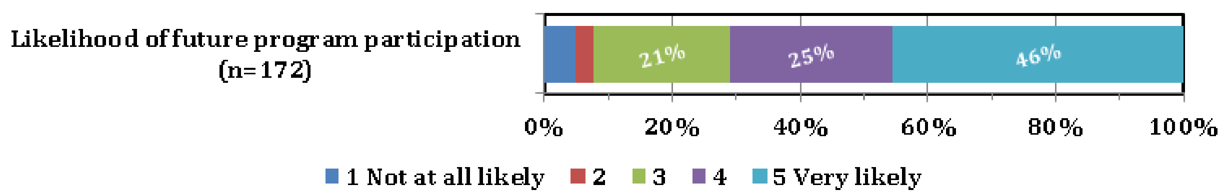

Figure 151: Likelihood of Future Participation, among CFL Owner Install Participants

In final comments about their experience, 8% of respondents volunteered that they were dissatisfied with the CFLs they had received. The most common source of dissatisfaction mentioned was complaints that the bulbs did not last as long as they were supposed to, but other respondents mentioned that they took too long to warm up, and that proper disposal options were not available.

18.3.3.2. Residential CFL Direct Install

We surveyed 65 respondents who had CFLs installed by the auditor(s) conducting their Home On-site Audit (a component of NWE's E+ Audit Home or Business program).

Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency from NorthWestern Energy, the kind of additional information they wanted, as well providing information about their decision to continue using the CFLs installed.

Most respondents (71%) had never visited NWE's website. Just under one-half of the non-users (45%) said they "don't like to use it much" (Table 474).

Table 474: Reasons Website Not Used, among Residential CFL Direct Install Participants

	Weighted Percent (n=43)
Don't like to use it much	45%
No need or no reason	21%
Don't have access	15%
Never thought to	10%
Just haven't	5%
Have access but connection is slow	2%
Other	2%

We surveyed 18 respondents in this program group who had visited the utility website. There were two main reasons for visiting: for utility contact information and to pay their utility bill (Table 475).

Table 475: Website Use, among Residential CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Pay utility bill (n=18)	63%
Utility contact information (n=18)	62%
Learn about rebates or audits (n=18)	37%
Money saving tips (n=18)	33%
Energy saving educational opportunities (n=18)	16%
Look up general information (n=18)	12%
How-to videos (n=18)	11%
Track energy usage (n=18)	6%

The majority (68%) of the website users agreed that the web information was easy to find and helpful (Figure 152).

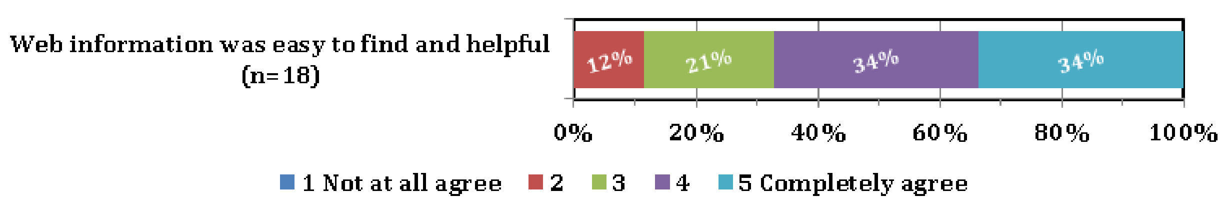

Figure 152: Website Effectiveness, among Residential CFL Direct Install Participants

Half of all the program respondents would like to receive more information on energy-saving educational opportunities (50%). Nearly half of the respondents (48%) desire no further information from NWE (Table 476).

Table 476: Further Information Desired, among Residential CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Energy saving educational opportunities (n=65)	50%
Energy efficiency programs (n=65)	34%
Workshops or events on energy efficiency (n=65)	20%
Does not want any (n=65)	48%

Those desiring further information overwhelmingly prefer to receive information by mail (100%; Table 477).

Table 477: Information Delivery Preference, among Residential CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
US Mail (n=34)	100%
Community event (n=34)	34%
Email (n=34)	30%
Trainings, workshops or seminars (n=34)	24%
Phone (n=34)	23%
Webinar (n=34)	9%
Other (n=34)	3%

Participants became aware of the audit program chiefly through noticing a utility publication or advertisement (90%). Additionally, 45% heard about it by contacting the utility themselves (Table 478).

Table 478: Means of Program Awareness, among Residential CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Utility publication or advertisement (n=64)	90%
Directly contacted utility (n=62)	45%
Heard of Program Other Ways (n=65)	26%
Word of mouth (n=65)	21%
Utility representative appearance (n=63)	12%
Building professional, vendor, or contractor (n=64)	9%

Very few (9%) of the respondents had concerns or questions before participation. When asked about whether typical reasons for participation influenced their own decision, most respondents said each of the listed reasons were a factor (Table 479).

Table 479: Reasons For Program Participation, among CFL Direct Install Participants

(Allowed Multiple)	Weighted Percent
Save energy (n=65)	97%
Save money (n=65)	97%
Installed equipment would be reliable if done by utility (n=65)	85%
Items were free (n=65)	77%
Good experience with other NWE efficiency program (n=65)	27%

A strong majority of respondents who received these CFLs rated the information they received about the program as “clear” or “very clear” (Figure 153).

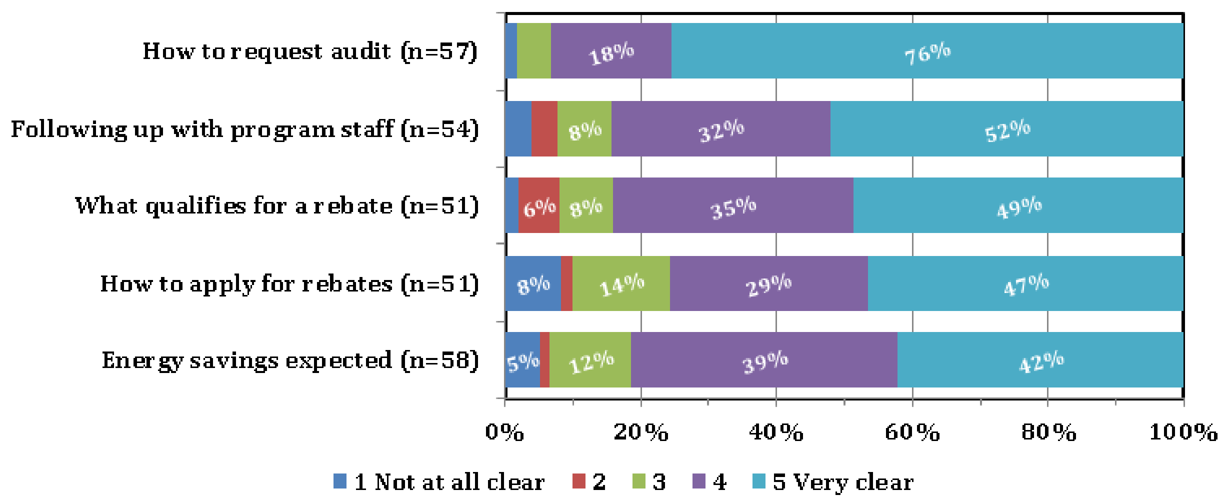

Figure 153: Clarity of Program Information, among Residential CFL Direct Install Participants

Program Experience

Participants reported on their experience of program components or phases, and they rated the equipment acquired through NWE.

Respondents mostly completely agreed (68%) that the CFL bulbs performed well. Nearly all respondents also found representatives to be courteous and helpful (Figure 154).

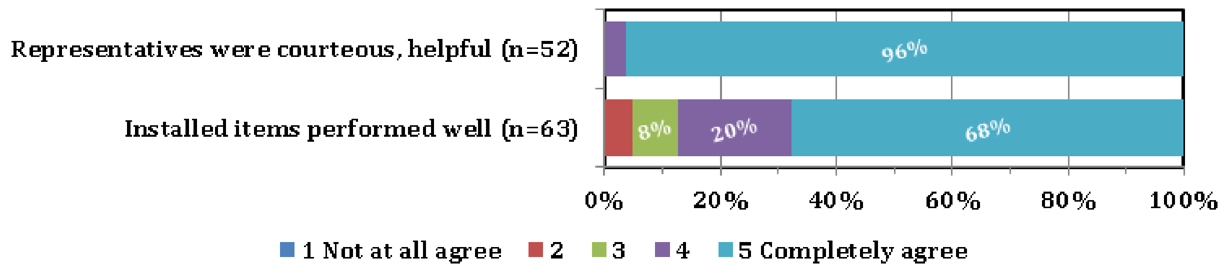

Figure 154: Experience With Installation Process, among CFL Direct Install Participants

Based on program data, on-site auditors replaced an average of five incandescent lamps operating at least three hours per day with CFLs in the 65 households surveyed.

Most (86%) respondents reported that *all* of their direct-install bulbs were still in use. At least some of the program's CFL bulbs were still in use in 99% of the respondents homes (Table 480).

Table 480: Program CFLs Still In Use, among CFL Direct Install Participants

	Weighted Percent (n=65)
All	86%
Some	13%
None	1%

Nearly three-quarters (72%) of respondents would be likely or "very likely" to participate in energy efficiency programs in the future (Figure 155).

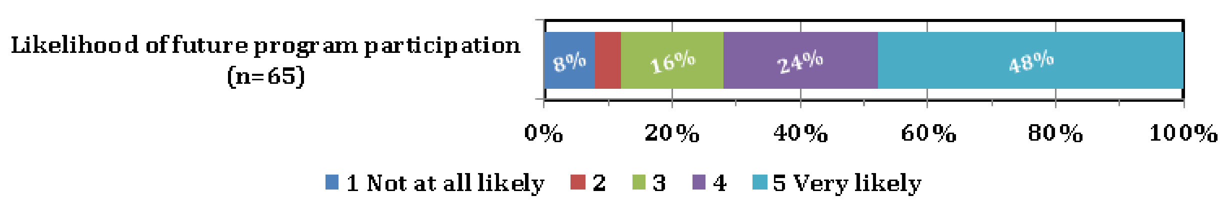

Figure 155: Likelihood of Future Participation, among CFL Direct Install Participants

In final comments about their experience, 12% of respondents volunteered that they were dissatisfied with the CFLs they had received. The most common source of dissatisfaction mentioned was complaints that the bulbs did not last as long as they were supposed to, but other respondents mentioned that they took too long to warm up, and that proper disposal options were not available.

18.3.3.3. Upstream CFL Buy-down

Because NWE did not interact directly with the consumers who purchased CFLs through the Upstream CFL Buy-down, while surveying other residential and commercial program participants and residential non-participants we asked a total of 1006 respondents if they had also purchased CFLs at participating Upstream CFL Buy-down retailers. If our survey respondent recalled buying specialty CFLs at reduced rates, we asked a series of questions about lighting.

The percentage of all survey respondents who recalled buying specialty compact fluorescents at promotional prices in the past year was highest (44%) among commercial program participants. Just over a quarter of residential respondents, whether NWE program participants (27%) or not (28%), recalled buying specialty CFLs at special prices (Table 481).

Table 481: Recall Buying CFLs without Coupon, among Upstream CFL Buy-down Respondents

	Percent
Residential participants (n=692)	27%
Residential nonparticipants (n=60)	28%
Commercial participants (n=226)	44%

All three respondent groups had strong majorities who said it was “very easy” to find CFL bulbs at the stores where they commonly buy light bulbs. Just 3% of over 900 respondents said it was “not at all easy” (Figure 156).

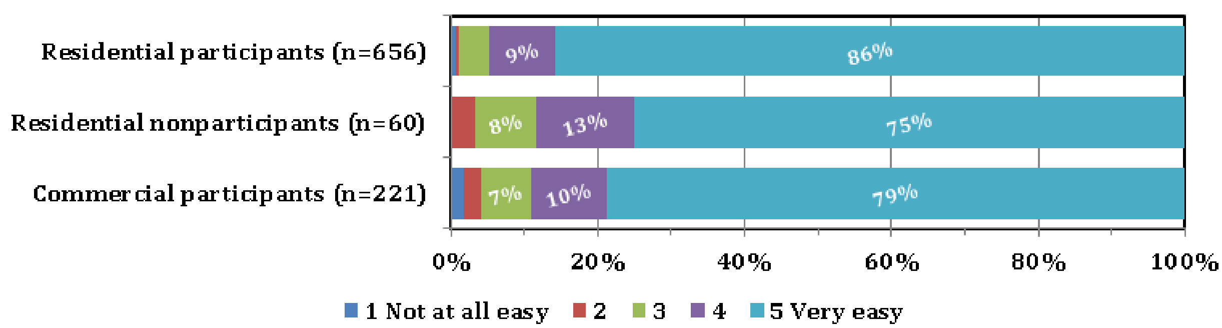

Figure 156: Ease Finding CFLs, among Upstream CFL Buy-down Respondents

We asked respondents if they felt comfortable looking for and figuring out the information on CFL packages about which bulb to buy to get the light they needed. Majorities in each respondent group reported being “comfortable” or “very comfortable” doing so, with participant majorities of 89% among commercial and 72% for residential respondents. A smaller majority, 56%, of the non-participants were comfortable (Figure 157).

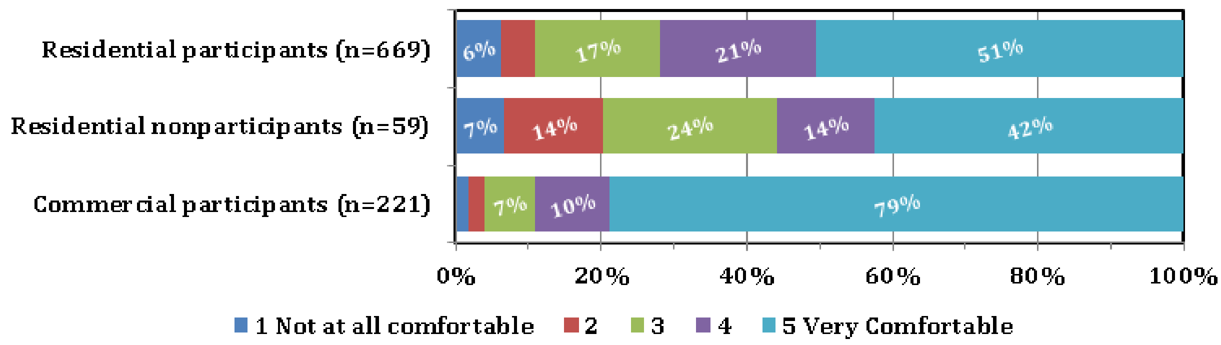

Figure 157: Comfort Understanding CFL Package, among Upstream CFL Buy-down Respondents

Respondents volunteered suggestions for making CFL information easier to understand. Respondents most frequently suggested that "a chart" listing what kind of CFL to buy to replace varying Wattages of old bulbs would address confusion about how bright the CFL light would be when its Watts are no longer the measure. Also reported were suggestions for well-informed salespeople to help respondents choose a replacement that works.

We asked all groups of respondents if they kept a spare stock of light bulbs on hand, and almost everyone did, whether commercial or residential (Table 482).

Table 482: Keeps A Spare Stock of Lightbulbs, among Upstream CFL Buy-down Respondents

	Percent
Residential participants (n=699)	93%
Residential nonparticipants (n=67)	97%
Commercial participants (n=231)	89%

Large majorities in each respondent group kept CFLs in their stock of spare bulbs, but non-participants somewhat were less likely to do so (Table 483).

Table 483: Stock Includes CFLs, among Upstream CFL Buy-down Respondents

	Percent
Residential participants (n=649)	87%
Residential nonparticipants (n=65)	69%
Commercial participants (n=201)	85%

Among purchasers of upstream Buy-down bulbs, commercial and residential program participants were twice as likely to replace a burned-out incandescent light bulb with a CFL bulb as were respondents who had not participated in a NWE E+ program. Non-participants said they replaced burned-out lights with incandescent bulbs 43% of the time, while participants only put in incandescent replacements about one-fifth of the time. Compared to participant groups choosing to install spent incandescent with CFLs over 60% of the time, nonparticipants were nevertheless installing CFL replacements 42% of the time (Table 484).

Table 484: How Replace Burned-Out Bulbs, among Upstream CFL Buy-down Respondents

	Replace with incandescent	Replace with CFL	Depends
Residential participants (n=686)	17%	66%	16%
Residential nonparticipants (n=65)	43%	42%	15%
Commercial participants (n=230)	21%	63%	16%

Among respondents reporting that CFL replacements “depends,” responses reveal that amount of concern related to location, bulb type, bulb's use, and convenience varied across respondent groups. The location of the fixture was a factor mentioned by more residential (40%) than commercial participants (26%; Table 485).

Table 485: CFL Replacement Depends On, among Upstream CFL Buy-down Respondents

	Location	Bulb type	Bulb's use	Convenience	Other	Don’t use CFLs
Residential participants (n=112)	40%	31%	23%	11%	0%	5%
Residential nonparticipants (n=10)	0%	0%	60%	0%	30%	0%
Commercial participants (n=35)	26%	29%	23%	20%	0%	0%

On average, residential customers recalled buying between seven (nonparticipants) and eight (NWE program participants) CFLs last year during Buy-down promotion events. Commercial participants reported buying 26 bulbs on average (Table 486).

Table 486: Average Number of CFLs Bought, among Upstream CFL Buy-down Respondents

	Mean
Residential participants (n=151)	8
Residential nonparticipants (n=7)	7
Commercial participants (n=60)	26

Majorities of each respondent group (71%, 86%, and 56%) say that *all* of the promotional CFLs they bought this past year are still in use. Among NWE program participants, about one-fourth of commercial respondents and one-tenth of residential respondents were using fewer than *half* of their CFL bulbs at the time of our survey (Figure 158).

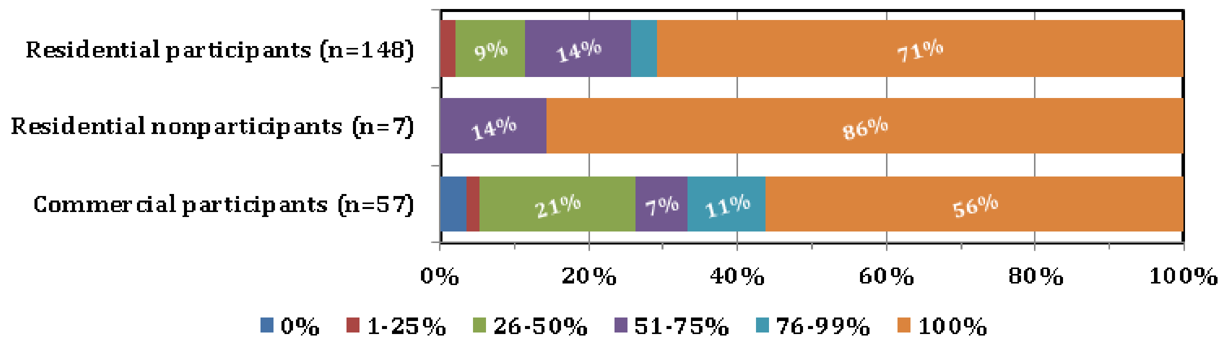

Figure 158: Percent CFLs Still In Use, among Upstream CFL Buy-down Respondents

Among possible reasons for not using all the CFL bulbs purchased at the time of our survey, NWE program participant groups most often “wanted extras on hand” (Table 487). This stocking up supports the higher replacement rates of incandescent bulbs with CFLs reported by NWE program participants compared to nonparticipants.

Table 487: Reason Not Using All CFLs Bought, among Upstream CFL Buy-down Respondents

	It stopped working	Not bright enough	Too bright	Too long to warm up	Didn't like the color	Gave away	Wanted extras on-hand	Other
Residential participants (n=699)	6%	3%	1%	2%	2%	1%	48%	36%
Commercial participants (n=47)	6%	2%	0%	0%	0%	0%	77%	15%

We asked all participants and non-participants whether they had actually bought any CFLs at full price since their purchase of NWE Buy-downs, or other discounted bulbs. At the time of our survey, notable segments of each of four respondent groups had purchased CFLs at full price in the past year (Table 488).

Table 488: Bought Additional CFLs at Full Price, among Upstream CFL Buy-down Respondents

	Percent
Residential participants (n=687)	39%
Residential nonparticipants (n=66)	41%
Commercial participants (n=225)	54%
Commercial nonparticipants (n=149)	40%

To gauge NWE's influence on customer purchases of non-promotional CFLs , respondents were asked to rate the influence of NWE activities on their purchase of full-price CFLs. Rating show that the utility influenced 47% of residential participants (“4” or “5” ratings), but in the other groups at least 40% reported “No influence” (Figure 159).

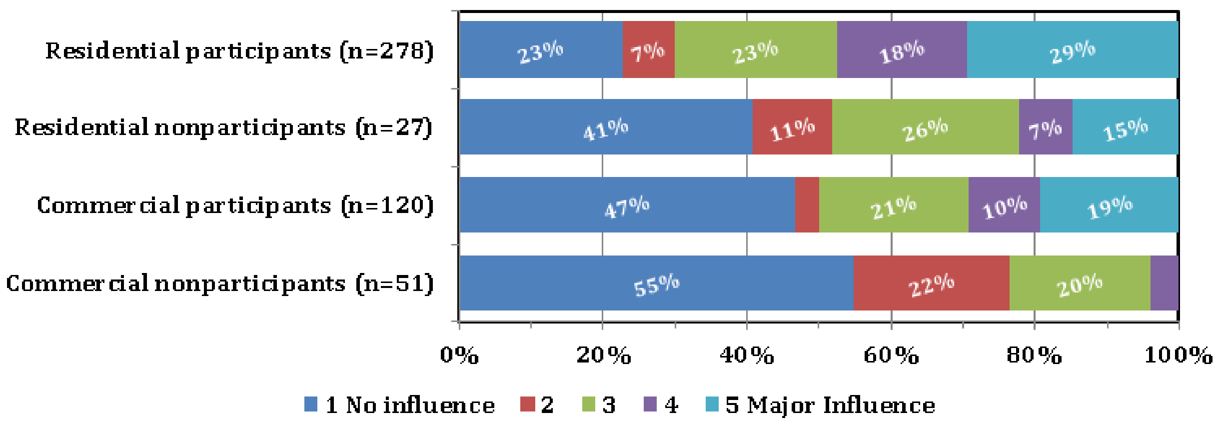

Figure 159: Utility Influence on Buying Full-Price CFLs, among Upstream CFL Buy-down Respondents

Commercial program participants reported on the retail outlets where they purchased Buy-down CFLs. Two national home improvement chains and one national hardware franchise predominated, with 71% of these commercial respondents naming those retailers (Table 489)

Table 489: Stores Where CFLs Were Bought, among Upstream CFL Buy-down Respondents

(Allowed Multiple)	Percent
Lowes, Home Depot, Ace Hardware, Kenyon Noble (n=100)	71%
Costco, Sam's, Wal-Mart (n=100)	42%
Platt Electric (n=100)	14%
Albertsons, CVS (n=100)	2%
Bed, Bath, and Beyond (n=100)	0%
None of those (n=100)	10%

18.3.4. Trade Ally Findings

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

18.3.4.1. In-Store Coupon Retailers

We surveyed 40 retailers at stores that participated in the NWE CFL In-Store Coupon promotions during 2010 and 2011.

We asked these participating CFL retailers why their store decided to participate in the Coupon promotion. Participants rated five potential reasons on a five-point scale (Figure 160). Majorities of these retailers “agreed” or “strongly agreed” that helping customers receive the benefits of CFLs (88%) and/or increasing sales of CFLs as well as overall sales (69% each) were reasons for participating in the promotion.

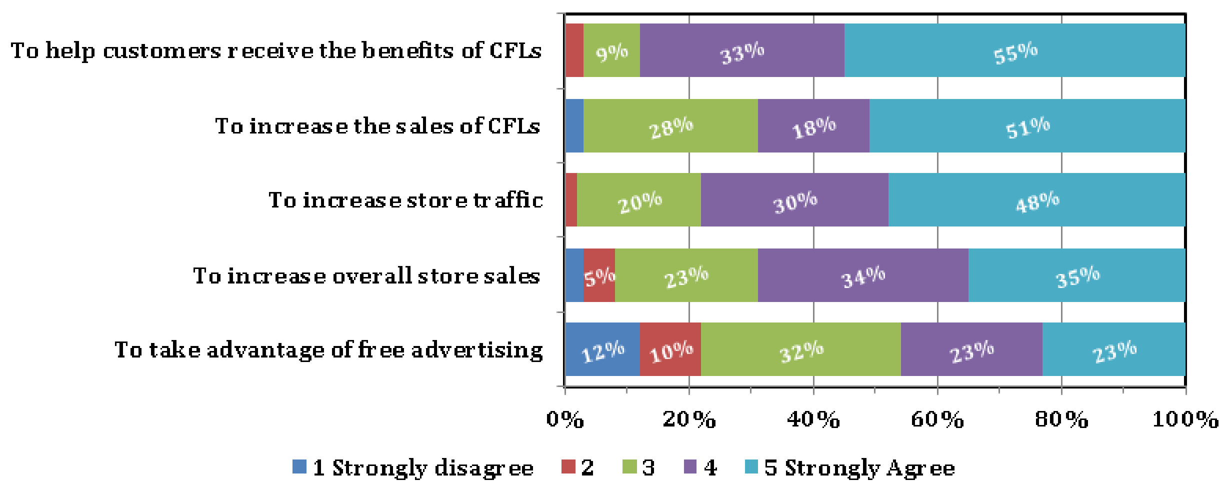

Figure 160: Reasons for Participation, among In-Store Coupon Retailers

Participating retailers reported taking various actions in order to support the CFL promotion. The most common activities included helping customers buy appropriate CFLs (95%), training employees about promotional procedures (93%), and encouraging future sales of Energy Star bulbs (90%; Table 490).

Table 490: Actions Taken, among In-Store Coupon Retailers

Actions	Percent (n=40)
Helping customers buy the CFLs that were right for them	95%
Training employees about promotion procedures	93%
Encouraged customers to buy Energy Star lights in the future	90%
Moved the CFLs to a prominent location	58%
Mentioned the promotion name in advertising	40%
Mentioned the CFLs in advertising	25%

Most (93%) of surveyed retailers reported that participating in the CFL Coupon promotion increased their store's sales of CFLs. Less than half of retailers were able to specify how much their sales increased. Among the 16 retailers who could specify, sales increases ranged from one to ninety percent (Table 491). Most retailers indicated that these estimates were based on impressions, not sales data.

Table 491: Percentage Increase in CFL Sales, among In-Store Coupon Retailers

Increase in Sales Percentage	Percent (n=16)
One to five	19%
Six to ten	25%
Eleven to twenty	44%
Twenty to fifty	
Over fifty	13%

We asked participating CFL Coupon retailers to rate their agreement with six positive statements about possible experiences with the promotion. At least 90% of these retailers agreed with the statements, including that information provided by the program was clear and participation was easy, overall (Figure 161).

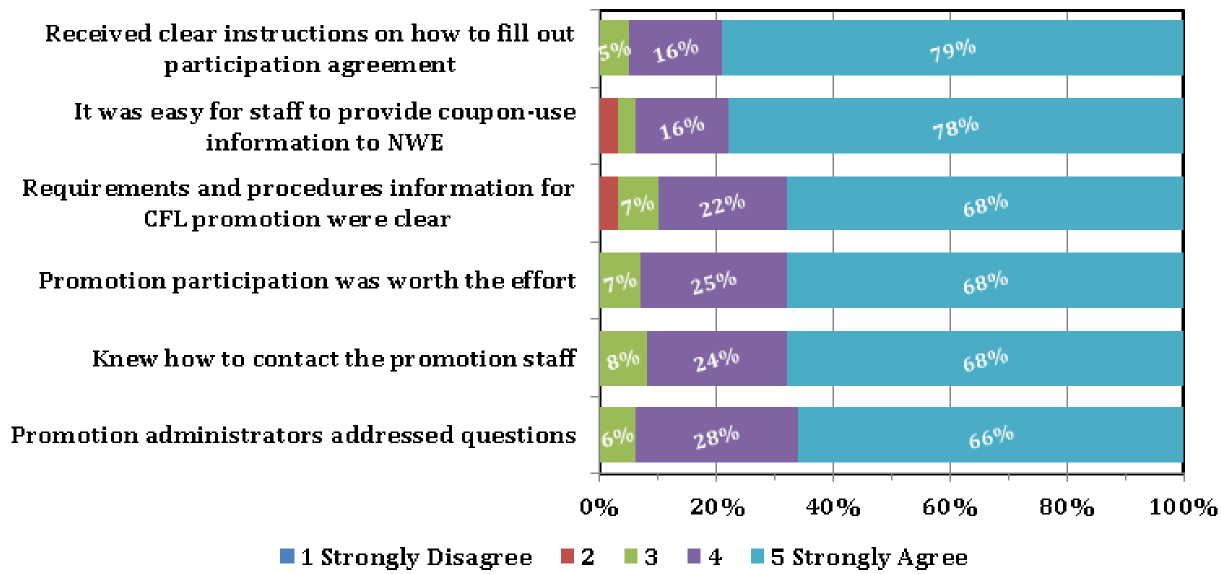

Figure 161: Rating of Program Elements, among In-Store Coupon Retailers

We also asked CFL retailers about their experiences handling the CFLs coupons in-store. Most participating of these retailers indicated that they received enough information about the promotion and that is was easy to process the coupons (Figure 162).

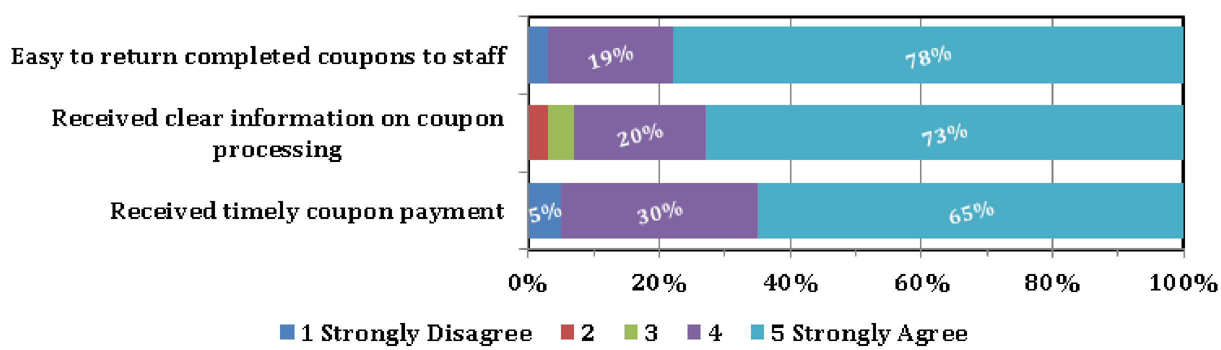

Figure 162: Coupon Handling Experience, among In-Store Coupon Retailers

Participating CFL retailers also reported being satisfied with other elements of the promotion, such as the requirements and procedures and the participation agreement (Figure 163). Most (90%) of CFL retailers surveyed rated the program overall a “4” or “5” on a five-point satisfaction scale.

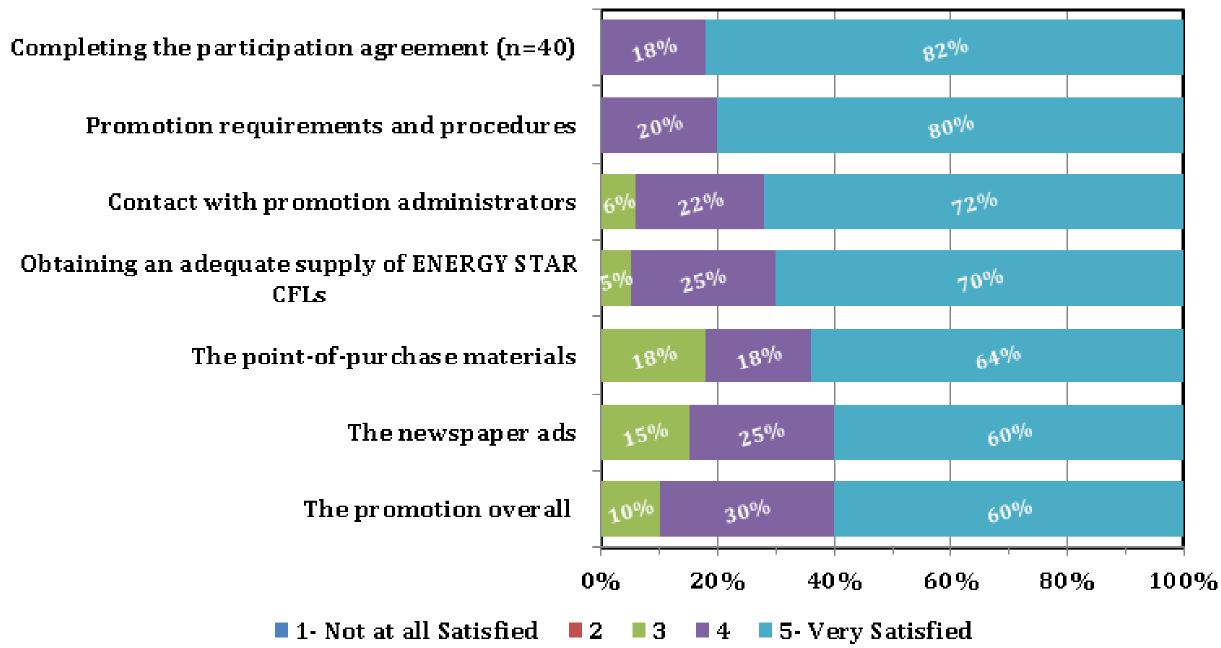

Figure 163: Satisfaction With Program Elements, among In-Store Coupon Retailers

We asked participating CFL retailers for potential program improvement suggestions. Retailers most frequently suggested more in-store signage or displays and more point-of-sale signage (Table 492).

Table 492: Suggested Program Changes, among In-Store Coupon Retailers

Suggestion (multiple responses allowed)	Percent (n=40)
No changes	70%
More in-store signage, displays	8%
More point-of-sale signage	8%
More radio, TV, or newspaper advertising by NWE	7%
Flyers to hand to customers in-store	3%
More lead time between contract and roll out	3%
Faster reimbursement for coupons	3%

Retailers also offered their perspective on which aspects of the program were working well. Slightly fewer than half of CFL retailers indicated that the promotion attracts customers to their stores (Table 493).

Table 493: Successful Program Elements, among In-Store Coupon Retailers

Successful Aspects (multiple responses allowed)	Percent (n=37)
The promotion attracted customers to our store	46%
The promotional materials effectively marketed the program to our customers	41%
The rebate amount was large enough to motivate customers	14%
The promotion enabled our store to sell more bulbs	5%

18.3.4.2. Upstream CFL Buy-down Retailers

We surveyed eighteen CFL retailers who participated in NWE's Upstream CFL Buy-down promotion.

We asked participating Upstream CFL Buy-down retailers why their store decided to participate in the Buy-down promotion. Participants rated five potential reasons on a five-point scale (Figure 164). Almost all (94%) of these retailers "agreed" or "strongly agreed" that helping customers receive the benefits of CFLs was a reason for participating in the promotion.

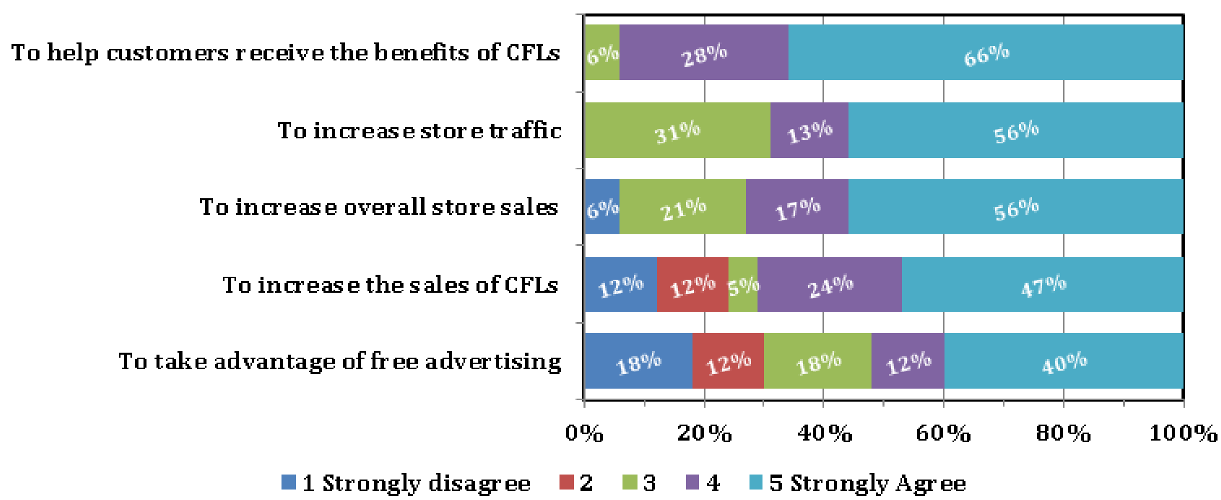

Figure 164: Reasons for Participation, among Upstream CFL Buy-down Retailers

Participating retailers reported taking various actions in order to support the CFL Buy-down promotion. The most common activities included encouraging customers to buy Energy Star lights (89%), helping customers buy appropriate CFLs (83%), and training employees about promotional procedures (67%; Table 494).

Table 494: Actions Taken, among Upstream CFL Buy-down Retailers

Actions	Percent (n=18)
Encouraged customers to buy Energy Star lights in the future	89%
Helping customers buy the CFLs that were right for them	83%
Training employees about promotion procedures	67%
Moved the CFLs to a prominent location	58%
Mentioned the promotion name in advertising	39%
Mentioned the CFLs in advertising	39%

Most (89%) Buy-down retailers reported that participation increased their sales of CFLs. However, fewer than half (44%) of these retailers reported that participating in the CFL promotion increased their store traffic. Less than half of retailers were able to specify how much their sales increased. Among six retailers who could specify, sales increases ranged from one to twenty percent. Most of these retailers indicated that these estimates were based on impressions, not sales data.

We asked participating CFL Buy-down retailers to describe their experiences with seven elements of the promotion. High majorities of retailers were satisfied with the information provided by the program and other elements of their experience (rankings of "4" or "5") (Figure 165).

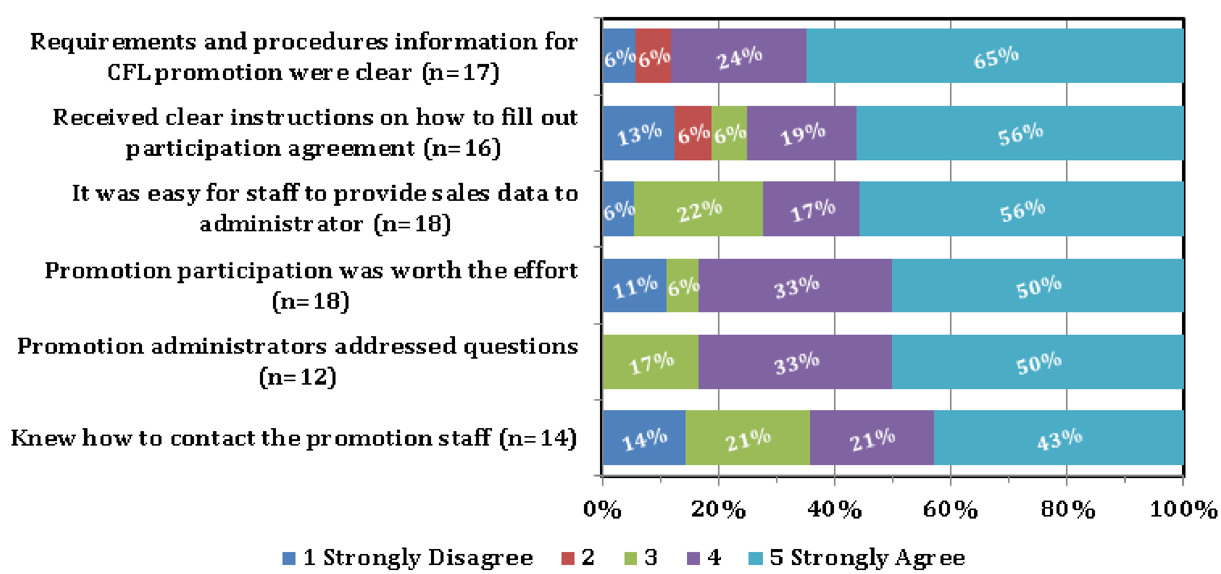

Figure 165: Rating of Program Elements, among Upstream CFL Buy-down Retailers

Participating CFL Buy-down retailers also reported being satisfied with other elements of the promotion, such as the requirements and procedures and the participation agreement (Figure 166). Most (90%) of Buy-down respondents rated the program overall a "4" or "5" on a five point satisfaction scale. All eighteen of the Buy-down retailers indicated that they would participate in the promotion again.

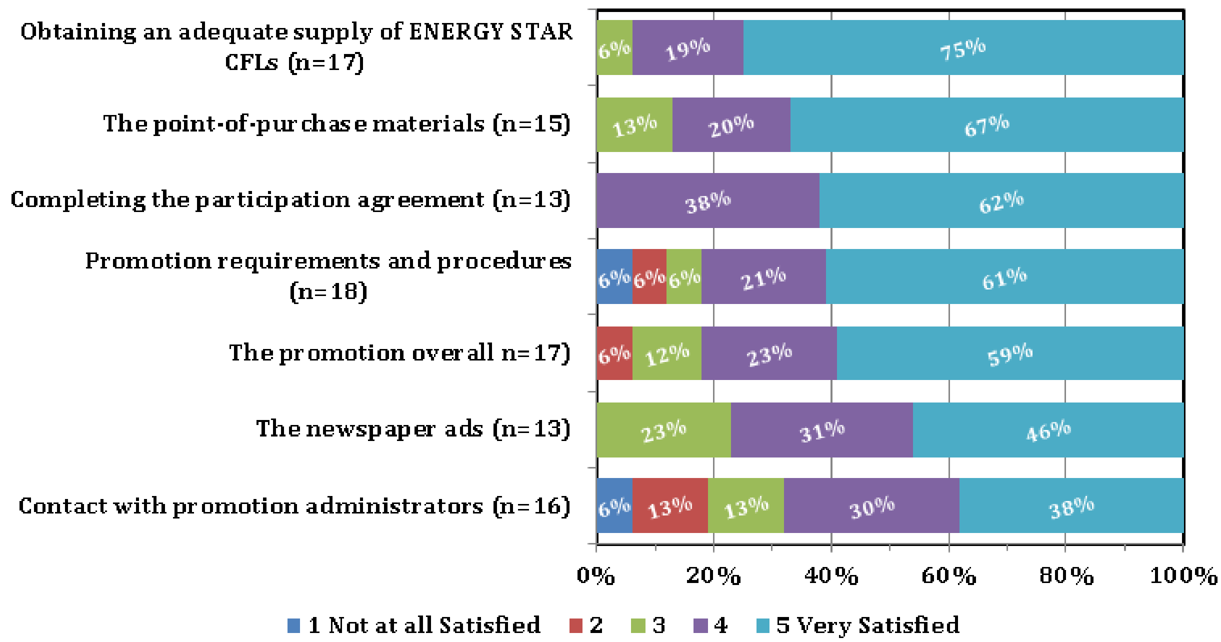

Figure 166: Satisfaction, among Upstream CFL Buy-down Retailers

We asked participating CFL Buy-down retailers for potential program improvement suggestions. These retailers suggested more in-store signage or displays and more point-of-sale signage most frequently (Table 495).

Table 495: Suggested Program Changes, among Upstream CFL Buy-down Retailers

Responses (multiple responses allowed)	Percent (n=18)
No changes	72%
More in-store signage, displays	17%
More point-of-sale signage	11%
More radio, TV, or newspaper advertising by NWE	6%
Better communication with promotion administrators	3%

Retailers also offered their perspective on which aspects of the program were working well. Slightly fewer than half of CFL retailers indicated that the promotion attracts customers to their stores (Table 496).

Table 496: Successful Program Elements, among Upstream CFL Buy-down Retailers

Successful Aspects (multiple responses allowed)	Percent (n=15)
The promotional materials effectively marketed the program to our customers	60%
The promotion attracted customers to our store	40%
The rebate amount was large enough to motivate customers	7%

18.4. Recommendations

18.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Residential hours of use:** Based on the results of the Residential CFL Operating Hours Study performed as part of this evaluation, revise the default assumption for average daily on-time used in the estimation of residential CFL program savings. The current value of 3.7 on-time hours per days should be reduced to 2.0 hours per day.
- **Direct-install hours of use threshold:** Based on the results of the Residential CFL Operating Hours Study performed as part of this evaluation, reconsider the threshold value used as the basis for implementing direct install CFLs during a residential on-site audit. The current threshold value of 3.0 hours per days should be reduced to a lower number of perhaps 1.5-2 hours per day. Since residential customers often cannot estimate hours of use accurately, as an alternative, consider replacing hours per day with room type as the CFL direct install justification criteria. Results from the operating hours study tempered by some customer input could be a better indicator of a worthwhile installation.
- **Satisfactory light levels:** Conduct market research to reassess the Wattage of the CFLs distributed to customers in give-away programs. During the site inspections, we observed that some customers were dissatisfied with the Wattage and resultant lumen output of the bulbs that they received and therefore did not install them or removed them from service.
- **More complete receipts:** We found that the documentation of CFL purchases was incomplete because the bulb Wattages and sometimes the quantity purchased were not included on the store receipts. Consider working with retailers to improve the completeness and legibility of the CFL information included on the receipts.
- **Mark giveaway bulbs:** During the site inspections, it was often difficult to locate the CFLs that were received and installed from give-away programs and through direct installation. Consider marking giveaway and direct install bulbs, perhaps through the use of a stamp or sticker, so they can be more easily identified in the field.
- **More robust hours of usage study:** The Residential CFL Operating Hours Study was limited in that it included only a three-month data collection period. Extrapolation of the on-hours

from the data collection period to an annual value relied upon the results of other studies (outside of Montana) that collected data throughout the year. If NWE would like a more Montana-specific annual hours of use value, consider performing a follow-on study that allows sufficient time for data collection throughout the year. The study could also increase the sample size to provide statistically reliable results for varying building classifications and room types, if this level of resolution is important to the program decision-making process.

- **In-store coupon limits:** The evaluation observed that the tracking database contained CFL counts for the in-store coupon portion of the E+ Residential Lighting program that exceed the coupon limit per participant. Consider expanding data entry quality control procedures to ensure that the proper limits are observed during data entry.
- **Increased marketing:** Consider increasing marketing efforts to increase awareness of the efficiency opportunities that NWE offers. During the site inspections, many customers inquired about getting incentives for efficiency improvements that they were considering. Often they were not aware that they could go to the NWE website to get information regarding the efficiency programs.
- **Customer cost data:** The tracking database for this program does not include customer costs for each record in the savings claim. This lack of complete data for this important evaluation item complicates and increases the cost of the evaluation. Quality control measures should be instituted to ensure this information is included for all tracking records.

18.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices; including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Residential Lighting participants reported positive experiences overall. However, a notable minority were dissatisfied with the quality of the CFLs they received, particularly through direct install. Respondents also voiced concern about a lack of safe disposal options. All customers (both residential and commercial, and those that participated in NWE's incentive and audit programs and those that did not) may have purchased the reduced-price buy-down CFLs. Majorities of all buy-down participant respondent types reported that they keep a stock of CFLs in their homes. A notable minority of the buy-down-only participants (a subset of the nonparticipant sample) voiced concerns about the quality and safety of CFLs, echoing comments of the incentive and audit participants that had CFLs through the various distribution channels. Residential buy-down-only participants lag behind others in terms of comfort with CFL labeling and willingness to replace burnt out bulbs with CFLs, suggesting that continuing education about the safety and increasing quality of CFLs will continue to be valuable for NWE customers.

Surveyed CFL retailers reported positive program experiences. Upstream buy-down retailers were less clear, overall, about procedures for participation than coupon retailers, and a third of upstream buy-down retailers reported that they had not conducted any training with their employees about the promotion.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **Expand CFL information:** Continue current practice of providing NWE's guidelines. Remember the Four Ls of CFLs to participants. Consider adding to the guideline a reference to the fact sheet on CFL disposal available on NWE's website. Consider ways to increase dissemination of the guidelines, such as more prominent website access to the guideline and availability at buy-down retailers. Provide materials for retail employees, so they are equipped to answer customer questions.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.

- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

19. E+ Residential New Electric Rebate

19.1. Program Description

This is a prescriptive rebate program that began in April 2011. The program is funded through DSM supply rates. Rebates are available on a whole-house basis for manufactured homes meeting the Northwest (NW) Energy Star certification standard and for specific measures within the newly constructed electrically heated site-built homes.

Electrically-heated manufactured homes sited where natural gas is available are not eligible for the Northwest (NW) Energy Star manufactured home (Electric Heat) incentive.

NWE contracts with an implementation contractor for rebate program administration and marketing.

19.1.1. Energy Savings and Measures

Below is an inclusive list of program measures.

Table 497: Measures Offered by E+ Residential New Electric Rebate

Equipment/Measure Description	Rebate Type	Qualifier
Northwest Energy Star Manufactured Home (Electric Heat) Incentive	$/Home	Northwest Energy Star certified non-foundation home where gas is not available
Air Source Heat Pump (heating/cooling)	$/Ton	SEER ≥14, HSPF ≥8.5, and Energy Star rated
Air-to-Air Heat Exchanger[1]	$/Home	-
R-11 Steel Door Foam Core[1]	$/Door	2 exterior door minimum, NFRC label required
R-5 Composite Door Foam Core[1]	$/Door	2 exterior door minimum, NFRC label required
Ductless Mini Split Heat Pump[1]	$/Ton	SEER ≥ 15 SEER, HSPF ≥ 9.0 HSPF
Light Colored Roofing Shingles	$/Home	Asphalt shingles, Energy Star rated, home must have central air conditioning
Pool/Hot Tub Pump Timer	$/Unit	Must reduce operating hours ≥ 67%
Programmable Thermostat	$/Sq. Ft.	For homes heated exclusively with electricity
Programmable Thermostat	$/Sq. Ft.	For homes with central air cooling
Programmable Thermostat	$/Sq. Ft.	For homes heated exclusively with electricity and that have central air cooling
High Efficiency Clothes Dryer with Moisture Sensor	$/Unit	Must replace electric clothes dryer w/o a moisture sensor. Must install an electric clothes dryer with moisture sensor located in the drum.
Energy Star rated Stand Alone Freezer	$/Unit	Energy Star Rating
Energy Star rated Refrigerator/Freezer	$/Unit	Energy Star Rating and ≥ 7.75 cubic feet
Faucet Aerator (≤ 0.5 GPM)[2]	$/Unit	Minimum of 3 faucets; Water Sense labeled only and ≤ 0.5 GPM

Equipment/Measure Description	Rebate Type	Qualifier
Faucet Aerator (≤ 1.5 GPM)[2]	$/Unit	Minimum of 3 faucets; Water Sense labeled only and ≤ 1.5 GPM
Low Flow Showerhead (≤ 2.0 GPM)[2]	$/Unit	Water Sense labeled only
Water Heater Thermostat Setback[2]	$/Unit	Thermostat ≤ 120 degrees F
Heat Pump Ground or Water Source (Desuperheater)[2]	$/Unit	DHW water heating heat recovery unit with new ground source heat pump

[1] Home must be heated exclusively with electricity.

[2] Domestic water must be heated with electricity.

Measure savings are UES values from a third party electric resource assessment study (Nexant, Cadmus 2010) based on average annual savings specifically for NWE Montana customers. Each UES must pass a cost-to-benefit test, based on current electric avoided costs, the TRC test.

19.1.2. History

The program began late in the evaluation cycle, and there were no changes.

19.1.3. Marketing

A broad mix of marketing activities is employed to promote residential new construction programs to the design and construction industries, homeowners, and other interested parties.

Marketing activities for 2011 include:

- Builder recruitment/training
- Verifier recruitment/training
- Preferred Contractor annual training sessions
- NWE customer service personnel training
- NWE sponsored public informational workshops directed at customers who may be purchasing new homes
- Design and construction industry conferences and tradeshows
- Code training for the builders and the design community
- Event and program advertising through media news releases, email and website promotions, and spot advertising in newspapers and home publications
- Homebuilder associations - outreach, training, and publication articles
- Parade of Homes publications and web site featuring Northwest Energy Star certified homes and Energy Star certified builders

NWE marketing activities are supported by NEEA, program staff, program contractor, and utility personnel

19.1.4. Program Steps

Customers must consult the program guidelines and application form, available on NWE's website and through contract program staff, to determine the eligibility of measures for which they wish to apply. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers may immediately solicit bids from contractors or do the work themselves. Customers' rebate submittal packages include a completed and signed application form, their contractor's invoice or materials receipts if self-installed, and a recent NWE bill for the residence where the installation occurred.

19.2. Impact Evaluation

19.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

19.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings (UES) as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the two measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate UES method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and producing energy savings. We collected data as necessary to support a re-estimation of energy savings, using the UES method that resulted from the UES review and data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

19.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

19.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

19.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

19.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

19.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

19.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of five sampled cases for this program across the 2010–2011 program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

UES review

We reviewed the two UES measures installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. We made changes to both UES values. In one case we used the existing UES values, but applied them on a building type basis.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 498: Summary of UES Adjustments for E+ Residential New Electric Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Programmable T-Stat, heating, Electric room heat	Residential, Single-family	0.383	kWh per Sq. Ft.	0.477	kWh per Sq. Ft.
Programmable T-Stat, heating, electric furnace	Residential, Single-family	0.383	kWh per Sq. Ft.	0.477	kWh per Sq. Ft.
Programmable T-Stat, heating, heat pump	Residential, Single-family	0.383	kWh per Sq. Ft.	0.318	kWh per Sq. Ft.
Programmable T-Stat, heating, Electric room heat	Residential, Multi-family	0.383	kWh per Sq. Ft.	0.366	kWh per Sq. Ft.
Programmable T-Stat, heating, electric furnace	Residential, Multi-family	0.383	kWh per Sq. Ft.	0.366	kWh per Sq. Ft.
Programmable T-Stat,	Residential,	0.383	kWh per Sq. Ft.	0.277	kWh per Sq. Ft.

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
heating, heat pump	Multi-family				
Programmable T-Stat, heating, All	Residential, Manufactured home	0.383	kWh per Sq. Ft.	0.956	kWh per Sq. Ft.
Programmable T-Stat, cooling, Packaged/rooftop	Residential, Single-family	0.032	kWh per Sq. Ft.	0.028	kWh per Sq. Ft.
Programmable T-Stat, cooling, Packaged/rooftop	Residential, Multi-family	0.032	kWh per Sq. Ft.	0.063	kWh per Sq. Ft.
Programmable T-Stat, cooling, Packaged/rooftop	Residential, Manufactured home	0.032	kWh per Sq. Ft.	0.049	kWh per Sq. Ft.
Energy Star Manufactured Home, Resistance Heat	Residential, Manufactured home	6893	kWh per unit	8057	kWh per unit
Energy Star Manufactured Home, Heat Pump	Residential, Manufactured home	6893	kWh per unit	5642	kWh per unit

Programmable Thermostat. Savings were estimated in the 2010 electric potential assessment (Nexant, Cadmus 2010) as 6.8% of space heating and cooling UEC. Separate measures were provided by NWE for heating, cooling, or both. Cooling savings are around 5% of heating savings. The measure for combined heating and cooling appears too low – it should be greater than the measure for just heating.

We reviewed the literature for this measure, and found three state TRMs (MA, NY, OH) which cite one report (RLW Analytics 2007) as support for 6.8% savings. We accepted the existing NWE UES values, but applied them on a building type and heating system type basis for the evaluation. Savings for the measure for combined heating and cooling we estimated as the sum of the two measures.

Energy Star Manufactured Home. We could not find a source for the program unit savings estimate. We reviewed the literature and chose to use the RTF estimate of savings for this measure (Regional Technical Forum 2011), since it is based on calibrated regional simulations. We applied the savings on a heating system type basis – the UES increased for resistance heat, and decreased for heat pump systems.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which we contacted, recruited, scheduled, and visited on-site volunteers. For the E+ Residential New Electric Rebate program, we successfully visited four sites. There were six potential site visits; of these six, one could not be reached by phone, and one was subsequently not available when it came to schedule the visit.

Table 499: Site Recruitment Disposition for E+ Residential New Electric Rebate

	Total n	%
Recruitment		
Telephone Lab	0	
Special Effort		
Attempts	6	
No Reply	1	17%
Refused	0	0%
Recruited	5	83%
Total Recruited	5	
Onsite		
Refused	1	20%
Not Needed	0	0%
Total Completed	4	80%

Site Inspections

For the 2010–2011 program years we performed four site inspections which considered two measures: Energy Star Manufactured Home (three sites) and Thermostat Control (one site). The Energy Star Manufactured Home measure includes insulation, digital thermostats, high efficiency windows, high efficiency furnaces, high efficiency water heaters, and Energy Star appliances.

At all four of the sites we visited we found the Energy Star Manufactured Home measures and the Thermostat Control measures installed and operational as documented by NWE.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit. For all four sites, the evaluation site-specific savings are greater than the claimed savings. The increase in savings is due to changes in the evaluation UES (see UES Review above).

For the Energy Star Manufactured Home measure, the evaluation UES is 1.17 times the claimed UES; therefore the evaluation savings is 1.17 times higher than the claimed savings.

For the Thermostat Control measure, single-family residence with space heating and cooling the evaluation UES, 0.505 kWh/sq-ft, (0.477 for heating + 0.028 for cooling) is 1.95 times the claimed UES (0.259 kW/sq-ft) ; therefore the evaluation savings is 1.95 times higher than the claimed savings.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 500: File Review and Site Visit Adjustment to Savings for E+ Residential New Electric Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Residential New Electric Rebate	kWh	36,210	36,210	43,797	43,797	1.00	1.21	1.21

19.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 501: Savings Adjustments by Calendar Year for E+ Residential New Electric Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Residential New Electric Rebate	kWh	2010	6,893	1.21	-	-	1.21	8,337	1
	E+ Residential New Electric Rebate	kWh	2011	29,317	1.21	-	-	1.21	35,459	4
	E+ Residential New Electric Rebate	kWh	All Years	36,210	1.21	-	-	1.21	43,797	5
Electric										
	E+ Residential New Electric Rebate	kWh	All Years	36,210	1.21	-	-	1.21	43,797	5

19.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 502: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Residential New Electric Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Residential New Electric Rebate	kWh	2010	8,337	9.44	-0.00	7.03	10.39
	E+ Residential New Electric Rebate	kWh	2011	35,459	0.82	0.78	0.72	0.90
	E+ Residential New Electric Rebate	kWh	All Years	43,797	0.99	0.96	0.87	1.09
Electric								
	E+ Residential New Electric Rebate	kWh	All Years	43,797	0.99	0.96	0.87	1.09

19.3. Process Evaluation

19.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with two participants and 50 trade allies. Surveyed trade allies include those who reported offering HVAC products and services to residential end-users.

19.3.2. Implementation Findings

19.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, “program staff” or “staff”) to implement this program.

To seek a rebate, customers may use program guidelines and application forms available on NWE’s website, which also lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor’s invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application.

The customer’s application must include a current NWE bill for the building where the installation occurred. Rebate applications for new manufactured homes must include a copy of the homes’ NorthWest Energy Star certificate.

NWE has linked its master customer lists to the implementation contractor’s databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor’s accounting department for processing. The implementation contractor’s program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

19.3.2.2. Best Practices Assessment

Table 503 through Table 506 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 503: Program Planning and Design Best Practices for E+ Residential New Electric Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies

Practice	NWE Assessment
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 504: Program Management and Administrative Best Practices for E+ Residential New Electric Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority

Practice	NWE Assessment
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain “program memory” in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE’s program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 505: Marketing and Outreach Best Practices for E+ Residential New Electric Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program’s website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials

Practice	NWE Assessment
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 506: Program Quality Control Best Practices for E+ Residential New Electric Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

19.3.3. Participant Findings

We conducted surveys with two of the seven participants of the E+ Residential New Electric Rebate program. This section summarizes these responses.

Both respondents reported that their contractors played a key role in influencing their program participation. Neither respondent reported having any initial concerns about participating. They reported positive program experiences. They gave high ratings the program information provided (including information about what qualifies for a rebate, how to apply for rebates, expected savings, and following up with program staff). They both “completely agreed” that “applying for a rebate was easy.” Both respondents also agreed that having an environmentally friendly home was even more important than cost. Finally, these two respondents reported not wanting any additional information about efficiency programs or activities from NWE.

19.3.4. Trade Ally Findings

We surveyed 50 NWE equipment trade allies who installed equipment that qualified for rebates through NWE residential programs.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

19.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from noticing a utility publication or advertisement (76%), by directly contacting the utility, or from a utility representative at a meeting or event (Table 507).

Table 507: Means of General Program Awareness, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=50)	76%
Directly contacted utility (n=50)	70%
Utility representative appearance (n=50)	68%
Utility website (n=50)	46%
Word of mouth (n=50)	44%
Associated vendors and contractors (n=50)	38%

Trade ally respondents most frequently learned about specific program requirements from a utility representative at a meeting or event (53%), or by contacting NWE directly (42%; Table 508).

Table 508: Specific Requirements Awareness, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=50)	52%
Directly contacted utility (n=50)	42%
Utility publication (n=50)	28%
Associated vendors and contractors (n=50)	10%
Utility website (n=50)	6%

A majority (66%) of surveyed trade allies had visited NWE's website. Among those website users, approximately three-quarters (76%) said they used the site to find information related to rebates or audits, and smaller majorities had printed rebate forms or searched for NWE contact information (Table 509).

Table 509: Website Use, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebate or audit information (n=33)	76%
NWE contact information (n=33)	64%
Print rebate forms (n=33)	55%

(Allowed Multiple)	Percent
Educational events information (n=33)	39%
Money saving ideas (n=33)	36%
How-to videos (n=33)	9%

Most (62%) of the website users “agreed” or “completely agreed” that the web information was easy to find and helpful, however 13% gave low ratings (Figure 167).

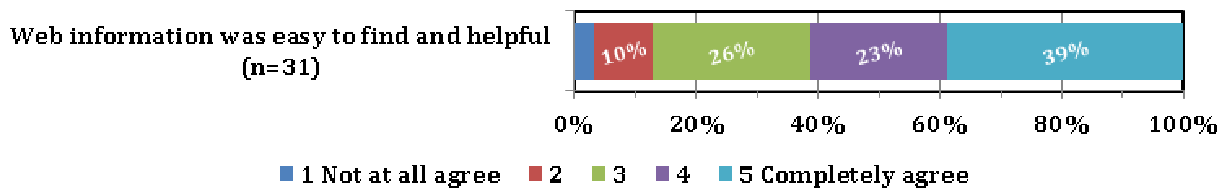

Figure 167: Website Effectiveness, among E+ Residential New Electric Rebate Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority (62%) said they had contacted the utility to learn how the rebate program worked (Table 510).

Table 510: Reasons for Contacting NWE, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=50)	62%
To resolve a problem (n=50)	44%
Investigate status of an application (n=50)	36%
Investigate status of a rebate payment (n=50)	30%
None of these (n=50)	24%
Other (n=50)	16%

About half of surveyed trade allies would like to receive further information on energy savings programs and opportunities, or to attend additional workshops or events (Table 511).

Table 511: Further Information Desired, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=50)	60%
Energy efficiency programs (n=50)	58%
Energy saving educational opportunities (n=50)	54%
None (n=50)	30%

Those desiring further information preferred to receive information by mail (38%) and other methods such as email (30%) or trainings and workshops (26%; Table 512).

Table 512: Information Delivery Preference, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
US mail (n=50)	38%
Email (n=50)	30%
Trainings, workshops or seminars (n=50)	28%
Community event (n=50)	16%
Webinar (n=50)	16%
Phone (n=50)	8%

19.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

We asked residential trade allies if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if instead they kept unrated/standard items in stock and *ordered* the high-efficiency items as needed. Just over half (54%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 513 below. Most (84%) kept a range of equipment that varied in quality and prices to offer customers, and 97% agreed that the “Better” and “Best” equipment is usually more energy-efficient than the “Good.” Over half (63%) reported they suggest the “Best” equipment to customers first.

Table 513: Equipment Sales Approach, among E+ Residential New Electric Rebate Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option to buy (n=49)	84%
Agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' option (n=39)	97%
Best presented first (n=40)	63%
Better presented first (n=40)	23%
Present all options simultaneously (n=40)	13%
Good presented first (n=40)	3%

The figure below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. Less than half (42%) of these trade allies reported that over three-quarters of their stock was high-efficiency equipment. A third of these respondents said that no more than 25% of their regular stock was comprised of high-efficiency equipment. Those trade allies who reported that they stocked efficient equipment also estimated the share of sales made in the past two years that were energy-efficient items. A majority (63%) reported that more than three-fourths of the equipment they sold in the past two years as high-efficiency (Figure 168).

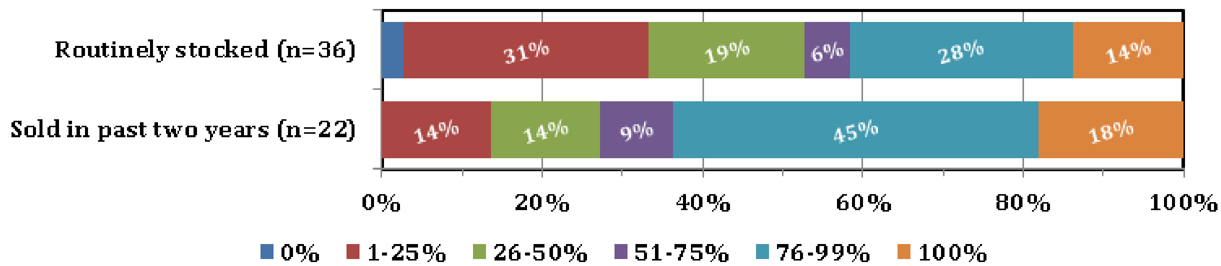

Figure 168: High Efficiency Equipment Share, among E+ Residential New Electric Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment that qualifies for rebates. The most commonly mentioned benefits, by 88% of these trade allies, were the rebate itself and the lower operation costs of the equipment (Table 514).

Table 514: Customer Benefits Mentioned, among E+ Residential New Electric Rebate Trade Allies

Benefit	Percent
Lower operation costs (n=50)	88%
Utility rebate (n=50)	88%
High-quality of product (n=50)	70%
Lower maintenance costs (n=50)	54%

About 20% of these residential trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these ten respondents mentioned cost half the time (Table 515).

Table 515: Reasons for Discouraging Efficient Equipment Purchase, among E+ Residential New Electric Rebate Trade Allies

(Allowed Multiple)	Percent
Cost (n=10)	50%
Installations are too complex (n=10)	20%
Less reliable than standard items (n=10)	20%
Other (n=10)	20%

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. About one-third (35%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. Among the reasons reported in the following table, no single reason stands out as a barrier to rebate applications (Table 516).

Table 516: Circumstances When Rebate Foregone, among E+ Residential New Electric Rebate Trade Allies

	Percent
Trade ally unaware of rebate/program (n=14)	21%
Customer did not apply (n=14)	21%
Customer ineligible (n=14)	14%
Rebate too small (n=14)	14%
Applying takes too long (n=14)	7%
Unspecified or unclear (n=14)	21%

19.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (64%) of trade ally respondents said they had trained staff to talk to customers about energy efficient choices. In fact, 46% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 517).

Table 517: Rebate Initiator, among E+ Residential New Electric Rebate Trade Allies

	Percent (n=50)
Almost always trade ally initiated	46%
Mostly trade ally initiated	36%
About half trade ally and half customer	10%
Almost always customer initiated	8%

When a customer is considering an equipment purchase, 94% of these respondents suggest equipment that qualifies for the rebate program, rather than waiting for the customer to show interest in qualifying for rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Most surveyed trade allies (86%) indicated that nothing about the program raised issues or concerns about their customers' participation. Among the seven respondents who had initial concerns, the reasons given showed no pattern. However, problems with the rebate were concerns for two respondents.

A minority (18%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" were contacting customers with varied frequency, some as often as daily and some yearly (Table 518).

Table 518: Customer Contact Frequency, among E+ Residential New Electric Rebate Trade Allies

	Percent (n=9)
Once a year	33%
Every day	33%
Once a month	11%
2 times a year	11%
Varies by customer	11%

A majority of these trade ally respondents rated four aspects of program information they received from NWE about rebate processes as "clear" or "very clear." Slightly lower ratings were given for two of the four: reading and understanding program information, and information about which items qualify for rebate (Figure 169).

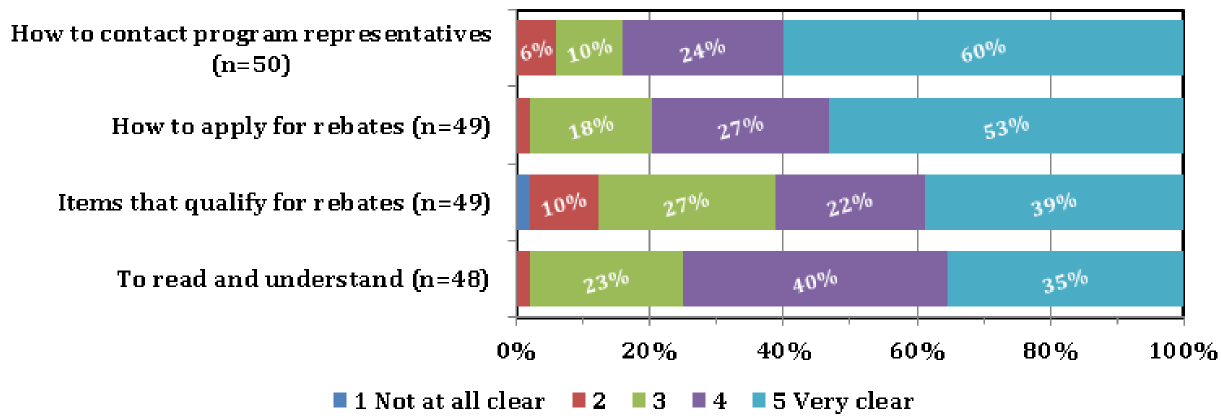

Figure 169: Clarity of Program Information, among E+ Residential New Electric Rebate Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (62%) reported working with the customer in a joint effort to prepare the applications. Another 26% reported doing all or most of the application themselves.

Table 519: Rebate Application Preparer, among E+ Residential New Electric Rebate Trade Allies

	Percent (n=50)
Typically both trade ally and customer - about half and half effort	62%
Typically the trade ally prepares all or most of the application	26%
Typically the customer prepares all or most of the application	10%
Depends on the rebate	2%

About three-quarters (72%) of the 43 trade ally respondents involved with completing the rebate application “agreed” or “completely agreed” that the process was simple to follow (Figure 170).

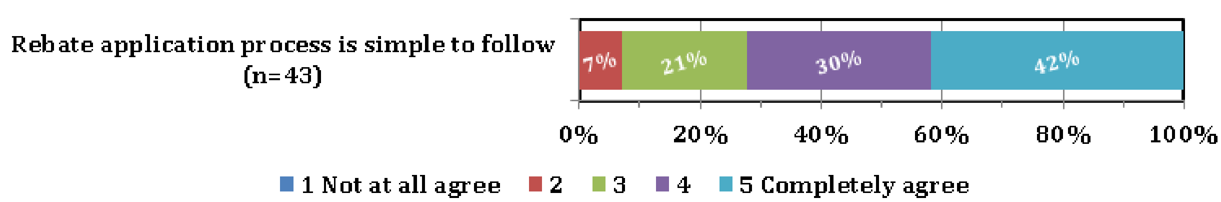

Figure 170: Rebate Application Process, among E+ Residential New Electric Rebate Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes. At least 61% of respondents “agreed” or “completely agreed” that

NWE provided updates in a timely manner, staying current takes little staff time, and that customers benefit from program additions (Figure 171).

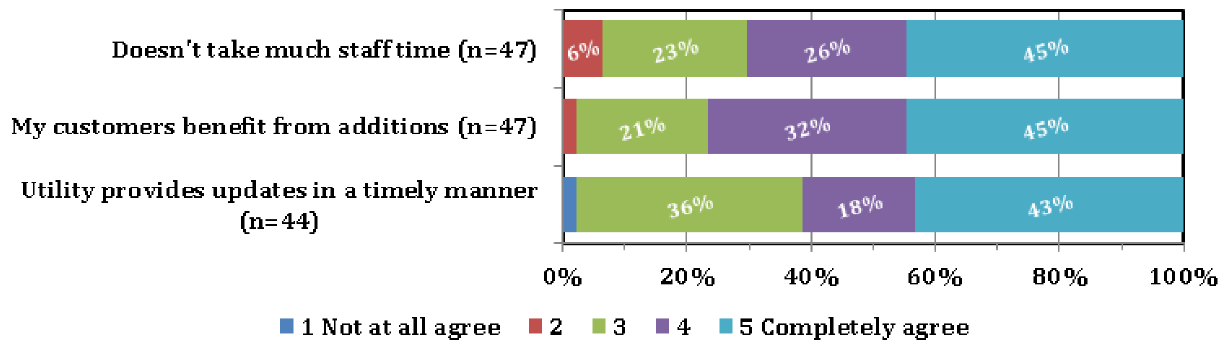

Figure 171: Experience With Program Changes, among E+ Residential New Electric Rebate Trade Allies

Most (83%) of the 46 residential allies surveyed reported that they were on NWE's Preferred Contractors list. Almost all of the preferred contractors (97%) "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (84%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." However, just under half (48%) agreed or completely agreed that being a preferred contractor had "helped grow our business" (Figure 172).

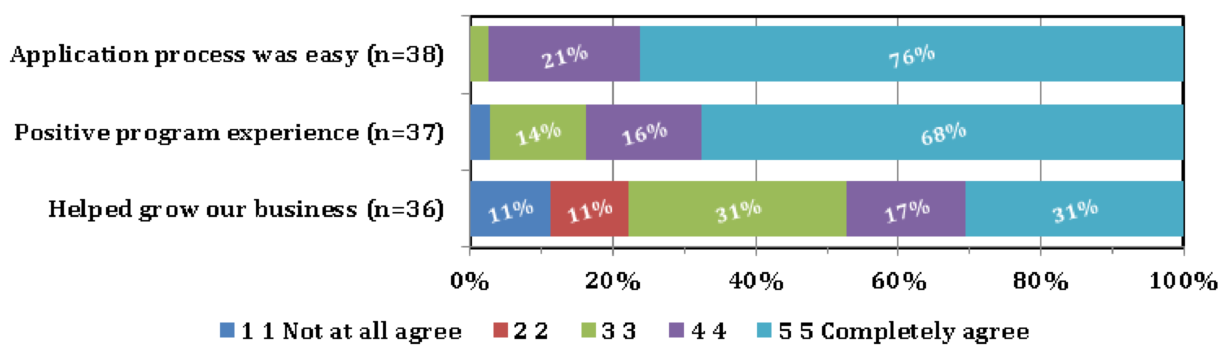

Figure 172: Experience As Preferred Contractor, among E+ Residential New Electric Rebate Trade Allies

We asked the eight trade allies who gave a rating of "1" or "2" on the five-point agreement scale to explain their low ratings. Their answers indicated they did not think being on the preferred list was a reason customers contacted them, and that there is little outreach coordination with NorthWestern.

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. The most common suggestion, made by 40%, was an expanded range of HVAC systems (Table 520). LED lighting and heat pumps were suggested by 20%. These trade

allies indicated they suggested such items primarily because they were "more efficient" (Table 521).

Table 520: High Efficiency Equipment Suggested, among E+ Residential New Electric Rebate Trade Allies

	Percent (n=15)
Other heating systems	40%
LED lighting	20%
Heat pumps	20%
On demand water heaters	13%
Other	7%

Table 521: Reasons Equipment Should Be Added, among E+ Residential New Electric Rebate Trade Allies

	Percent (n=14)
It's more efficient	50%
Cost	14%
Customers request them	14%
Where industry is going	7%
Other	14%

19.3.4.4. Firmographics

A few trade allies (18%) served customers in more than 20 Montana locations. More than half (60%) of these respondents reported serving five or fewer locations.

Table 522: Number of Montana Locations, among E+ Residential New Electric Rebate Trade Allies

	Percent (n=50)
1 location	36%
2 to 5 locations	24%
6 to 10 locations	12%
11 to 20 locations	10%
21 to 50 locations	4%
Over 50 locations	14%

Trade allies reported on the maximum number of miles they would travel to serve clients. About a quarter (24%) would travel less than 100 miles, while 14% would travel more than 400 miles. The largest portion (46%) would travel between 101 and 200 miles to serve a client (Figure 173).

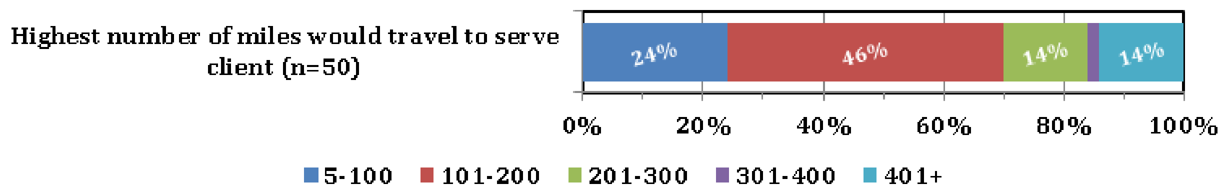

Figure 173: Maximum Miles, among E+ Residential New Electric Rebate Trade Allies

19.4. Recommendations

19.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **New construction program changes:** New construction programs in general have had few participants in recent years. Consider increasing marketing efforts to increase participation. Also consider combining gas and electric programs into a single new construction program to reduce administrative costs.
- **Customer cost data:** The tracking database for this program does not include customer costs for each record in the savings claim. This lack of complete data for this important evaluation item complicates and increases the cost of the evaluation. Quality control measures should be instituted to ensure this information is included for all tracking records.
- **Evaluated values:** Update UES values for the Energy Star manufactured homes and thermostats measures to the evaluation values, which incorporate the findings from recent research.

19.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Two E+ Residential New Electric participants agreed to be surveyed. Both respondents reported that their contractors played a key role in influencing their program participation; neither wanted additional efficiency information from NWE. They reported positive program experiences, giving high ratings to ease of program participation and to the program information provided (including information about what qualifies for a rebate, how to apply for rebates, expected savings, and following up with program staff).

Residential trade allies reported positive program experiences, with no major concerns or suggestions. Many are also interested in receiving more efficiency information: nearly two-thirds of trade allies reported interest in efficiency workshops or other events. Just under two-thirds reported that they trained their staff to talk to clients about energy efficiency. Although two-thirds of trade allies have used the website, just one tenth report that they get information about program requirements from the website.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.

- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

20. E+ Residential New Gas Rebate

20.1. Program Description

This is a prescriptive rebate program that began in January 2009. The program is funded through DSM. Rebates are available on a whole-house basis for manufactured homes meeting the Northwest Energy Star certification standard and for specific measures within newly constructed natural gas heated site-built homes.

NWE contracts with KEMA for rebate program administration and marketing.

20.1.1. Energy Savings and Measures

Below is an inclusive list of program measures.

Table 523: Measures Offered by E+ Residential New Gas Rebate

Equipment/Measure Description	Rebate Type	Qualifier	End Date
Northwest Energy Star Manufactured Home (Gas) Incentive	$/Ft²	Northwest Energy Star certified non-foundation home	
Northwest Energy Star Manufactured Home (Electric Heat)	$/Unit	Northwest Energy Star certified non-foundation home where gas is not available	3/31/2011
High Efficiency Gas Condensing Boiler	$/Unit	AFUE ≥ 90%, rather than a standard AFUE ≤ 82% boiler	
High Efficiency Gas Condensing Furnace AFUE ≥ 90%	$/Unit	AFUE ≥ 90% , rather than a standard ≥AFUE 80% furnace	
Gas Boiler Controls	$/Unit	Heating water temperature reset based on outside air temperature	
Gas-Fired Tankless Water Heater	$/Unit	Rather than code minimum storage water heater EF ≥ 0.594	6/1/2011

Measure savings are UES values from third party electric resource assessment studies (KEMA 2003) (KEMA 2008 (b)) based on average annual savings specifically for NWE Montana customers. Each UES must pass a cost-to-benefit test, based on current electric avoided costs, the TRC test.

20.1.2. History

The program began late in the evaluation cycle, there was one change, tankless water heaters were removed from the program in June 2011.

20.1.3. Marketing

A broad mix of marketing activities is employed to promote residential new construction programs to the design and construction industries, homeowners, and other interested parties.

Marketing activities include:

- Builder recruitment/training
- Verifier recruitment/training
- Preferred Contractor annual training sessions
- NWE customer service personnel training
- NWE sponsored public informational workshops directed at customers who may be purchasing new homes
- Design and construction industry conferences and tradeshows
- Code training for the builders and the design community
- Event and program advertising through media news releases, email promotions, and spot advertising in newspapers and home publications
- Homebuilder associations - outreach, training, and publication articles
- Parade of Homes publications and web site featuring Northwest Energy Star certified homes and Energy Star certified builders

NWE marketing activities are supported by KEMA, NEEA, and utility personnel. The mix of marketing activities varies from year to year to match program needs and as other opportunities in the community present themselves.

20.1.4. Program Steps

Customers must consult the program guidelines and application form, available on NWE's website and through KEMA or Preferred Contractors, to determine the eligibility of measures for which they wish to apply. NWE provides assistance through a customer help line. NWE pre-approval is not required. Customers may immediately solicit bids from contractors or do the work themselves. Customers' rebate submittal packages include a completed and signed application form, their contractor's invoice or materials receipts if self-installed, and a recent NWE bill for the residence where the installation occurred.

All contractor invoices must provide considerable detail on the installation as noted on the application form. Inspections occur on a random basis prior to payment approval. Customers receive their rebate checks in four to six weeks.

20.2. Impact Evaluation

20.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (dkt) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (dkt) savings and perform the economic analysis.

20.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (dkt). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the six measures included in our sample. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods (dkt) that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate unit energy savings method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and produced energy savings. We collected data as necessary to support a re-estimation of energy (dkt) savings, using the UES method that resulted from the UES review, discussed above. Site data collection included installation verification and the collection of data necessary to support an estimate of the inputs to the UES method. We calculated evaluation energy savings (dkt) by applying the final UES method to the data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

20.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

20.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

20.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

20.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

20.2.2. Energy and Demand Impacts

We estimated gross and net savings (dkt) for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

20.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 55 sampled cases for this program across the three program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

UES Review

We reviewed the six UES measures installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. For two of these measures, we determined that the NWE methods were reasonable and made no changes. In two other cases we applied UES values on a building type basis. For the remaining measures, we determined that changes to the UES methods were appropriate.

The results from our review are shown in the table below. For each measure the table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for each measure in the table.

Table 524: Summary of UES Adjustments for E+ Residential New Gas Rebate

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Boiler Controls	All	9.474	dkt per unit	9.474	dkt per unit
High Efficiency Condensing Furnace	Residential, Single-family	6.682	dkt per unit	6.497	dkt per unit
High Efficiency Condensing Furnace	Residential, Multi-family	6.682	dkt per unit	3.947	dkt per unit
High Efficiency Condensing Furnace	Residential, Manufactured home	6.682	dkt per unit	6.708	dkt per unit
High Efficiency Condensing Boiler	Residential, Single-family	10.465	dkt per unit	11.191	dkt per unit
High Efficiency Condensing Boiler	Residential, Multi-family	10.465	dkt per unit	6.556	dkt per unit
Gas Tankless Water Heater	All	9.096	dkt per unit	9.096	dkt per unit
Northwest Energy Star Home - Electric	All	6893	kWh per unit	8057	kWh per unit
Northwest Energy Star Home - Gas	All	0.010	dkt per Sq. Ft.	0.016	dkt per Sq. Ft.

Boiler Controls. This controls measure resets boiler setpoints based on outside temperature. The 2008 gas potential assessment (KEMA 2008 (b)) cited an article which quotes vendors saying savings from 12–15% are likely with the measure.

In our literature review we did not find strong support for any particular savings value. We made no change to the UES for the evaluation.

Efficient Heating System (furnace and boiler). Savings were derived based on an efficiency improvement in boiler or furnace from around 80% to greater than 90%. Baseline usage was derived in the 2003 electric potential assessment (KEMA 2003) using the LBNL PEAR residential simulation software. Efficient room heaters were also rebated, with an apparent increase in efficiency from 65% to 82%.

We reviewed the methodology and found it reasonable. We re-calculated savings on a building type basis for the evaluation.

Efficient Tankless Water Heater. The 2008 gas potential assessment (KEMA 2008 (b)) cited case studies showing savings from 20–40%. KEMA selected a savings value of 34% of baseline DHW UEC.

Out literature review found other values in the same range. We made no changes to the UES for the evaluation.

Energy Star Manufactured Home - Gas. The 2008 gas potential assessment (KEMA 2008 (b)) cited a NEEA website as the source of savings for this measure. Savings appear to be 30% compared with a code baseline new home.

We could not find the NEEA website. The RTF has intensively researched and modeled this measure. Without any support for the program value, we adopted the RTF UES for the evaluation, a 30% increase.

Energy Star Manufactured Home - Electric. The program included a small number of electric home measures. We could not find a source for the program unit savings estimate. We reviewed the literature and chose to use the RTF estimate of savings for this measure (Regional Technical Forum 2011), since it is based on calibrated regional simulations. We applied the resistance heat value rather than the heat pump system value.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. "Total Recruited" is the total number of customers who volunteered for an on-site inspection. "Total Completed" is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which we contacted, recruited, scheduled, and visited on-site visit volunteers. For the E+ Residential New Gas Rebate program we successfully visited 31 sites. We encountered a high refusal rate (39%) when recruiting for this program; and the on-site inspectors experienced a high refusal rate (26% "Onsite Refused") when it came time to schedule the visit or meet at the site.

Table 525: Site Recruitment Disposition for E+ Residential New Gas Rebate

	Total n	%
Recruitment		
Telephone Lab	15	
Special Effort		
Attempts	89	
No Reply	27	30%
Refused	35	39%
Recruited	27	30%
Total Recruited	**42**	
Onsite		
Refused	11	26%
Not Needed	0	0%
Total Completed	**31**	**74%**

Site Inspections

For the 2010–2011 program years we performed 31 site inspections which considered six measures: Efficient Heating System – furnace and boiler (22 sites), High Efficiency Water Heater (five sites), Energy Star Manufactured Home – gas and electric (three sites), and one Boiler Controls site. The Energy Star Manufactured Home measures include insulation, digital thermostats, high efficiency windows, high efficiency furnaces, high efficiency water heaters, and Energy Star appliances.

At all 31 sites we found the measures installed, operational, and matching the quantity and sizes as documented by NWE.

We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit.

For the one Boiler Control measure site and the five High Efficiency Water Heater sites, the evaluation savings is equal to the claimed savings.

For the three Energy Star Manufactured Home sites, the claimed savings are between 1.17 and 1.89 times the evaluation savings. The increased savings are a direct result of changes to the evaluation UES values.

For the 22 Efficient Heating System sites, the evaluation savings vary between 0.59 to 1.01 times the claimed savings. The evaluation UES method used the building-type specific UES values developed by NWE; the claimed savings are based on an averaged UES value used across all building types. (See the UES Review section above).

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 526: File Review and Site Visit Adjustment to Savings for E+ Residential New Gas Rebate

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	E+ Residential New Gas Rebate	kWh	13,786	13,786	16,113	16,113	1.00	1.17	1.17
Natural Gas									
	E+ Residential New Gas Rebate	dkt	1,350	1,350	1,443	1,443	1.00	1.07	1.07

20.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 527: Savings Adjustments by Calendar Year for E+ Residential New Gas Rebate

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Residential New Gas Rebate	kWh	2010	13,786	1.17	-	-	1.17	16,113	2
	E+ Residential New Gas Rebate	kWh	All Years	13,786	1.17	-	-	1.17	16,113	2
Natural Gas Supply - DSM										
	E+ Residential New Gas Rebate	dkt	2009	221	1.07	-	-	1.07	236	
	E+ Residential New Gas Rebate	dkt	2010	701	1.07	-	-	1.07	749	
	E+ Residential New Gas Rebate	dkt	2011	429	1.07	-	-	1.07	458	
	E+ Residential New Gas Rebate	dkt	All Years	1,350	1.07	-	-	1.07	1,443	
Electric										
	E+ Residential New Gas Rebate	kWh	All Years	13,786	1.17	-	-	1.17	16,113	2
Natural Gas										
	E+ Residential New Gas Rebate	dkt	All Years	1,350	1.07	-	-	1.07	1,443	

20.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 528: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Residential New Gas Rebate

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios: Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	E+ Residential New Gas Rebate	kWh	2010	16,113	-0.00	-0.00	7.03	-0.00
	E+ Residential New Gas Rebate	kWh	All Years	16,113			7.03	
Natural Gas Supply - DSM								
	E+ Residential New Gas Rebate	dkt	2009	236	0.43	1.01	0.86	0.48
	E+ Residential New Gas Rebate	dkt	2010	749	0.52	1.83	1.48	0.57
	E+ Residential New Gas Rebate	dkt	2011	458	0.45	0.89	0.81	0.49
	E+ Residential New Gas Rebate	dkt	All Years	1,443	0.48	1.27	1.09	0.53
Electric								

					Benefit/Cost Ratios			
Funding	Program	Units	Year	Net Adjusted Energy Savings	Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	E+ Residential New Gas Rebate	kWh	All Years	16,113			7.03	
Natural Gas								
	E+ Residential New Gas Rebate	dkt	All Years	1,443	0.48	1.27	1.09	0.53

20.3. Process Evaluation

20.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with 27 participants and 50 trade allies. Surveyed trade allies include those who reported offering HVAC products and services to residential end-users.

20.3.2. Implementation Findings

20.3.2.1. Interview Findings

NWE works through a program implementation contractor (hereafter, "program staff" or "staff") to implement this program.

To seek a rebate, customers may use program guidelines and application forms available on NWE's website, which also lists the energy efficiency measures that are eligible for rebates. There are several different sets of application forms and guidelines on the easily navigable website. The forms and guidelines are further broken down by fuel type, and between measures for existing buildings and new construction. Program staff provide assistance for questions about the process through a customer help line.

After determining the eligibility of their prospective measures, customers proceed with measure purchase and installation either on their own or by hiring a contractor. Equipment and measures that are eligible for rebates through this program require no pre-approval by NWE.

To obtain a rebate for a contractor-installed project, the customer must mail or fax a completed application form and the contractor's invoice to program staff. Contractor invoices must provide certain additional details on the installation as noted on the various application forms. For customer-installed projects, receipts for materials must accompany the application.

The customer's application must include a current NWE bill for the building where the installation occurred. Rebate applications for new manufactured homes must include a copy of the homes' Northwest Energy Star certificate.

NWE has linked its master customer lists to the implementation contractor's databases, and automatically populate the application database with customer information. Program staff must manually enter the remaining information from applications.

The implementation contractor uses a check-request database that is linked to the program database to import and export check request information for customer payment. A check request list is generated weekly. Program staff review the check request spreadsheet against each hard-copy customer file to ensure accuracy of data entry and rebate amount. The check request data is exported and provided to the implementation contractor's accounting department for processing. The implementation contractor's program manager provides final approval to the accounting department to pay a rebate.

Post-installation inspections, conducted by program staff, occur on a random basis (25% of projects with a rebate amount of $200 or more) prior to approval of a rebate payment. In any case, the implementation contractor mails rebate checks to customers within four to six weeks from the time they submit their applications.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

20.3.2.2. Best Practices Assessment

Table 529 through Table 532 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 529: Program Planning and Design Best Practices for E+ Residential New Gas Rebate

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually ▪ Opportunity exists to systematically update customers

Table 530: Program Management and Administrative Best Practices for E+ Residential New Gas Rebate

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple application forms and simple requirements for participants and trade allies
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information ▪ Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact

Practice	NWE Assessment
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

Table 531: Marketing and Outreach Best Practices for E+ Residential New Gas Rebate

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	Case studies appear on NWE's program website, in newsletters for contractors, and in print materials
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

Table 532: Program Quality Control Best Practices for E+ Residential New Gas Rebate

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.

Practice	NWE Assessment
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors (which can and do conduct both residential and non-residential projects) are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

20.3.3. Participant Findings

We conducted phone surveys with 27 residential natural gas customers of NorthWestern Energy who had participated in the E+ Residential New Gas Rebate program.

Interpreting Response Frequencies

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

20.3.3.1. Information Access, Awareness, and Decision Making

Survey respondents provided general feedback about how they learned about home energy efficiency rebates from NWE, the kind of additional information they wanted. They also provided information about their decision to take actions recommended by the program.

Participants became aware of this natural gas efficiency program through multiple sources of information. The two most frequently mentioned methods were through utility publication or advertisement (54%) and through a building professional, vendor, or contractor (52%). Another popular source for utility program information was word of mouth (33%; Table 533).

Table 533: Means of Program Awareness, among E+ Residential New Gas Rebate Participants

Means (Allowed Multiple)	Percent
Utility publication or advertisement (n=26)	54%
Building professional, vendor, or contractor (n=27)	52%

Means (Allowed Multiple)	Percent
Word of mouth (n=27)	33%
Utility representative appearance (n=27)	22%
Directly contacted utility (n=27)	22%

Half (52%) of respondents had visited the utility website. Those who had not visited the website (12 respondents) mainly either did not like to use the internet (42%), or saw no need or reason to visit (33%; Table 534).

Table 534: Reasons Website Not Used, among E+ Residential New Gas Rebate Participants

Reason	Percent (n=12)
Don't like to use it much	42%
No need or no reason	33%
Just haven't	8%
Never thought to	8%
Other	8%

For the half of respondents who used the NWE website, four main reasons spurred a website visit: to look up contact information for the utility, find money-saving tips, learn about rebates, or to pay the utility bill (Table 535).

Table 535: Website Use, among E+ Residential New Gas Rebate Participants

Reason for Use (Allowed Multiple)	Percent
Utility contact information (n=13)	69%
Money saving tips (n=13)	62%
Learn about rebates or audits (n=13)	54%
Pay utility bill (n=13)	54%
How-to videos (n=13)	15%
Track energy usage (n=13)	8%
Energy saving educational opportunities (n=13)	0%
Look up general information (n=13)	0%
View employment information (n=13)	0%

Three quarters of the 13 website users agreed the website information was easy to find and helpful (Figure 174).

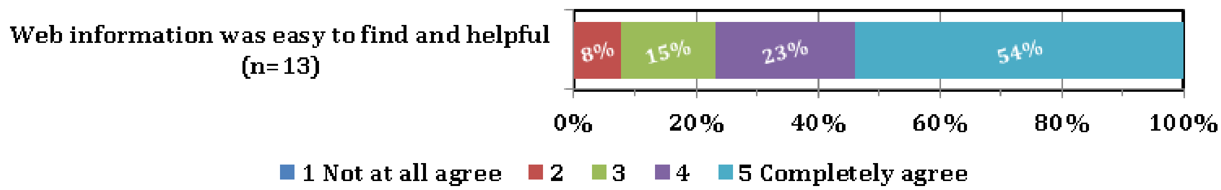

Figure 174: Website Effectiveness, among E+ Residential New Gas Rebate Participants

A majority of respondents, 56%, would like more information on energy efficiency educational opportunities and about 44% wanted more information about utility energy efficiency programs. Four in ten said they needed no further information from NWE (Table 536).

Table 536: Further Information Desired, among E+ Residential New Gas Rebate Participants

Information Type (Allowed Multiple)	Percent
Energy saving educational opportunities (n=27)	56%
Energy efficiency programs (n=27)	44%
Does not want any (n=27)	41%
Workshops or events on energy efficiency (n=27)	22%

Those desiring further information prefer to receive information by mail (81%) and email (75%). A third of these respondents also mentioned community events as a means of information delivery (Table 537).

Table 537: Information Delivery Preference, among E+ Residential New Gas Rebate Participants

Means (Allowed Multiple)	Percent
US Mail (n=16)	81%
Email (n=16)	75%
Community event (n=16)	31%
Phone (n=16)	19%
Webinar (n=16)	19%
Trainings, workshops or seminars (n=16)	6%
Other (n=16)	0%

A majority of respondents reported each of the listed reasons as a participation motivation (Table 538). The only exception was a good experience with other NWE efficiency programs, cited by one-fourth of respondents as a reason for participation.

Table 538: Reasons for Program Participation, among E+ Residential New Gas Rebate Participants

Reason (Allowed Multiple)	Percent
Save money (n=27)	100%
Save energy (n=27)	100%
Increase home comfort (n=27)	81%
Increase home value (n=27)	81%
Easy to use the program (n=27)	74%
Contractor recommendation (n=27)	56%
NWE vouched for equipment by rebating (n=26)	54%
Good experience with other NWE efficiency program (n=24)	25%

When considering participation in this gas efficiency program, 81% of respondents said they had no concerns about participating. None was unsure it would be worth it, and none thought it was too difficult or confusing. Three individuals reported difficulty with qualifying criteria.

20.3.3.2. Program Experience

Respondents gave high ratings about the clarity of program information offered: a minimum of 58% of them rated the information “very clear.” The only exception was expected energy savings, which only 36% of contacts rated “very clear” (Figure 175).

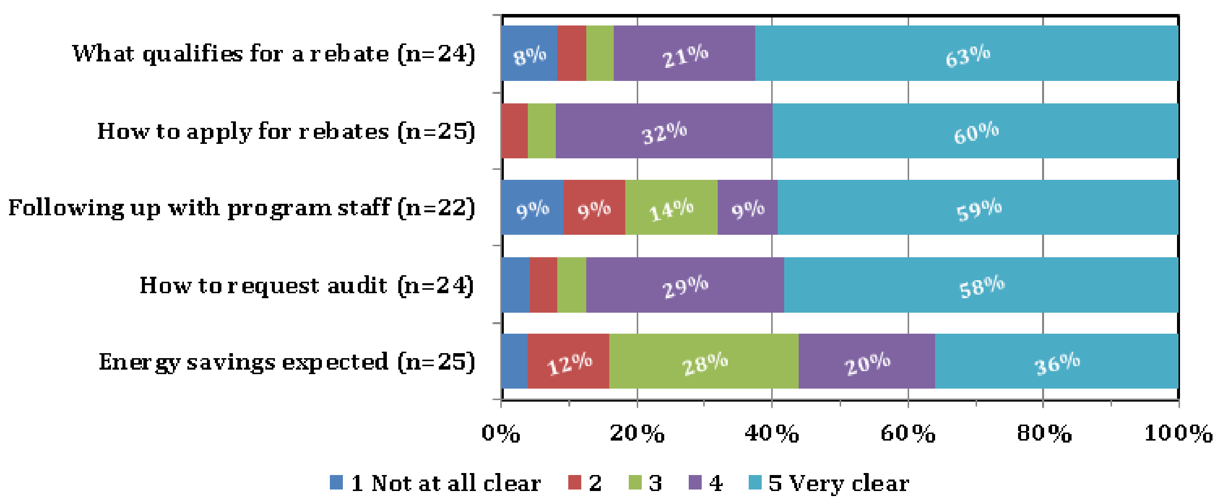

Figure 175: Clarity of Program Information, among E+ Residential New Gas Rebate Participants

Respondents reported a high level of agreement with positive statements about the ease of applying for a rebate, and about NWE representatives' conduct (Figure 176).

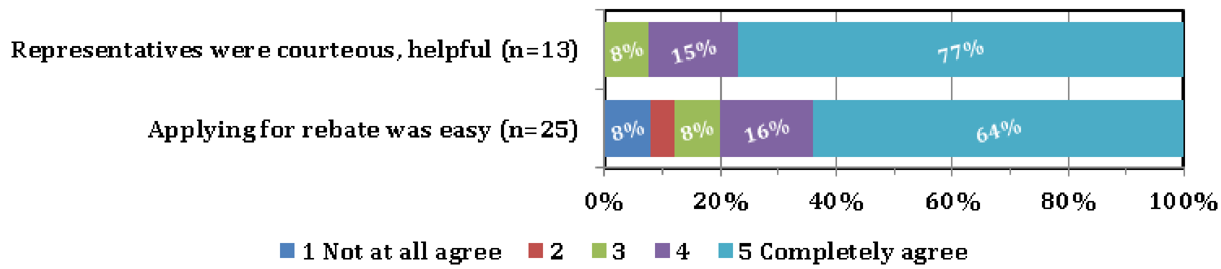

Figure 176: Experience with Process, among E+ Residential New Gas Rebate Participants

As an indicator of overall satisfaction with NWE's efficiency activities, we also asked respondents whether they were likely to participate in future NWE efficiency programs (Figure 177). Two-thirds rated themselves "very likely" to participate in the future.

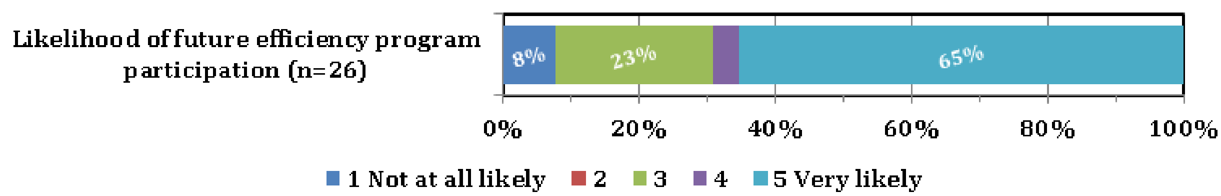

Figure 177: Likelihood of Future Participation, among E+ Residential New Gas Rebate Participants

20.3.4. Trade Ally Findings

We surveyed 50 NWE equipment trade allies who installed equipment that qualified for rebates through NWE residential programs.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all trade allies.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

20.3.4.1. Information Access and Awareness

Surveyed trade allies reported on the ways they receive information about NWE programs, and additional information and support they would like to receive from NWE.

Respondents heard about NWE efficiency program opportunities chiefly from noticing a utility publication or advertisement (76%), by directly contacting the utility, or from a utility representative at a meeting or event (Table 539).

Table 539: Means of General Program Awareness, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Utility publication (n=50)	76%
Directly contacted utility (n=50)	70%
Utility representative appearance (n=50)	68%
Utility website (n=50)	46%
Word of mouth (n=50)	44%
Associated vendors and contractors (n=50)	38%

Trade ally respondents most frequently learned about specific program requirements from a utility representative at a meeting or event (53%), or by contacting NWE directly (42%; Table 540).

Table 540: Specific Requirements Awareness, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Utility representative appearance (n=50)	52%
Directly contacted utility (n=50)	42%
Utility publication (n=50)	28%
Associated vendors and contractors (n=50)	10%
Utility website (n=50)	6%

A majority (66%) of surveyed trade allies had visited NWE's website. Among those website users, approximately three-quarters (76%) said they used the site to find information related to rebates or audits, and smaller majorities had printed rebate forms or searched for NWE contact information (Table 541).

Table 541: Website Use, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Finding rebate or audit information (n=33)	76%
NWE contact information (n=33)	64%
Print rebate forms (n=33)	55%
Educational events information (n=33)	39%
Money saving ideas (n=33)	36%
How-to videos (n=33)	9%

Most (62%) of the website users "agreed" or "completely agreed" that the web information was easy to find and helpful, however 13% gave low ratings (Figure 178).

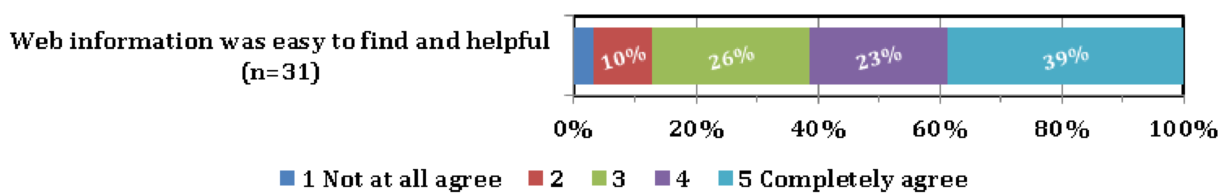

Figure 178: Website Effectiveness, among E+ Residential New Gas Rebate Trade Allies

Trade ally respondents also reported the reasons they typically contact NWE. A majority (62%) said they had contacted the utility to learn how the rebate program worked (Table 542).

Table 542: Reasons for Contacting NWE, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
To learn how the rebate program works (n=50)	62%
To resolve a problem (n=50)	44%
Investigate status of an application (n=50)	36%
Investigate status of a rebate payment (n=50)	30%
None of these (n=50)	24%
Other (n=50)	16%

About half of surveyed trade allies would like to receive further information on energy savings programs and opportunities, or to attend additional workshops or events (Table 543).

Table 543: Further Information Desired, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Workshops or events on energy efficiency (n=50)	60%
Energy efficiency programs (n=50)	58%
Energy saving educational opportunities (n=50)	54%
None (n=50)	30%

Those desiring further information preferred to receive information by mail (38%) and other methods such as email (30%) or trainings and workshops (26%; Table 544).

Table 544: Information Delivery Preference, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
US mail (n=50)	38%
Email (n=50)	30%
Trainings, workshops or seminars (n=50)	28%
Community event (n=50)	16%
Webinar (n=50)	16%
Phone (n=50)	8%

20.3.4.2. Efficient Equipment Promotion

Trade allies provided general information about their stocking and promotion of efficient equipment.

We asked residential trade allies if equipment they normally kept in stock was high-efficiency or Energy Star rated, or if instead they kept unrated/standard items in stock and *ordered* the high-efficiency items as needed. Just over half (54%) of the respondents said their stock does typically include high-efficiency equipment, while the other half makes special orders as needed.

Trade allies reported on their sales strategies, listed in Table 545 below. Most (84%) kept a range of equipment that varied in quality and prices to offer customers, and 97% agreed that the “Better” and “Best” equipment is usually more energy-efficient than the “Good.” Over half (63%) reported they suggest the “Best” equipment to customers first.

Table 545: Equipment Sales Approach, among E+ Residential New Gas Rebate Trade Allies

	Percent
Typically sell a range of equipment that gives customers a GOOD, BETTER or BEST option to buy (n=49)	84%
Agree that BETTER and BEST equipment options are typically more energy efficient than the 'GOOD' option (n=39)	97%
Best presented first (n=40)	63%
Better presented first (n=40)	23%
Present all options simultaneously (n=40)	13%
Good presented first (n=40)	3%

Figure 179 below illustrates respondent reports of the proportion of high-efficiency or Energy Star equipment they stock. Less than half (42%) of these trade allies reported that over three-quarters of their stock was high-efficiency equipment. A third of these respondents said that no more than 25% of their regular stock was comprised of high-efficiency equipment. Those trade allies who reported that they stocked efficient equipment also estimated the share of sales made in the past two years that were energy-efficient items. A majority (63%) reported that more than three-fourths of the equipment they sold in the past two years as high-efficiency.

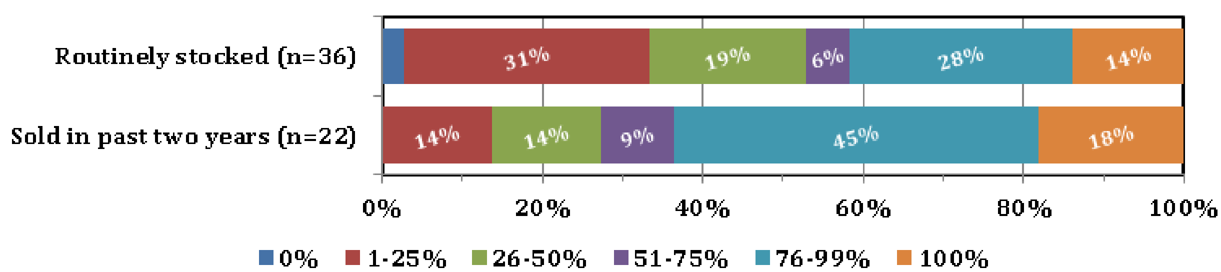

Figure 179: High Efficiency Equipment Share, among E+ Residential New Gas Rebate Trade Allies

Respondents reported on what benefits they typically mention to customers about the high-efficiency equipment that qualifies for rebates. The most commonly mentioned benefits, by 88% of these trade allies, were the rebate itself and the lower operation costs of the equipment (Table 546).

Table 546: Customer Benefits Mentioned, among E+ Residential New Gas Rebate Trade Allies

Benefit	Percent
Lower operation costs (n=50)	88%
Utility rebate (n=50)	88%
High-quality of product (n=50)	70%
Lower maintenance costs (n=50)	54%

About 20% of these residential trade allies recalled discouraging a customer from choosing the highest-efficiency equipment sometime in the past two years. When asked why, these ten respondents mentioned cost half the time (Table 547).

Table 547: Reasons for Discouraging Efficient Equipment Purchase, among E+ Residential New Gas Rebate Trade Allies

(Allowed Multiple)	Percent
Cost (n=10)	50%
Installations are too complex (n=10)	20%
Less reliable than standard items (n=10)	20%
Other (n=10)	20%

Surveyed trade allies also reported on whether their customers ever installed qualifying efficient equipment without pursuing a rebate. About one-third (35%) of respondents said they recalled installing rebate-qualifying equipment in cases when they knew customers did not pursue rebates. Among the reasons reported in the following table, no single reason stands out as a barrier to rebate applications (Table 548).

Table 548: Circumstances When Rebate Foregone, among E+ Residential New Gas Rebate Trade Allies

	Percent
Trade ally unaware of rebate/program (n=14)	21%
Customer did not apply (n=14)	21%
Customer ineligible (n=14)	14%
Rebate too small (n=14)	14%
Applying takes too long (n=14)	7%
Unspecified or unclear (n=14)	21%

20.3.4.3. Program Activity

Surveyed trade allies reported how they typically manage activities related to NWE efficiency programs, including their experience with program processes.

Two-thirds (64%) of trade ally respondents said they had trained staff to talk to customers about energy efficient choices. In fact, 46% of these respondents said they “almost always” initiate the discussion about utility rebates for which their customer might qualify (Table 549).

Table 549: Rebate Initiator, among E+ Residential New Gas Rebate Trade Allies

	Percent (n=50)
Almost always trade ally initiated	46%
Mostly trade ally initiated	36%
About half trade ally and half customer	10%
Almost always customer initiated	8%

When a customer is considering an equipment purchase, 94% of these respondents suggest equipment that qualifies for the rebate program, rather than waiting for the customer to show interest in qualifying for rebates.

Trade allies also indicated whether they had any reservations about recommending participation to their customers. Most surveyed trade allies (86%) indicated that nothing about the program raised issues or concerns about their customers' participation. Among the seven respondents who had initial concerns, the reasons given showed no pattern. However, problems with the rebate were concerns for two respondents.

A minority (18%) of trade ally respondents contacted their clients on a regular basis with notifications about new rebates or other energy efficiency program opportunities offered by NWE. These "regular communicators" were contacting customers with varied frequency, some as often as daily and some yearly (Table 550).

Table 550: Customer Contact Frequency, among E+ Residential New Gas Rebate Trade Allies

	Percent (n=9)
Once a year	33%
Every day	33%
Once a month	11%
2 times a year	11%
Varies by customer	11%

A majority of these trade ally respondents rated four aspects of program information they received from NWE about rebate processes as "clear" or "very clear." Slightly lower ratings were given for two of the four: reading and understanding program information, and information about which items qualify for rebate (Figure 180).

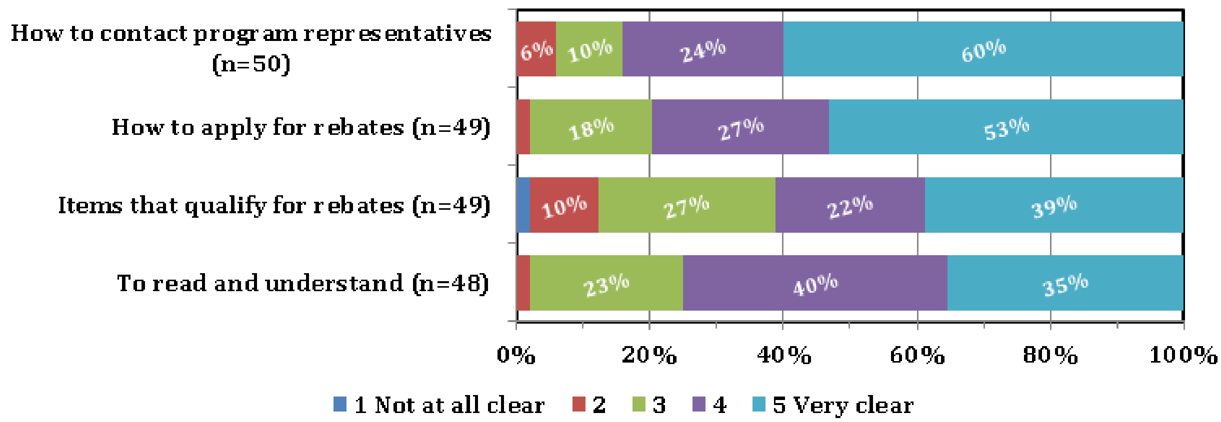

Figure 180: Clarity of Program Information, among E+ Residential New Gas Rebate Trade Allies

Trade ally respondents also reported on their involvement in completing the rebate application. Most of these trade allies (62%) reported working with the customer in a joint effort to prepare the applications. Another 26% reported doing all or most of the application themselves (Table 551).

Table 551: Rebate Application Preparer, among E+ Residential New Gas Rebate Trade Allies

	Percent (n=50)
Typically both trade ally and customer - about half and half effort	62%
Typically the trade ally prepares all or most of the application	26%
Typically the customer prepares all or most of the application	10%
Depends on the rebate	2%

About three-quarters (72%) of the 43 trade ally respondents involved with completing the rebate application "agreed" or "completely agreed" that the process was simple to follow (Figure 181).

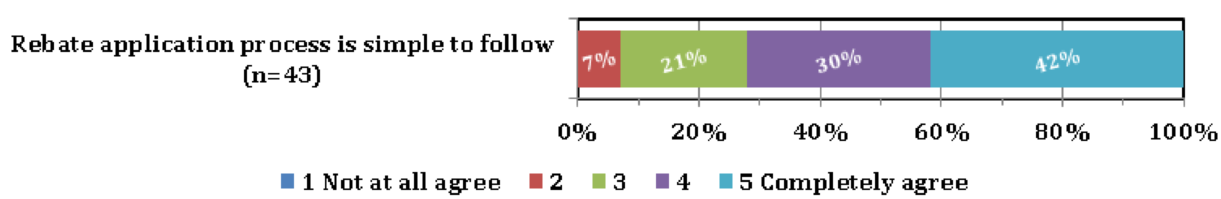

Figure 181: Rebate Application Process, among E+ Residential New Gas Rebate Trade Allies

Respondents rated their agreement with positive statements related to staying current with periodic program changes. At least 61% of respondents "agreed" or "completely agreed" that

NWE provided updates in a timely manner, staying current takes little staff time, and that customers benefit from program additions (Figure 182).

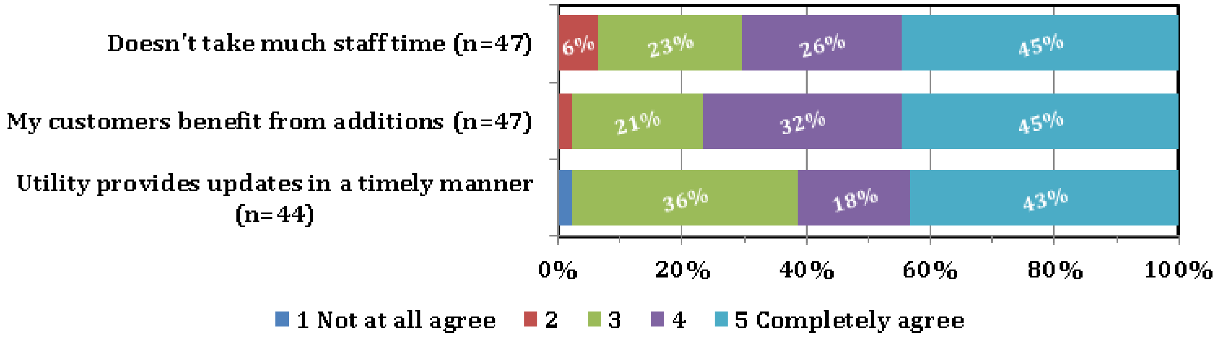

Figure 182: Experience With Program Changes, among E+ Residential New Gas Rebate Trade Allies

Most (83%) of the 46 residential allies surveyed reported that they were on NWE's Preferred Contractors list. Almost all of the preferred contractors (97%) "agreed" or "completely agreed" that "the process of becoming a preferred contractor was easy to do." Likewise, most (84%) agreed or completely agreed that their "program experience as a preferred contractor has been positive." However, just under half (48%) agreed or completely agreed that being a preferred contractor had "helped grow our business" (Figure 183).

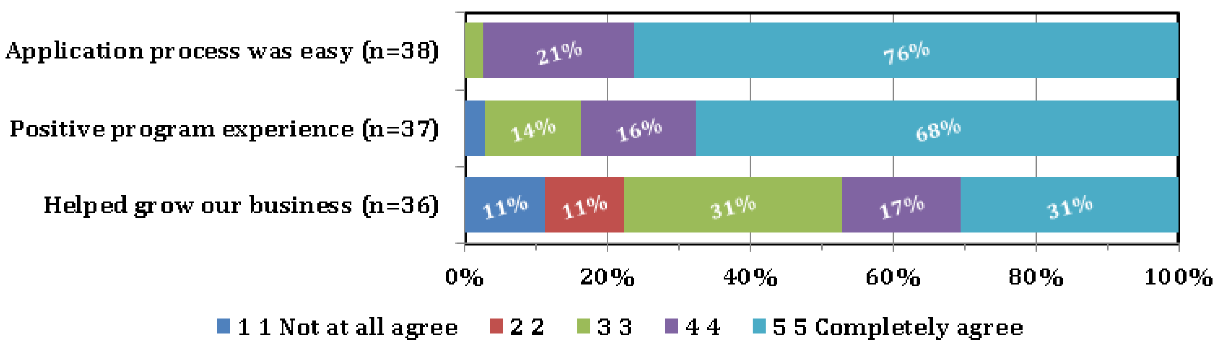

Figure 183: Experience As Preferred Contractor, among E+ Residential New Gas Rebate Trade Allies

We asked the eight trade allies who gave a rating of "1" or "2" on the five-point agreement scale to explain their low ratings. Their answers indicated they did not think being on the preferred list was a reason customers contacted them, and that there is little outreach coordination with NorthWestern.

We asked respondents what products and equipment they would like to see added to the list of qualifying measures. The most common suggestion, made by 40%, was an expanded range of HVAC systems (Table 552). LED lighting and heat pumps were suggested by 20%. These trade

allies indicated they suggested such items primarily because they were "more efficient" (Table 553).

Table 552: High Efficiency Equipment Suggested, among E+ Residential New Gas Rebate Trade Allies

	Percent (n=15)
Other heating systems	40%
LED lighting	20%
Heat pumps	20%
On demand water heaters	13%
Other	7%

Table 553: Reasons Equipment Should Be Added, among E+ Residential New Gas Rebate Trade Allies

	Percent (n=14)
It's more efficient	50%
Cost	14%
Customers request them	14%
Where industry is going	7%
Other	14%

20.3.4.4. Firmographics

A few trade allies (18%) served customers in more than 20 Montana locations. More than half (60%) of these respondents reported serving five or fewer locations.

Table 554: Number of Montana Locations, among E+ Residential New Gas Rebate Trade Allies

	Percent (n=50)
1 location	36%
2 to 5 locations	24%
6 to 10 locations	12%
11 to 20 locations	10%
21 to 50 locations	4%
Over 50 locations	14%

Trade allies reported on the maximum number of miles they would travel to serve clients. About a quarter (24%) would travel less than 100 miles, while 14% would travel more than 400 miles. The largest portion (46%) would travel between 101 and 200 miles to serve a client (Figure 184).

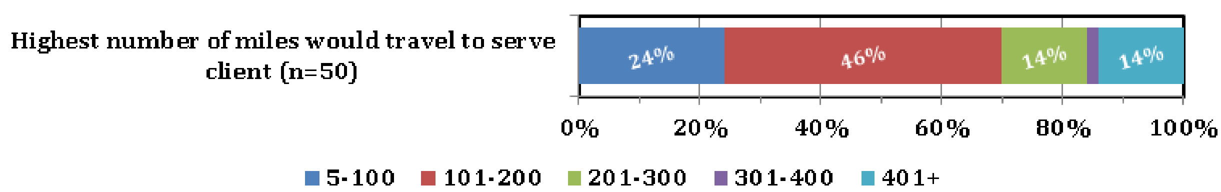

Figure 184: Maximum Miles, among E+ Residential New Gas Rebate Trade Allies

20.4. Recommendations

20.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **New construction program changes:** New construction programs in general have had few participants in recent years. Consider increasing marketing efforts to increase participation. Also consider combining gas and electric programs into a single new construction program to reduce administrative costs.
- **Updated values:** Update UES values for the Energy Star manufactured homes and efficient heating system measures to the evaluation values, which incorporate the findings from recent research.

20.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices; including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Overall, surveyed E+ Residential New Gas participants reported positive program experiences, and found the program easy to navigate. However, the responses of a few participants (less than 20%) suggest they do not have the information they need to navigate the program. Over half of participants reported wanting more information about energy efficiency opportunities.

Residential trade allies reported positive program experiences, with no major concerns or suggestions. Many are interested in receiving more efficiency information: nearly two-thirds of trade allies reported interest in efficiency workshops or other events. Just under two-thirds reported that they trained their staff to talk to clients about energy efficiency. Although two-thirds of trade allies have used the website, just one tenth report that they get information about program requirements from the website.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency.
- **Program change updates:** Consider ways to systematically update customers about program changes, if not too costly.
- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Workshops for trade allies, customers:** Consider offering workshops at NWE's division offices or webinars to trade allies and customers targeted by this program.
- **Trade ally feedback:** Program communications with trade allies should include publicizing a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement. However, NWE should take care in

the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received.

- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Non-energy benefits:** Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Fewer C-E analysis updates:** Consider reducing the frequency of updates to cost-effectiveness analyses and qualifying measures.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

21. Low Income Appliance

21.1. Program Description

The Low Income Appliance program operated from February 2011 to November 2011 in partnership with Energy Share of Montana, a private non-profit agency, to replace old refrigerators with free Energy Star refrigerators to qualified low income NWE customers meeting the following criteria:

- Customers are certified by Montana's Department of Public Health and Human Services as eligible for the Low Income Energy Assistance Program (LIEAP) in three out of the past five years, including the year of the program, 2011.
- Own their stick-built home which previously had weatherization work performed in the prior six years.
- Own a refrigerator manufactured before 1995.

Energy Share Montana administered the program for NWE. Energy Share contracted with Human Resource Development Councils (HRDCs), local agencies that connect low-income Montanans with programs and services.

Due to fewer older refrigerators in qualifying customer homes than originally estimated, the program did not disburse all funding assigned to the program.

21.1.1. Energy Savings

A UES deemed savings value of 95 kWh/year per refrigerator is the basis for the savings.

21.1.2. History

There were no changes over the life of the program.

21.1.3. Marketing

A direct marketing process located potentially eligible customers through database searches to identify LIEAP-eligible homeowners in NWE's service territory. Customers appearing likely to meet eligibility requirements received program mailings and follow-up phone calls from the HRDCs. NWE provided the program marketing materials that were mailed to qualifying customers and the HRDCs made follow-up phone calls.

21.1.4. Program Steps

Customers expressing interest in the program were initially screened for qualifications by returning the questionnaire provided by NWE, and then a HRDC representative visited the home as the final verification step. The HRDC representative scheduled the delivery of the new Energy Star rated refrigerator and the removal, disabling and recycling of the old refrigerator.

21.2. Impact Evaluation

21.2.1. Methodology

We performed an impact evaluation of this program to assess the gross energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program year. We based the gross program savings assessment on file reviews, verification of measure counts and a review of the UES methods used by NWE to estimate program savings. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross energy (kWh) and demand (kW) savings and perform the economic analysis.

21.2.1.1. Estimation of Gross Savings

This program included the installation of efficient residential refrigerators. We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

NWE provided a detailed workbook that listed each refrigerator installed and provided the unit energy savings (UES) method used by NWE to estimate program savings. We verified the counts of implemented measures, to the extent possible. We reviewed the refrigerator unit energy savings. We applied the final refrigerator UES value, as appropriate, to the verified counts to estimate energy (kWh) and demand (kW) savings from this program.

21.2.1.2. Free Ridership

No customers surveys were possible for this program. Therefore, we were not able to estimate free ridership.

21.2.1.3. Spillover

No customer surveys or site visits were possible for this program. Therefore, we were not able to estimate spillover.

21.2.1.4. Leakage

No customer surveys visits were possible for this program. Therefore, we were not able to estimate leakage.

21.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

21.2.2. Energy and Demand Impacts

We estimated gross energy (kWh) and demand (kW) savings for each of the implemented measures.

21.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 46 sampled cases for this program across the 2010–2011 program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

UES review

We found that the program savings from the Energy Star refrigerator measure were not appropriate for this program. The program savings apply to the difference between a new minimum federal standard refrigerator and an Energy Star refrigerator. This program is an early replacement program, with the existing unit required to be pre-1995. We reviewed the literature to determine a more appropriate UES.

(Blasnick and Teague 2004) monitored 93 baseline and new refrigerators in early replacement programs, and found the average savings. The RTF (Regional Technical Forum 2012) calculates savings for residential recycling programs. The workbook shows the estimated annual consumption found by the recyclers for the replaced unit. Based on the consumption found in that program, and the consumption estimated by Energy Star (US EPA n.d.) for a new Energy Star unit, we estimated savings for replacement of a 1985 average vintage appliance. We selected this latter, more conservative, value as the UES to apply for this program. The UES for this program increased from 95 kWh per year to 1032 kWh per year, as a result of our treatment of this program as an early rather than normal replacement program.

Count Verification

We reviewed the documentation of installed measures in the tracking database that was the basis for the NWE savings claim. The results from the review indicate that the data records were in order and reasonable. The measure count accurately reflected the program accomplishments claimed by NWE.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review results for this program. The table compares the reported savings to those adjusted for changes based on our file review. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 555: File Review Adjustment to Savings for Low Income Appliance

Funding	Study Name	Units	Savings		Savings Adjustment Rates
			Reported	Final	Final
Electric					
	Low Income Appliance	kWh	12,350	134,134	10.86

21.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews. The net savings adjustment rate reflects the combined effect of the other rates. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings.

Table 556: Savings Adjustments by Calendar Year for Low Income Appliance

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	Low Income Appliance	kWh	2011	12,350	10.86	-	-	10.86	134,134	15
	Low Income Appliance	kWh	All Years	12,350	10.86	-	-	10.86	134,134	15
Electric										
	Low Income Appliance	kWh	All Years	12,350	10.86	-	-	10.86	134,134	15

21.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 557: Net Savings and Benefit/Cost Ratios by Calendar Year for Low Income Appliance

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	Low Income Appliance	kWh	2011	134,134	0.23	0.23	0.23	0.26
	Low Income Appliance	kWh	All Years	134,134	0.23	0.23	0.23	0.26
Electric								
	Low Income Appliance	kWh	All Years	134,134	0.23	0.23	0.23	0.26

21.3. Process Evaluation

21.3.1. Methodology

We met with all key members of NWE’s program team. To inform our implementation findings for this program, we interviewed those team members involved with the program. NWE program staff did not interact with participants; thus, the process evaluation research plan for this program did not include a participant sample. No trade allies were involved in program delivery.

21.3.2. Implementation Findings

21.3.2.1. Interview Findings

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

The appliance replacement program ran during 2011 to replace refrigerators that were produced before 1995 with new Energy Star models that had equivalent features. NWE staff was challenged to find a partner to deliver the program. Staff first approached the HRDCs, which declined to take on the program because they were struggling to use an influx of American Recovery and Reinvestment Act (ARRA) funds and did not have the capacity for new partnerships. Next, NWE sought to partner with retailers, but found their interest to be low.

NWE launched the program through partnering with Energy Share of Montana, a private nonprofit organization founded in 1982. Its primary purpose is to help Montanans faced with energy emergencies meet their needs and move toward self-reliance. In addition to raising and distributing contributions from individuals, Energy Share works with Montana utilities to implement low-income USB-funded programs. Energy Share administered the program and contracted with the HRDCs to deliver program services to qualifying customers.

In developing the program plan, NWE staff overestimated the number of eligible customers, due to an incorrect estimate of the average age of refrigerators among low income customers. Staff's planning assumed a high proportion of low income customers would have old refrigerators (older than 1995 models). During program implementation, it became apparent that few LIEAP-eligible customers had an eligible refrigerator.

The implementation staff initially marketed the program by identifying potentially eligible customers and sending them a mailing to encourage them to contact program staff. This mailing led to relatively few inquiries. Program staff then launched a telephone campaign to reach potentially eligible customers, learn the age of their refrigerator and, if they qualified, encourage them to participate. Through this process, NWE staff learned the program plan overestimated eligible customers. NWE staff reported that this was a great learning experience; even seemingly obvious assumptions (such as refrigerator age among low income customers) need to be corroborated if the assumption plays a key role in program design.

21.3.2.2. Best Practices Assessment

The Low Income Appliance program followed a key best practice in using the Energy Star logo to instill consumer confidence. We do not assess the program for other best practices as the program is over. We assess NWE's residential rebate programs with respect to best practices.

21.3.3. Participant Findings

We did not speak to any participants for this evaluation.

21.3.4. Trade Ally Findings

No trade allies were involved in program delivery.

21.4. Recommendations

We offer no conclusions or recommendations for this program, because NWE no longer offers it.

22. VENDING MISER

22.1. Program Description

Vending Misers (VMs) are devices attached in-line between a beverage vending machine and the power receptacle which reduce energy consumption during periods of light occupancy. VMs are comprised of an occupancy sensor and control module. NWE made a single bulk purchase of VMs in 2003 and the program began in 2004. The program is funded through USB.

VMs are installed in school and local government facilities participating in other NWE programs by KEMA, typically the E+ Energy Appraisal for Small Businesses program. VMs are also installed in NWE facilities. NWE will operate the program until the remaining inventory is gone.

22.1.1. Energy Savings

Unit energy savings were adopted by NWE from Nexant's Addendum to Evaluation of NorthWestern Energy's DSM Energy Efficiency Programs (Nexant 2007).

22.1.2. Marketing

None

22.1.3. Program Steps

When KEMA personnel are at a customer's facility for another NWE energy efficiency program, and the site is owned by a school district or local government, they will ask for permission to install VMs on beverage machines.

22.2. Impact Evaluation

22.2.1. Methodology

We performed an impact evaluation of this program to assess the gross and net energy (kWh) and demand (kW) savings associated with participants that were paid during the 2010–2011 program years. We based the gross program savings assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods that we used to assess gross and net energy (kWh) and demand (kW) savings and perform the economic analysis.

22.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy savings (e.g., installed units, installed capacities) to identify data entry errors. We corrected errors that were found and recalculated energy savings (kWh). We recorded reasons for differences with the program tracking savings.

Since this was a prescriptive program, NWE used unit energy savings (UES) as the basis for measure savings estimates. We performed a review of the UES methods that NWE applied to the vending miser measure. Our review included an examination of relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to the conditions experienced by NWE in their service area.

We compared and contrasted unit energy savings methods that were found for each measure. We also critiqued them for their relevance to conditions that exist at NWE. Based on our engineering judgment, we determined the most appropriate UES method. In cases where we determined that changes to the UES methods used by the program were appropriate, we submitted the revised values to the NWE project manager for review and comment.

We performed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and producing energy savings. We collected data as necessary to support a re-estimation of energy savings, using the UES method that resulted from the UES review and data observed during the site visit. To the extent possible, we documented reasons for differences between the evaluated and program savings.

22.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

22.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of "3" or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

22.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility's service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent's possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient's location. We compared responses to questions about electric efficiency measures to NWE's electricity service territory and responses about gas measures to its gas service territory. We considered as "leaked" any measures we found that left the relevant service territory.

22.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

22.2.2. Energy and Demand Impacts

We estimated gross and net energy (kWh) and demand (kW) savings for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

22.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 15 sampled cases for this program across the five program years. In ten of the 15 sampled cases we found duplicate --and in two cases, triplicate-- entries for multiple vending misers:

We re-calculated annual energy savings (kWh) after corrections were made to the data entry errors listed above. The total reduction in energy savings was 48,561 kWh.

UES review

We reviewed the one UES measure installed in the sampled cases addressed in the evaluation of this program. Our review included an examination of the UES methods used by NWE to establish the program estimates. We made no change to the UES value.

The results from our UES review are shown in the table below. The table provides the UES value used by NWE in their program estimates and the corresponding evaluation value. Provided below is a discussion of the program and evaluation methods for the measure.

Table 558: Summary of UES Adjustments for Vending Miser

Measure	Building Type	Program UES (2010)	Program units	Evaluation UES	Evaluation units
Vending Miser	All	1441.000	kWh per unit	1441.000	kWh per unit

The program adopted the UES value estimated by Nexant in an addendum to the 2007 evaluation (Nexant 2007). The value was derived as the average of the values found in a number of studies. We reviewed the studies cited, and found Nexant's conclusions to be reasonable. We made no change to the UES for the evaluation.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. "Total Recruited" is the total number of customers who volunteered for an on-site inspection. "Total Completed" is the total number of customers who we were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which we contacted, recruited, scheduled, and visited on-site visit volunteers. For the Vending Miser program, we successfully visited seven sites. The customers in this program were very accommodating when it came to agreeing to and scheduling site visits.

Table 559: Site Recruitment Disposition for Vending Miser

	Total n	%
Recruitment		
Telephone Lab	0	
Special Effort		
Attempts	7	
No Reply	0	0%
Refused	0	0%
Recruited	7	100%
Total Recruited	**7**	
Onsite		
Refused	0	0%
Not Needed	0	0%
Total Completed	**7**	**100%**

Site Inspections

We performed site inspections for a sample of seven measures that were assigned to the 2010–2011 program years. We calculated savings for each sampled measure by applying the evaluation UES method to the as-built conditions observed during the site visit. In all cases we determined site-specific savings to be less than the program estimate. This was due primarily to data entry errors for all cases. Tracking data was entered twice for six of the seven cases. Tracking data was triple entered for the remaining case. In addition savings we reduced to zero for one case because the single vending machine treated by the program was removed. We reduced savings at two other sites with multiple treated machines, where one of the treated machines was removed.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 560: File Review and Site Visit Adjustment to Savings for Vending Miser

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	Vending Miser	kWh	118,534	73,142	47,414	85,071	0.62	0.40	0.72

22.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 561: Savings Adjustments by Calendar Year for Vending Miser

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	Vending Miser	kWh	2007	42,161	0.72	-	-	0.72	30,259	3
	Vending Miser	kWh	2008	11,528	0.72	-	-	0.72	8,274	1
	Vending Miser	kWh	2010	64,845	0.72	-	-	0.72	46,539	5
	Vending Miser	kWh	All Years	118,534	0.72	-	-	0.72	85,071	10
Electric										
	Vending Miser	kWh	All Years	118,534	0.72	-	-	0.72	85,071	10

22.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 562: Net Savings and Benefit/Cost Ratios by Calendar Year for Vending Miser

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	Vending Miser	kWh	2007	30,259	-0.00	-0.00	1.66	-0.00
	Vending Miser	kWh	2008	8,274	-0.00	-0.00	2.19	-0.00
	Vending Miser	kWh	2010	46,539	-0.00	-0.00	1.92	-0.00
	Vending Miser	kWh	All Years	85,071			1.85	
Electric								
	Vending Miser	kWh	All Years	85,071			1.85	

22.3. Process Evaluation

22.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

For the market findings, we interviewed one of the two NWE facilities managers who were the contacts for the Vending Miser installations at six Butte and one Lewistown site(s) during 2010–2011. No trade allies were involved in this program.

22.3.2. Implementation Findings

22.3.2.1. Interview Findings

The Vending Miser program began in 2003 when NWE used USB funds to purchase some Vending Miser units. Initially, installations were limited to locations where taxpayers paid the utility bill. Toward the end of the decade, the implementation contractor had promoted Vending Misers to virtually all eligible properties and installed the units as requested. Yet due to the limited target market, units remain in stock. The implementation contractor makes these installations and maintains the units until suitable locations are found, at which time it installs them.

During our evaluation period, NWE expanded the eligible market and began to install these units in NWE facilities and federal buildings, reasoning that ratepayers and taxpayers indirectly pay the electricity costs of these facilities. During the study period, the program installed Vending Misers at NWE locations in Butte and Lewistown. Additional units remain in stock, although the eligible market seems to be largely addressed.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

22.3.2.2. Best Practices Assessment

The evaluation community has not identified best practices for a Vending Miser program.

22.3.3. Participant Findings

We spoke with one of the two facilities managers that received a Vending Miser in 2010–2011 to understand the program from the participant perspective. While installations of Vending Misers were influenced by the advocacy of NWE's energy efficiency department, they were also influenced by Facility Management Services to address budget limitations and a need to lower costs. Local management also had an influence, wanting to address aging equipment. The facility manager is satisfied with the Vending Miser's performance and with program participation.

22.3.4. Trade Ally Findings

No trade allies were involved in this program.

22.4. Recommendations

22.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Vending Miser third-party implementer:** This program has a very low participation rate. Consider hiring a third-party implementer that specializes in the installation of this technology to focus on installing the remainder of the NWE equipment inventory in a timely manner. Otherwise, consider dropping this program from the portfolio.
- **Duplicate entries:** Records were entered multiple times into the tracking database for this program. Enhance quality control procedures for this program to ensure that records are only entered once.

22.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

We spoke with the two facilities managers that received a Vending Miser in 2010–2011. The facility manager is satisfied with the Vending Miser's performance and with program participation. No trade allies were involved in this program.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Expand Vending Miser program:** We encourage NWE to explore expanding its Vending Miser installations, purchased with USB funds in the past, beyond public establishments.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.

23. E+ Renewable

23.1. Program Description

E+ Renewable is a hybrid rebate/custom incentive program for renewable energy measures that began in 1999. Most projects are funded as prescriptive rebates, $/Watt with a funding cap. Other projects follow a non-prescriptive path for reasons outlined below. For the 2012 impact evaluation, the program is divided into two components, residential and non-residential. The program is available to residential and non-residential supply customers and electric choice customers < 1 MW. The program is funded with USB dollars.

The prescriptive option is open to residential photovoltaic (PV) and wind power projects. For all other projects, the USB Advisory Committee's renewable energy subcommittee provides advice to NWE; applicants submit proposals to NWE which NWE staff summarizes and presents along with their recommendations to the subcommittee at semi-annual meetings. Projects supported by the subcommittee are referred back to NWE. NWE staff carries the projects through the internal review by NWE management and develops and manages project contracts.

The majority of program projects are 1 to 3 kW PV systems, followed by wind turbines, and a small number of other renewable projects such as low-head hydro, biomass, solar thermal systems, and larger PV arrays. The program is technology neutral; any renewable technology may be brought forward for consideration by the subcommittee.

A prerequisite for all current projects is the renewable energy system must be connected to the NWE distribution grid. If a system is capable of producing more energy than a site's electrical base load, with customer agreement, NWE will install net metering equipment (for systems up to 50 kW) and credit the customer's account in kWh for energy fed back to the grid.

Residential PV

Most residential PV projects are rebates installed by NWE-qualified installers. Customers work directly with the installers, not NWE. The incentive is $3/Watt, up to a funding cap of $6,000. Incentives are paid directly to the installers to buy down the project cost. Customers may install systems larger than 2 kW but the maximum incentive remains capped at $6,000.

Residential wind power

Similar to residential PV, customers work with NWE-qualified installers and receive an incentive of $2/Watt, up to a funding cap of $10,000. Most incentives are paid directly to the installers to buy down the project cost. Customers may install wind systems larger than 5 kW but the incentive remains capped at $10,000.

All non-residential renewable energy systems

Customers and their qualified installers apply for funding by submitting a project proposal. Proposals may follow the $/Watt residential funding levels or propose higher levels, up to 100% of cost. NWE provides guidance on proposal development with a proposal template and a completed proposal example on their website.

The NWE-qualified PV and wind turbine installers receive annual block funding (a maximum dollar amount) based on the number of projects the installer anticipates completing, NWE's judgment on the installer's capability to deliver completed projects, and the availability of USB funds. When block funding is approved by NWE and a contract issued, installers may proceed with project installations and invoice NWE as individual projects are completed. NWE inspects a relatively small percentage of completed projects.

Project volume is subject to the level of annual funding for renewable and research and development categories which is determined through PSC allocation guidelines and needs of all USB categories.

Related Activities

NWE supports a robust renewable energy educational program through the NWE website, community events, renewable site tours, and partnerships with renewable educational organizations. NWE also provides information on additional funding sources such as state and federal tax credits, property tax exemptions, etc.

23.1.1. Energy Savings

Measure savings, or renewable energy generation, for the prescriptive rebates are determined by taking the rated peak kW output of the equipment and multiplying by annual equivalent full load hours. Equivalent full load hours are based on capacity factors multiplied by 8760 hours per year. PV systems have a deemed capacity factor of 15% or 1314 equivalent full load hours. Capacity factors for wind turbine systems vary between 5% and 15%, depending on equipment specifications. Non prescriptive measure energy savings estimates are derived from a variety of engineering calculations.

23.1.2. History

The installer network has grown substantially over the 2007–2011 time period. NWE began certification of trained and qualified installers in June of 2009.

In 2007–2008, prescriptive PV incentives were $3.50/Watt with a $7,000 funding cap. In 2009–2011, the PV incentive changed to $3/Watt with a $6,000 cap.

23.1.3. Marketing

NWE's renewable marketing strategy combines customer education activities, partnerships with educational organizations, and consumer marketing by the qualified installers. The partnerships have included renewable energy education work done by the National Center for Appropriate Technology's (NCAT's) Montana Green Power website and the Montana Renewable Energy Association (MREA).

NWE has developed several publications and informational resources to help customers decide whether renewable energy technologies are appropriate for their home or business. NWE's website also provides information about renewable technologies.

NWE sponsors presentations where interested customers learn about renewable energy technologies, the economics, and the importance of maximizing site energy efficiency prior to acquiring renewable resources. Customer appreciation events have featured renewable energy presentations and booths at events. NWE also sponsors tours of renewable energy sites around the state.

23.1.4. Program Steps

Customers are encouraged to work directly with NWE-qualified installers. For prescriptive PV and wind power measures, the qualified-installers handle all NWE requirements for the customer.

Occasionally NWE may engage with a customer and their installer on large or unique projects to evaluate feasibility prior to recommending the development of a proposal to go before the USB advisory subcommittee.

For non-residential projects and non-prescriptive residential projects, customers and installers develop a proposal in a standard format available on NWE's website. Upon submission of the completed proposal to NWE, the project is reviewed by the USB subcommittee which normally meets twice a year. If supported by the subcommittee and approved by NWE, NWE contracts with the customer or installer for the project.

23.2. Impact Evaluation

23.2.1. Methodology

We performed an impact evaluation of the residential and commercial components of the program to assess the gross and net energy (kWh) production associated with participants that were paid during the 2010–2011 program years. We based the gross program generation assessment on file reviews and site inspections for a representative sample (see section 2.1) of cases for these program years that was estimated to achieve 90/10 precision.

The evaluation also included an assessment of free ridership, leakage and spillover on participant samples, through a combination of interviews and site visits. In addition we performed an economic analysis for this program that assessed its cost-effectiveness. Below is a description of the methods used to assess gross and net energy (kWh) generation and perform the economic analysis.

23.2.1.1. Estimation of Gross Savings

We began the impact evaluation for this program with a file review to determine whether the detailed documentation (referred to as project files) was consistent with program tracking records. The file review for all sampled measures included a comparison of program tracking data to information in the project files for parameters relevant to energy generation (e.g., number of systems, size of systems) to identify data entry errors. We corrected errors that were found and recalculated energy (kWh) generation. We recorded reasons for differences with the program tracking generation.

NWE provided project files for all sampled renewable projects. We reviewed the files to gain a thorough understanding of the measures that were installed. We preformed site visits on the sampled sites to verify the measures installed under the program. The site visits included confirmation that the program measures were installed, were operational and generated energy (kWh). We collected data as necessary to support a re-estimation of energy (kWh) generation. For photovoltaic systems, the site visit data included location, system type and capacity (kW), panel, and inverter make and model, panel tilt and azimuth and presence of obstructions. For wind generation systems, the site visit data included location, system type, capacity (kW), turbine and inverter make and model, general topography description and turbine tower height.

We recalculated savings using appropriate algorithms based on as-built conditions observed during the site visit. For photovoltaic systems, we estimated annual energy production for each installation using the National Renewable Energy Laboratory (NREL) PVWATTS software. PVWATTS is a performance calculator for grid-connected PV systems. The PVWATTS results were also used to estimate the capacity factor for each sampled system. The capacity factor is the ratio of the expected annual system output relative to what the system could have produced if it ran at full power, 24 hours a day, for the entire year. For wind generation systems, we estimated the annual energy production for each installation using NREL published wind resource maps and manufacturer's wind speed versus energy production data. The capacity factor was also calculated in a similar manner to the PV systems. To the extent possible, we documented reasons for differences between the evaluation and program generation estimates.

We completed the evaluation by reviewing the UES calculation methods used by NWE to estimate program savings for the solar and wind systems. For each sampled case we compared the system production results based on the evaluation methodology to the tracking results. We made observations as to the ability of the UES methods to yield the same energy production estimates as the more complex evaluation methods.

23.2.1.2. Free Ridership

To estimate free ridership rates we used a self-report method through surveys with a statistically valid sample of participants. See section 31.4 for further discussion of how we treated free ridership in the estimation of net savings for this evaluation.

23.2.1.3. Spillover

Our spillover method combines survey and on-site research. Using the self-report (survey) method, we asked participants whether they installed efficiency measures in addition to those they obtained through the program and, if so, asked the extent to which NWE DSM activities had influenced them to undertake the efficiency action outside of the program. For respondents rating NWE's influence on their decision to install non-incented measures (influence ratings of “3” or higher), we investigated during the on-site research whether the measures were, indeed, energy efficient, and we again inquired about the program influence. We estimated savings for spillover measures using site visit observations and site-specific savings estimation procedures similar to those used for measures provided by the programs. See section 31.4 for further discussion of how we treated spillover in the estimation of net savings for this evaluation.

23.2.1.4. Leakage

Leakage occurs when a program-supported measure leaves the utility’s service territory. We assessed leakage of measures by asking participants whether they still had the program-supported equipment. If the measure(s) was no longer in the respondent’s possession, we asked what happened to the measure and if it was given to another person, we inquired as to the recipient’s location. We compared responses to questions about electric efficiency measures to NWE’s electricity service territory and responses about gas measures to its gas service territory. We considered as “leaked” any measures we found that left the relevant service territory.

23.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

23.2.2. Energy and Demand Impacts

We estimated gross and net production (kWh) for each of the sampled measures. Separate discussions of the gross and net savings realized for this program are provided below.

23.2.2.1. Estimation of Gross Savings

File Review

We completed a file review of 31 residential and 26 non-residential cases for this program across the five program years. The results from this review revealed no entry errors in the program tracking database associated with energy savings.

Site Recruitment

The table below summarizes the results of the recruiting and scheduling/inspecting effort for on-site visits. The table covers both the residential and commercial segments of the program. “Total Recruited” is the total number of customers who volunteered for an on-site inspection. “Total Completed” is the total number of customers who were subsequently able to schedule a site visit with and successfully conduct an on-site inspection. We recruited customers for a site visit two ways: either by the Telephone Lab during process interviews or during a follow-on Special Effort recruiting phase that was focused solely on site visits.

The percentages on the far right of the table provide some insight into the relative difficulty or ease with which on-site visit volunteers were contacted, recruited, scheduled, and visited. For the E+ Renewable program we successfully visited 29 sites encompassing three different strata. There was one stratum 9 site where the inspector was unable to contact the customer for scheduling the site visit; we replaced this site with a stratum 2 site.

Table 563: Site Recruitment Disposition for E+ Renewable

	Stratum			Total n	%
	1	2	9		
Recruitment					
Telephone Lab	31	16	0	47	
Special Effort					
Attempts	0	0	2	2	
No Reply	0	0	0	0	0%
Refused	0	0	0	0	0%
Recruited	0	0	2	2	100%
Total Recruited	**31**	**16**	**2**	**49**	
Onsite					
Refused	1	0	1	2	4%
Not Needed	14	4	0	18	37%
Total Completed	**16**	**12**	**1**	**29**	**59%**

Site Inspections

We performed site inspections for a sample of 12 commercial renewable projects and 17 residential renewable projects. Both the residential and commercial samples included one wind project. All other sample cases were solar photovoltaic projects. We calculated energy production (kWh) for each sampled project by applying the simulation methods described above using the as-built conditions observed during the site visit.

During the sites visits, we found that the projects were generally installed and producing energy. The evaluation and program estimates of electric production were very close for six of the twelve commercial projects. We assigned the evaluation production for one solar project a zero because the system was found to not be operating during the site visit. For two solar projects, the evaluation production was significantly less than the program estimate due to a less than optimum tilt angle, azimuth angle and/or shading of the PV array. The evaluation production was significantly greater than the program estimate in three cases. We determined the program estimate (UES method) of production for the wind project to be overly conservative. This was confirmed with measured production data observed during the site visit. We also determined the program estimate of production for one of the solar projects to be overly conservative because the installed project included a solar tracking system that increased electric production. We determined the program estimate of production for another solar system to be overly conservative because the program estimate was based on an incorrect rated system capacity.

The evaluation and program estimates of electric production were very close for 12 of the 17 residential projects. For five of the solar projects, the evaluation production was significantly less than the program estimate due to a less than optimum tilt angle, azimuth angle and/or shading of the PV array.

UES Review

NWE uses a similar UES method for both the solar and wind systems in both sectors. For both technologies, production is estimated by multiplying the rated generation capacity of the system (kW) by a constant, which represents annual number of full load hours. The equivalent full load hours are based on capacity factors multiplied by 8760 hours per year. Solar systems have a deemed capacity factor of 15% or 1314 equivalent full load hours. Capacity factors for wind turbine systems vary between 5% and 15%, depending on equipment specifications. For each sampled case, we compared the production estimated by the UES method to the production estimated by the more complex evaluation methods discussed above (see section 23.2.1.1). This comparison revealed that the UES and evaluation methods were in good agreement for solar systems that were installed properly. However, unlike the evaluation method, the UES method was not able to capture the site-specific effects on systems that were impacted by factors such as improper tilt and/or azimuth angles and partial shading of the PV array. We observed during the site visits that most of the solar systems were installed properly, so the UES method was very adequate. However, we reduced the overall realization rate for the program somewhat because the UES method over-estimated savings for the few systems that had less than optimum site factors.

We made a similar comparison for the two wind systems (one residential and one commercial). The evaluation and UES methods produced very similar estimates of electric production for the 5kW residential wind system. However, we estimated production for the 10kW commercial system to be 35% greater than estimated by the UES method. Actual measured wind production data observed during the site visit confirmed that the evaluation estimate was more accurate and that the UES method produced an overly conservative production estimate.

The results from the UES review suggest that NWE should consider a revision to the UES method for future program years or adopt the methodology used in this evaluation for all projects. Although the evaluation method is more complex than a simple UES formula, it is straightforward to use so it would not create an undue burden on the program implementers.

Capacity Factor

We calculated the capacity factor for each renewable project in the sample. The capacity factor is the ratio of the expected annual system output relative to what the system could have produced if it ran at full power for the entire year. For the commercial PV projects, the capacity factor for projects that were producing energy ranged from 0.070 to 0.219. The weighted average was calculated to be 0.157. For residential PV projects the capacity factor ranged from 0.121 to 0.190 with a weighted average of 0.147.

For the commercial wind project, we calculated the capacity factor to be 0.122. For the residential wind project the factor was 0.094. The weighted average capacity factor across both projects was 0.113.

Table 564: Summary of Commercial and Residential Production and Capacity Factor Results

Site	Type	Evaluation Annual Energy Production (kWh)	Program Annual Energy Production (kWh)	% Difference	Rated Capacity (kW)	Capacity Factor
Commercial						
CI 2	PV	0	4139	-100.00%	3.192	0.000
CI 3	PV	2688	3088	-12.95%	2	0.153
CI 4	PV	10411	10906	-4.54%	8	0.149
CI 5	PV	226	486	-53.50%	0.37	0.070
CI 8	PV	7356	5046	45.78%	3.84	0.219
CI 9	PV	3869	3811	1.52%	2.88	0.153
CI 10	PV	4346	4415	-1.56%	3.36	0.148
CI 11	PV	2877	3022	-4.80%	2	0.164
CI 12	PV	9296	7884	17.91%	6.72	0.158
CI 13	PV	4702	4836	-2.77%	3.68	0.146
CI 14	PV	65076	63860	1.90%	48.62	0.153
CI6	Wind	10671	7884	35.35%	10	0.122
Residential						
R 2	PV	2652	2719	-2.46%	2.07	0.146
R 3	PV	9063	8869	2.19%	6.75	0.153
R 4	PV	3189	3535	-9.79%	3	0.121
R 5	PV	8005	8449	-5.26%	6.43	0.142
R 6	PV	8003	8160	-1.92%	6.21	0.147
R 7	PV	7220	8094	-10.80%	6	0.137
R 10	PV	3798	3942	-3.65%	3	0.145
R 11	PV	2994	2957	1.25%	2.25	0.152
R 12	PV	3568	3705	-3.70%	2.82	0.144
R 14	PV	3361	3390	-0.86%	3	0.128
R 19	PV	2719	3022	-10.03%	2	0.155
R 21	PV	5803	5676	2.24%	4.32	0.153
R 26	PV	6495	6833	-4.95%	3.9	0.190
R28	PV	4757	4730	0.57%	3.6	0.151
R 31	PV	5483	5913	-7.27%	5	0.125
R 33	PV	3389	3705	-8.53%	3	0.129
R29	Wind	4112	3942	4.31%	5	0.094
Total		**206129**	**207018**	**-0.43%**	**163.0**	

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review and site visit results for this program. The table compares the reported savings to those adjusted for changes based on our file review. Also shown, are the savings after site visit adjustments are applied and the final effects of both file review and site visit adjustments. In addition to the program savings, the table also shows the adjustment rates associated with file review, site visits and the final savings adjustment rates. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 565: File Review and Site Visit Adjustment to Savings for E+ Renewable

Funding	Study Name	Units	Savings				Savings Adjustment Rates		
			Reported	File Review	Site Visit	Final	File Review	Site Visit	Final
Electric									
	Business Renewable	kWh	1,083,142	1,083,142	1,111,074	1,069,834	1.00	1.03	0.99
	Residential Renewable	kWh	1,321,415	1,321,415	1,277,455	1,305,180	1.00	0.97	0.99

23.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews and site visits. Free ridership and spillover rates are zero based on the analysis and findings we describe in section 31.4. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings. No leakage rate (measures being sent outside the NWE service area) was estimated as none of the sampled program participants reported any leakage.

Table 566: Savings Adjustments by Calendar Year for E+ Renewable

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	E+ Renewable	kWh	2007	285,657	0.99	-	-	0.99	282,147	32
	E+ Renewable	kWh	2008	599,146	0.99	-	-	0.99	591,784	68
	E+ Renewable	kWh	2009	557,439	0.99	-	-	0.99	550,590	63
	E+ Renewable	kWh	2010	612,472	0.99	-	-	0.99	604,946	69
	E+ Renewable	kWh	2011	349,844	0.99	-	-	0.99	345,545	39
	E+ Renewable	kWh	All Years	2,404,557	0.99	-	-	0.99	2,375,013	271
Electric										
	E+ Renewable	kWh	All Years	2,404,557	0.99	-	-	0.99	2,375,013	271

23.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 567: Net Savings and Benefit/Cost Ratios by Calendar Year for E+ Renewable

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	E+ Renewable	kWh	2007	282,147	0.06	0.19	0.17	0.07
	E+ Renewable	kWh	2008	591,784	0.14	0.44	0.40	0.15
	E+ Renewable	kWh	2009	550,590	0.08	0.36	0.34	0.09
	E+ Renewable	kWh	2010	604,946	0.09	0.29	0.28	0.10
	E+ Renewable	kWh	2011	345,545	0.09	0.24	0.23	0.09
	E+ Renewable	kWh	All Years	2,375,013	0.09	0.30	0.28	0.10
Electric -USB								
	E+ Renewable	kWh	All Years	2,375,013	0.09	0.30	0.28	0.10

23.3. Process Evaluation

23.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

To understand the process of participation and the experiences of participants, we conducted phone surveys with 41 residential participants, 16 commercial participants, and seven qualified installers from the E+ Renewable program. Surveyed trade allies include those who reported offering PV products and services. We were unable to complete surveys with any wind installers, but a few of the PV installers reported experience with wind systems.

23.3.2. Implementation Findings

23.3.2.1. Interview Findings

This program provides incentives for a variety of renewable generation technologies including wind, micro-hydro, and biomass, but the majority of projects and funding go to photovoltaics. The program is delivered primarily through qualified-installers who have undergone training for performing installations safely. These installers promote the program and determine pricing.

NWE conducts outreach activities for this program. They run education sessions yearly, as well as monthly tours of a facility site and other activities at schools and trade shows. NWE works with the Alternative Energy Resource Organization (AERO) to coordinate activities across the state, including special one-on-one sessions. NWE also partners with the Montana Renewable Energy Association (MREA) who does additional education. In addition, NWE developed several publications to market the program, particularly about what “renewable energy” means. The renewables program is funded with USB dollars. The program is available to all electric supply customers.

Most projects funded by this program are small-scale residential photovoltaics of about 1-3 kW. If a project requests more than the standard funding rate, the project proposal is included as in the review process by the USB renewable advisory subcommittee. The committee generally meets twice a year and provides advice to NWE regarding allocation of renewable and research and development funds. The committee has encouraged project funding that addresses geographic diversity of projects and is open to considering projects with novel, educational, or socially beneficial attributes. In advance of committee meetings, NWE provides a summary of each project proposal along with NWE staff recommendations. The committee meets with NWE to review the projects and advise NWE as to the allocation funds. This committee is considered a helpful and knowledgeable resource as many of the members have been working on the committee for over a decade. NWE takes the advice of the committee forward in securing NWE management approval to allocate available funds and to execute project contracts.

For this evaluation period, contracts were set up for installers guaranteeing a certain amount of funding for the projects they complete. NWE qualified installers were paid per completed installation from this contracted amount. Occasionally NWE entered into contracts with homeowners, guaranteeing funding after the installation is complete. However, starting in June 2009, contracts were only provided to qualified installers, those who have successfully completed training requirements. The listing of installers is provided on NWE’s website.

NWE offers net metering for projects under 50kW. One of the reasons why self-install is not encouraged is because the system has to be able to interface with NWE's infrastructure. As part of the net-metering process, the electrician who performs the hook-up verifies that the equipment is installed safely and properly for the purposes of connecting to the grid. NWE reserves the right to perform additional inspections but does so infrequently. These tend to be done for the purposes of verifying new equipment models.

Just prior to this evaluation cycle, there were some major changes to the program. Previously, program funds had decreased because more USB funding was allocated to other USB categories, such as low income. Incentive levels decreased from $3.50/watt up to a maximum of $7,000 for photovoltaics down to $3.00/watt up to a maximum of $6,000. As a result of new USB allocation guidelines established by the MPSC, funding levels were increased in 2009. 2009 was also the year that NWE began a training program and required qualifications for installers. NWE believes that the there may now be enough qualified installers and sufficient customer awareness to shift from securing a block of USB funds through a single contract with an individual qualified installer to a more traditional rebate-to-customer process. Under this approach, a rebate would be paid to a customer working with a qualified installer for qualifying "standard" small PV or wind projects. This approach is under consideration but has not yet been adopted. NWE is looking for opportunities to streamline contracting processes as the technology continues to evolve and the market develops. NWE is working to define installer and installation qualification requirements more clearly.

For evaluation purposes, documentation for the commercial and residential renewable technologies programs could be improved. The approach used by NWE was to sign contracts with installation contractors, who subsequently sign contracts with individual customers. This results in NWE being removed from the customers' projects without project-specific information available for evaluation. The only documentation provided was the contract with the installer. Because the evaluation was based on project-level (i.e. customer-level) sampling, extra effort was required to quantify evaluation parameters pertinent to individual projects. It was particularly difficult to compare measure costs to participant costs. The change in the incentive payment approach listed above could improve project detail for evaluation purposes.

23.3.2.2. Best Practices Assessment

Table 568 through Table 571 identify program best practices in four domains and assess NWE's program activities in comparison with the best practices. These domains are: program planning and design; program management and administration; marketing and outreach; and quality control. In addition to these domains, section 31 assesses NWE's activities in comparison with best practices for program tracking and evaluation.

Table 568: Program Planning and Design Best Practices for E+ Renewable

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic

Practice	NWE Assessment
success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to qualified installers annually

Table 569: Program Management and Administrative Best Practices E+ Renewable

Practice	NWE Assessment
Develop written process plan ▪ Include program management activities ▪ Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers ▪ Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE program has systematic inspections and verifications
Keep participation simple	Opportunity exists to facilitate the application process for participants
Offer assistance in preparing and submitting program applications	Renewable contractors are available to assist customers in the participation process
Use internet to facilitate participation	NWE's website clearly presents program information
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and installers to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff and installers,

Practice	NWE Assessment
	including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses program activity and experiences with qualified installers and customers
Offer a single point of contact	Participants have access to program staff
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	Program implementation staff has renewable energy education and experience

Table 570: Marketing and Outreach Best Practices for E+ Renewable

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	Program is actively marketed by renewable energy installers as incentives greatly increase their odds of closing sales; renewable/environmental advocacy organizations, public presentations and events through contractors and other organizations
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs Trade allies and qualified installers are informed of all NWE programs

Table 571: Program Quality Control Best Practices for E+ Renewable

Practice	NWE Assessment
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE inspects some of its renewable projects, due to uncertainty of savings

Practice	NWE Assessment
Assess customer satisfaction	NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE staff reviews all invoices for accuracy
Implement a contractor QC process, such as training, screening or certification	NWE has education and training materials for renewable installers, training to assist contractors in achieving qualifications, and NWE staff is available for ongoing support

23.3.3. Participant Findings

As a part of our process evaluation of the E+ Renewable program, we surveyed participants from both the Residential Renewable and Business Renewable components of this program.

Interpreting Response Frequencies from Stratified Samples

We surveyed the stratified random sample of program participants selected to support the impact analysis. Our tables of results identify the count of participants that responded to the question (exclusive of any participants responding “don’t know” or “not applicable”) and the weighted frequency (percent) of those respondents providing a given answer. Unlike the frequency results for simple random samples, for which one can calculate the number of respondents providing the given answer by multiplying the count by the frequency, for weighted samples this same calculation may indicate that a given answer was provided by a fractional number of respondents. For example, consider a sample of ten participants. While the frequencies of simple random samples would be multiples of 10%, the weighted frequencies for stratified random samples would not be. For small samples, in particular, this situation can be confusing for the reader.

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent’s view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text “Allowed Multiple” in table headers.

23.3.3.1. Residential Renewable

We administered a phone survey to 41 residential E+ Renewable program participants to assess various aspects of their experience with the program.

Information Access, Awareness, and Decision Making

Program participants provided general feedback about the types of NWE efficiency information resources they used and the types of additional information they wanted. They also provided information about their decision to enroll in the Program.

Most respondents (70%) had visited the utility website. Among those who had *not* been to the website, lack of access was not typically the reason (Table 572).

Table 572: Reasons Website Not Used, among Residential Renewable Participants

Reasons Given (Allowed Multiple)	Weighted Percent (n=10)
Don't like the internet	24%
No need	23%
Just haven't	18%
Don't have access	12%
No interest	12%
Other	12%

Over three-fourths of website users said they used the website to find information on how to contact NWE (Table 573). Over half said they used the website to pay their utility bill or find out about rebates or audits.

Table 573: Website Use, among Residential Renewable Participants

Reasons Given for Using Site (Allowed Multiple)	Weighted Percent (n=27)
To contact utility	82%
Pay utility bill	60%
Find out rebates or audits	53%
Money saving ideas	34%
Educational events info	22%
Track energy usage	22%
Look up general info	13%

Over two-thirds of respondents who visited the website indicated that the information was easy to find and helpful (Figure 185).

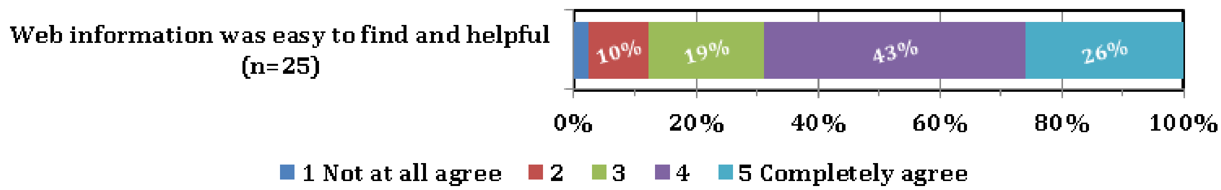

Figure 185: Website Effectiveness, among Residential Renewable Participants

At least half of all respondents would be interested in more information on energy efficiency programs, while just under half are not interested in more at this time (Table 574).

Table 574: Further Information Desired, among Residential Renewable Participants

Information Types (Allowed Multiple)	Weighted Percent (n=41)
Energy efficiency programs	50%
Do not want any	47%
Workshops or events on energy efficiency	37%
Energy saving educational opportunities	30%

Respondents identified the best ways to contact them with energy efficient information from NWE; the majority preferred both face-to-face (such as events) and written (via mail or email) delivery methods (Table 575).

Table 575: Information Delivery Preference, among Residential Renewable Participants

Preferred Method (Allowed Multiple)	Weighted Percent (n=22)
Community event	69%
Trainings, workshops or seminars	67%
US Mail	64%
Email	61%
Webinar	33%
Phone	19%
Other	11%

Responses emphasize the importance of the trade ally role for program promotion as the large majority of respondents heard about the renewable energy program through an equipment vendor, contractor, or other building professional (Table 576).

Table 576: Means of Program Awareness, among Residential Renewable Participants

Heard About Program From... (Allowed Multiple)	Weighted Percent (n=41)
Building professional, vendor, or contractor	82%
Word of mouth	54%
Utility publication or ad (n=40)	43%
Directly contacted utility (n=39)	26%
Utility representative appearance	13%
Other	21%

We asked respondents about their reasons for installing a renewable energy project. Reducing electric energy costs and environmental concerns were mentioned most often as important (Figure 186).

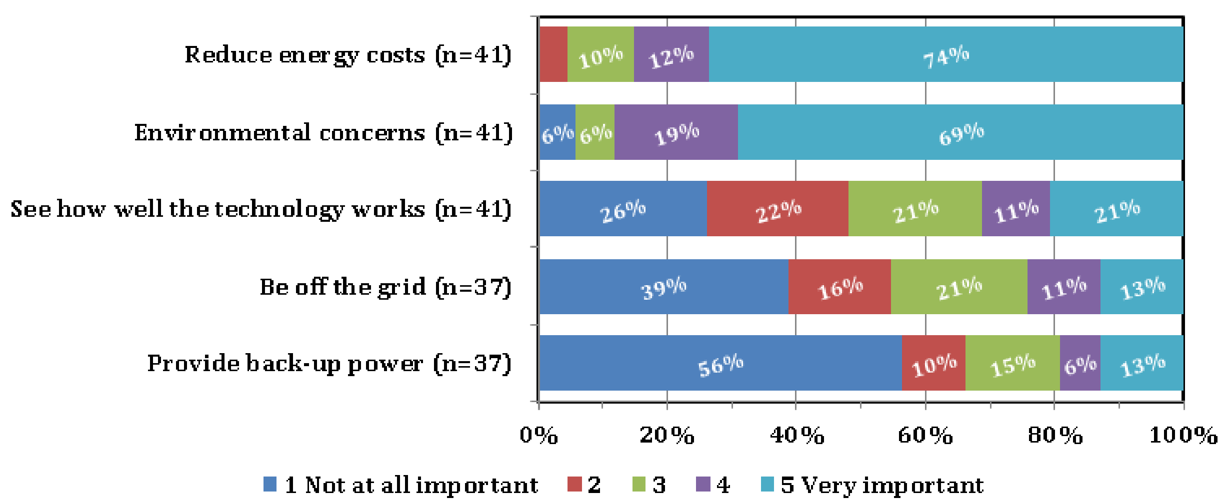

Figure 186: Importance of Reasons to Install Renewable Project, among Residential Renewable Participants

Nearly all respondents also mentioned saving money on utility bills as a key reason for installing a renewable energy system (Table 577).

Table 577: Typical Reasons for Program Participation, among Residential Renewable Participants

Other Reasons for Participation (Allowed Multiple)	Weighted Percent (n=41)
Save money on utility bill	97%
Reduce reliance on utility for electricity (n=40)	83%
Financial incentive on system	69%
Increase property value	66%

Other Reasons for Participation (Allowed Multiple)	Weighted Percent (n=41)
Contractor recommended (n=40)	55%
Utility vouched for equipment	49%
Prior good experience with utility program	21%

Most respondents said that the incentive they received played a major role in their decision to purchase their renewable energy source through NWE, while everyone had at least one other reason (Figure 187).

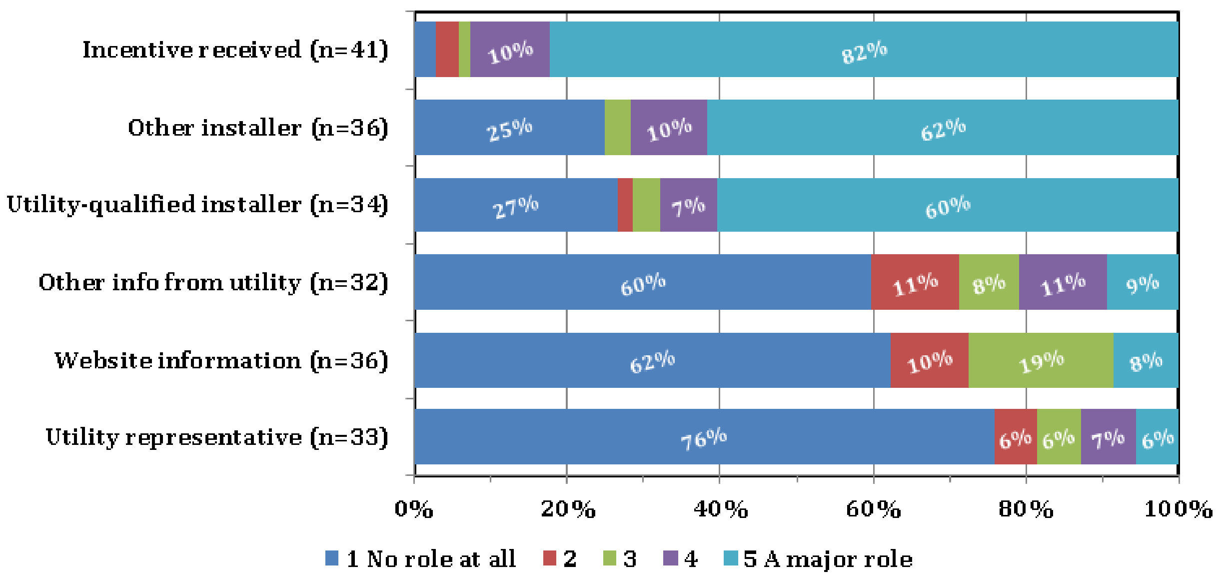

Figure 187: Influences on Decision, among Residential Renewable Participants

Twelve of 41 (29%) of respondents said that they had questions or concerns about doing a renewable energy project, and their concerns are detailed in the table below (Table 578).

Table 578: Initial Questions or Concerns, among Residential Renewable Participants

Question	Weighted Percent (n=12)
Specific building issues	26%
Not sure it would be worth it	16%
Financing	16%
Net metering	16%
Incentive not enough	16%
Other	11%

Program Experiences

Participants reported on their program participation experience during the application, installation, and verification processes, as well as their overall satisfaction with the program.

The majority of respondents reported that they initiated the conversation with their contractor about a renewable energy project (Table 579).

Table 579: Project Initiator, among Residential Renewable Participants

Initiator of Discussion About Project	Weighted Percent (n=41)
Participant	72%
Both	13%
Vendor or contractor	9%
Other	6%

Respondents also reported on how they found the contractor for their project: over half said that someone recommended the contractor (Table 580).

Table 580: Finding A Contractor, among Residential Renewable Participants

How Contractor Was Found	Weighted Percent (n=40)
Recommendation	51%
Contractor contacted participant	18%
Internet or phonebook search	11%
Advertisement	6%
Utility qualified list	2%
Other	12%

A large majority of respondents said that their engineer or contractor was largely responsible for preparing the project proposal (Table 581).

Table 581: Proposal Preparation, among Residential Renewable Participants

Main Proposal Preparer	Weighted Percent (n=41)
Contractor/installer	75%
Both participant and contractor/installer	16%
Other	9%

Prior to starting project preparations, few (5%) respondents received advisory services from NWE. Very few (2) who received advisory services thought it was useful and helpful.

When asked about the clarity of program information received from NWE, up to half of participants reported receiving no information directly from NWE about how the program worked. Of those who did, a strong majority rated the information a “3” or above, with a rating of “5” equal to “very clear” (Figure 188).

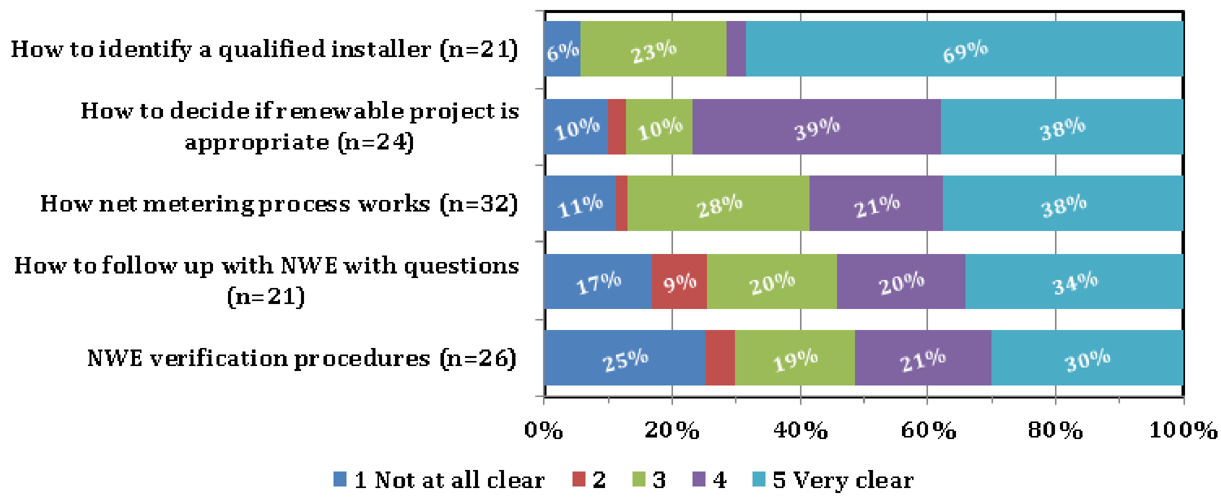

Figure 188: Clarity of Program Information, among Residential Renewable Participants

Most of respondents (37 of 41) were involved with their renewable project from the beginning of the project development phase. However, less than half reported receiving information from NWE related to the various project development steps. Of those who did, ratings of information clarity were low, with nearly half of contacts rating information about bids, proposal creation, submission and issue investigation as unclear (a “1” or a “2” on a five-point scale; Figure 189).

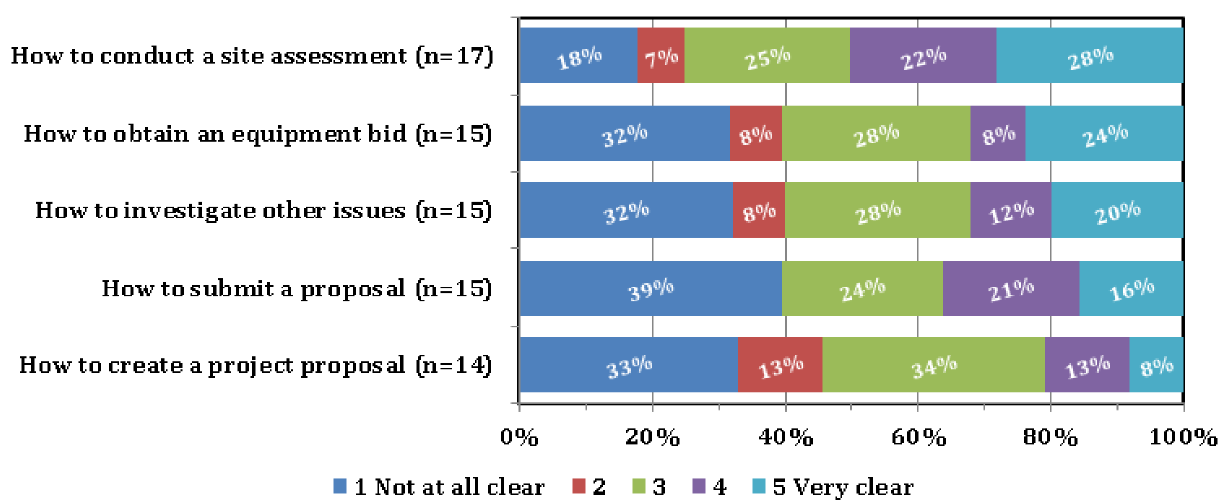

Figure 189: Clarity of Project Proposal Stages, among Residential Renewable Participants

When asked whether any further information would have been useful to have while working on their renewable energy project, a few respondents (8%) mentioned that information on net metering would be useful, but the majority (87%) said "none."

We also sought to understand whether respondents had applied for funding from *other* sources in addition to the incentive offered by NWE. A majority of respondents applied for a state of Montana tax credit (Table 582). All respondents who applied for federal funding received those funds, and all tax credit applications were at least partially funded.

Table 582: Funding Applied For, among Residential Renewable Participants

Other Funding Sources (Allowed Multiple)	Weighted Percent (n=41)
State of Montana Tax Credit	75%
Federal funding or tax credits	26%
State of Montana Alternative Energy Revolving Loan	24%
Property tax exemption	10%
Other funding	28%
None	12%

More than two-thirds of respondents met with a NWE inspector for work done through the program. Of those, more than 80% completely agreed the inspector was prompt and courteous.

Residential renewable respondents reported high levels of satisfaction with each step in the program process (Figure 190 and Figure 191). Respondents reported the highest satisfaction with the system design process and installation elements.

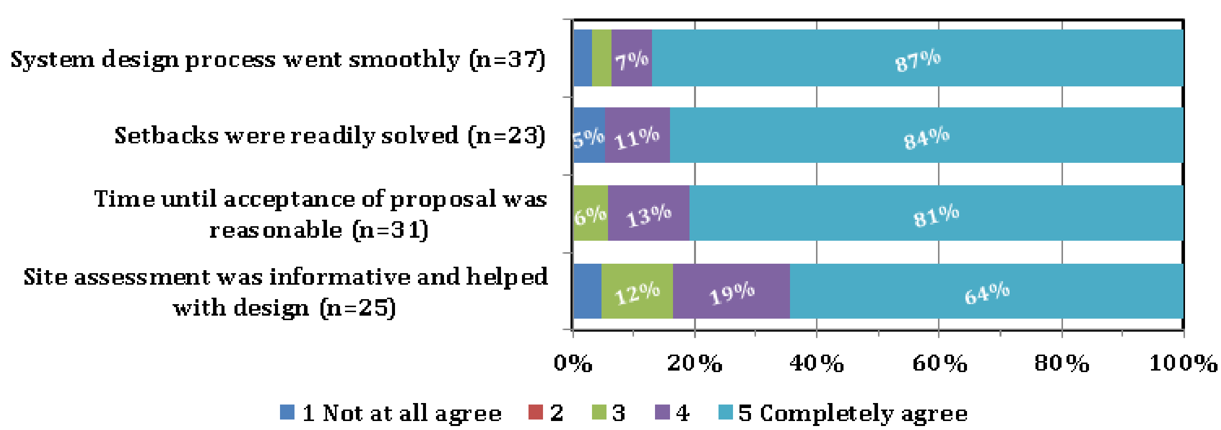

Figure 190: Satisfaction with Project Development, among Residential Renewable Participants

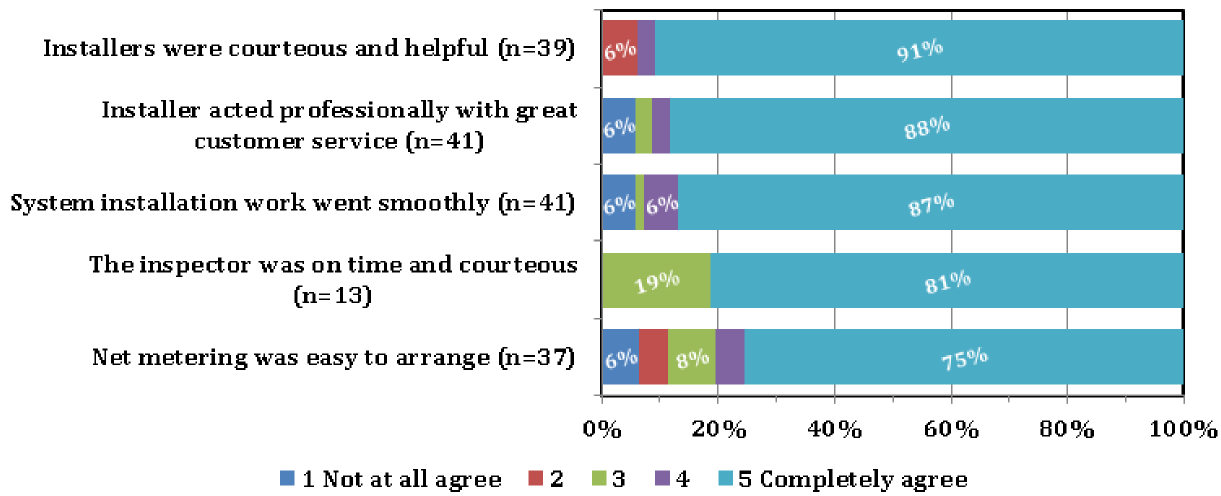

Figure 191: Satisfaction with Installation Process, among Residential Renewable Participants

The actual annual energy output of the renewable system met or exceeded participant expectations (Table 583).

Table 583: View of Energy Output, among Residential Renewable Participants

Annual Energy Output:	Weighted Percent (n=38)
Exceeded expectations	45%
Met expectations	44%
Fell short of expectations	11%

As an indicator of overall program satisfaction, the evaluation team also asked respondents whether they would be likely to participate in future programs. Nearly 90% of respondents said that they would be likely or very likely to participate in other NWE efficiency or renewable programs (Figure 192).

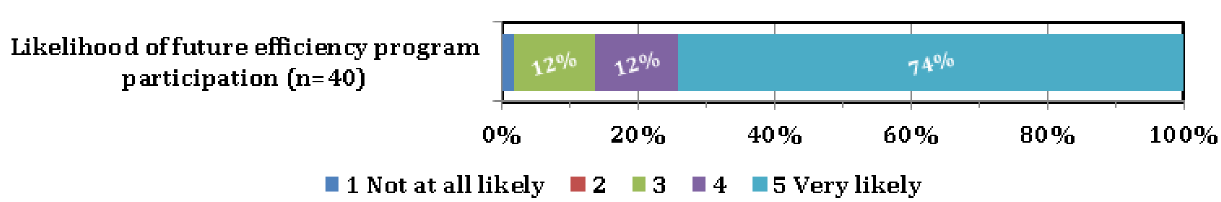

Figure 192: Likelihood of Future Participation, among Residential Renewable Participants

23.3.3.2. Business Renewable

We administered a phone survey to 16 Business Renewable component participants to assess various aspects of their experience with the program.

Information Access, Awareness, and Decision Making

Program participants provided general feedback about the types of NWE efficiency information resources they used and the types of additional information they wanted, as well as providing information about their decision to enroll in the Program.

Most respondents (62%) had visited the utility website. Among those who had *not* been to the website, the reasons given amounted to a simple "don't wish to."

Two-thirds of website users said they used the website to find information on how to contact NWE (Table 584). Over half also looked for information about: rebates or audits, money-saving ideas, and educational events.

Table 584: Website Use, among Business Renewable Participants

Reasons Given for Using Site (Allowed Multiple)	Weighted Percent (n=10)
To contact utility (n=10)	70%
Find rebates or audits (n=10)	61%
Money saving ideas (n=10)	59%
Educational events info (n=10)	50%
Pay utility bill (n=10)	20%
Track energy usage (n=10)	11%
Look up general info (n=10)	11%
How-to videos (n=10)	0%

Most respondents who visited the website at least partly agreed that the information was easy to find and helpful (Figure 193).

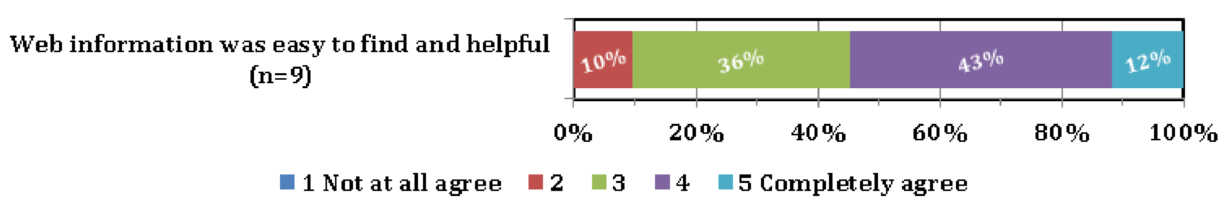

Figure 193: Website Effectiveness, among Business Renewable Participants

A majority of respondents would be interested in more information on energy efficiency programs, workshops, or events, or further education, with just 20% saying they do not want any more information (Table 585).

Table 585: Further Information Desired, among Business Renewable Participants

Topics (Allowed Multiple)	Weighted Percent (n=16)
Workshops or events on energy efficiency (n=16)	74%
Energy efficiency programs (n=16)	49%
Energy saving educational opportunities (n=16)	43%
Do not want any (n=16)	20%

Respondents identified the best ways to contact them with energy efficient information from NWE; more than half of participants preferred in-person workshops or training and written (via US Mail or email) communication (Table 586).

Table 586: Information Delivery Preference, among Business Renewable Participants

Preferred Method (Allowed Multiple)	Weighted Percent (n=13)
Mail (n=13)	76%
Email (n=13)	75%
Trainings, workshops or seminars (n=13)	56%
Community event (n=13)	46%
Webinar (n=13)	44%
Phone (n=13)	32%
Other (n=13)	15%

Responses emphasized the importance of the trade ally role for program promotion as a large majority of respondents heard about the program through an equipment vendor, contractor, or other building professional (Table 587). Over half heard through word of mouth or a NWE publication.

Table 587: Means of Program Awareness, among Business Renewable Participants

Heard About Program From…(Allowed Multiple)	Weighted Percent (n=16)
Building professional, vendor, or contractor	81%
Utility publication or ad	55%
Word of mouth	55%
Utility representative appearance	37%
Other	31%

Heard About Program From...(Allowed Multiple)	Weighted Percent (n=16)
Directly contacted utility	23%

We asked respondents to rate five possible reasons for installing a renewable energy project. Reducing electric energy costs and environmental concerns were mentioned most often as important (Figure 194).

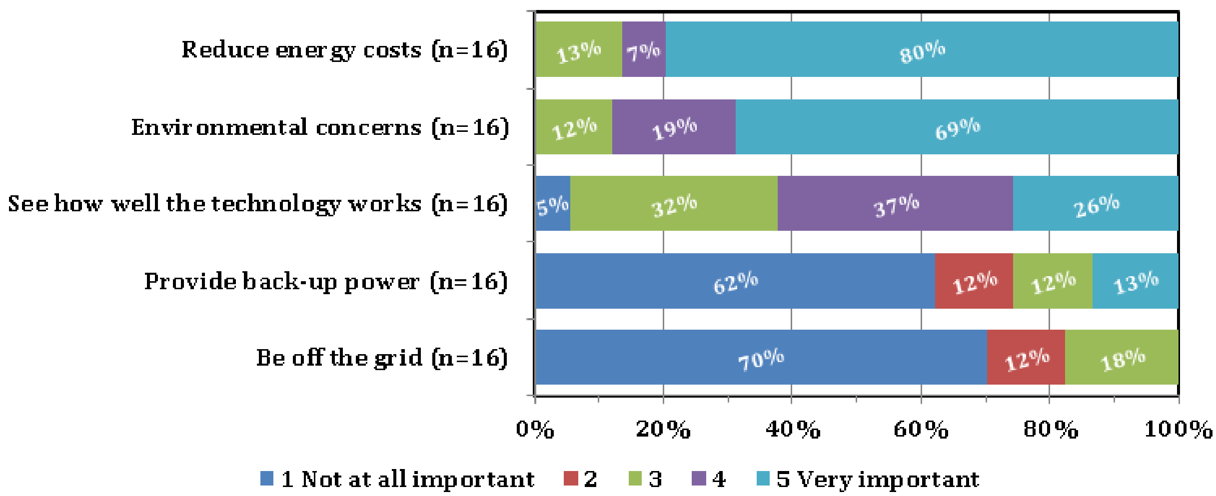

Figure 194: Importance of Reasons To Install Renewable Project, among Business Renewable Participants

Nearly all respondents mentioned saving money on utility bills as a key reason for participating in NWE's renewable energy program (Table 588). Having the utility "endorse" the equipment through the program was another reason for a large majority.

Table 588: Typical Reasons for Program Participation, among Business Renewable Participants

	Weighted Percent (n=16)
Save money on utility bill (n=16)	93%
Utility vouched for equipment (n=16)	81%
Reduce reliance on utility for electricity (n=16)	80%
Financial incentive on system (n=16)	63%
Contractor recommended (n=16)	46%
Prior good experience with utility program (n=16)	46%
Increase property value (n=16)	31%

A majority of respondents said that the incentive they received played a major role in their decision to purchase their renewable energy source through NWE, yet most had at least one other reason (Figure 195).

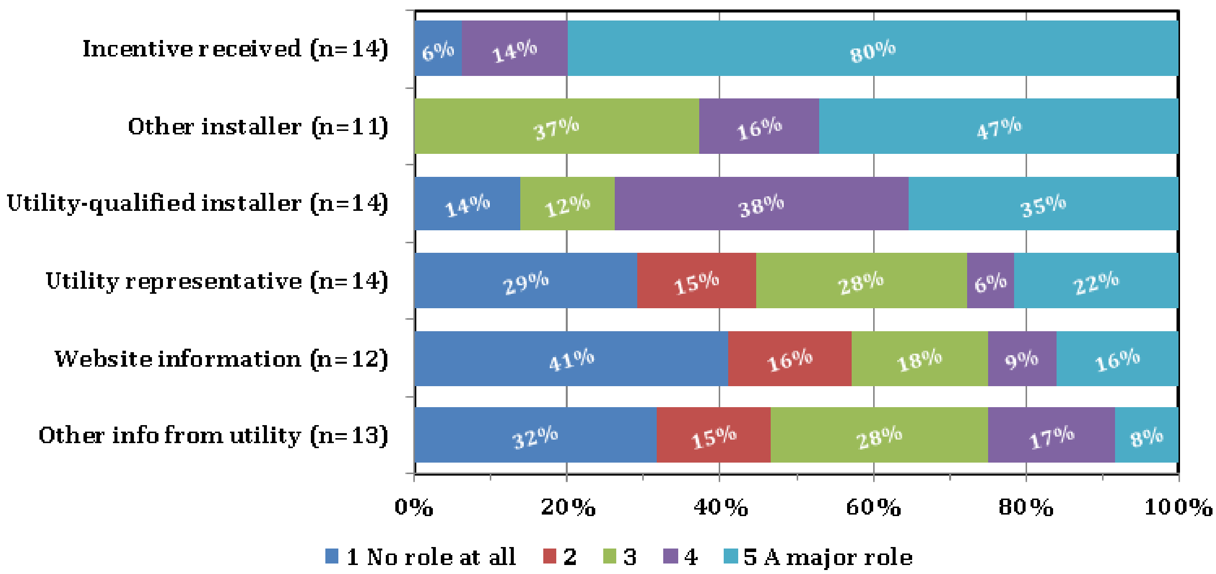

Figure 195: Influences on Decision, among Business Renewable Participants

Only one participant (of 16) had a question or concern about doing a renewable project, it had to do with sufficient southern exposure for solar panels.

Program Experience

Participants reported on their program participation experience during the application, installation, and verification processes, as well as their overall satisfaction with the program.

Respondents reported on who initiated the discussion about their renewable project. Reported initiators of this project discussion were fairly evenly divided amongst participants, vendors/contractors, or both (Table 589).

Table 589: Project Initiator, among Business Renewable Participants

	Weighted Percent (n=16)
Participant	39%
Vendor or contractor	26%
Both	24%
Other	11%

Respondents also reported on how they found the contractor for their project: one-third were contacted by the contractor (Table 590).

Table 590: Finding a Contractor, among Business Renewable Participants

How Contractor Was Found	Weighted Percent (n=15)
Contractor contacted participant	33%
Recommendation	20%
Internet or phonebook search	20%
Utility qualified list	14%
Advertisement	7%
Other	6%

Over half of respondents said that their engineer or contractor was largely responsible for preparing the project proposal (Table 591). However, participants played an active role in proposal preparations with one-third reporting taking a main or a supporting role.

Table 591: Proposal Preparation, among Business Renewable Participants

Main Proposal Preparer	Weighted Percent (n=15)
Engineer/ contractor / installer	54%
Both participant and contractor/installer	20%
Participant or another in organization	13%
Other	13%

Prior to starting project preparations, about a third of respondents received advisory services from NWE. Among those receiving advisory services, 77% agreed that the assistance was useful and helpful.

When asked about the clarity of program information provided by NWE on selected topics, at least one fourth of participants reported receiving no information directly from NWE about how the program worked. Of those who did, just over half said information on net metering and on-site verifications was clear (“4” and “5” ratings; Figure 196). Fewer than half of those receiving information on the three other topics rated the information as clear of very clear.

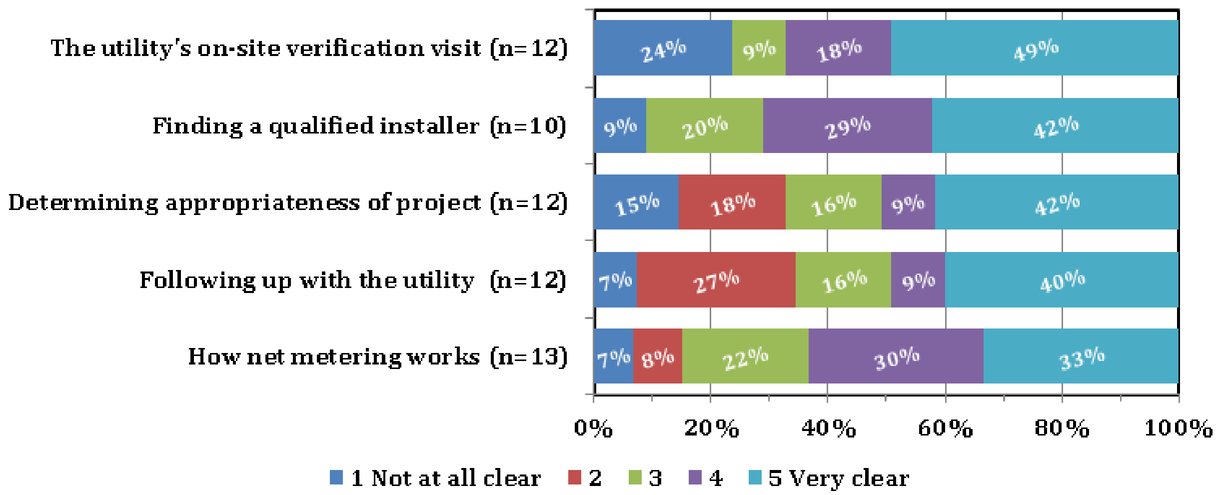

Figure 196: Clarity of Program Information, among Business Renewable Participants

Participants who took an active role in project development reported on the clarity of information provided on the stages of proposing a project (Figure 197). Responses were very mixed and generally poor, with top rating reported by less than 30% of respondents. Information on obtaining an equipment bid was rated least clear.

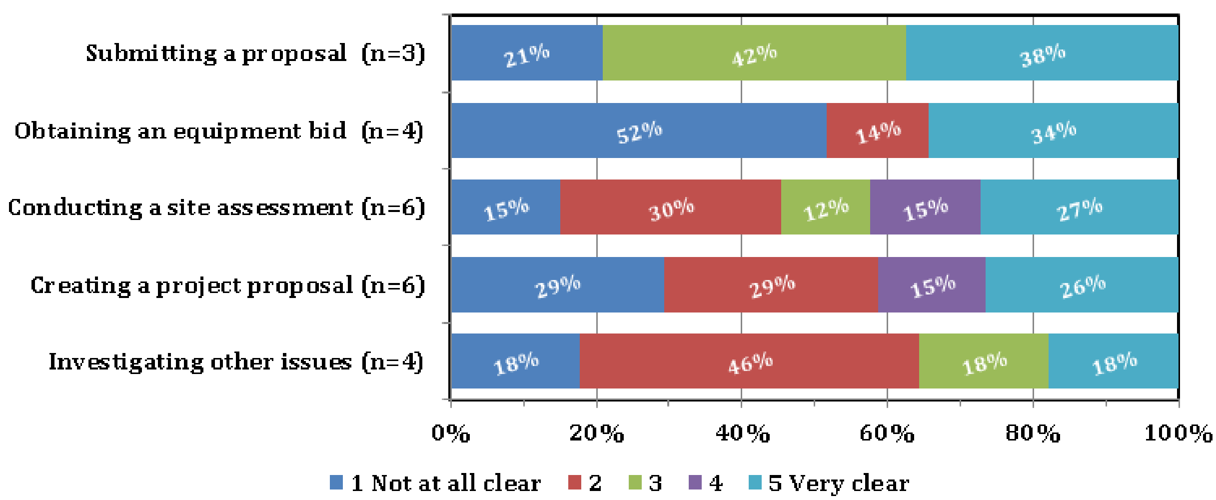

Figure 197: Clarity of Project Proposal Stages, among Business Renewable Participants

Eighty-eight percent of all respondents needed no further information from NWE to work on their renewable energy projects.

The evaluation team also sought to understand whether respondents had applied for funding from *other* sources in addition to the incentive offered by NWE (Table 592). A majority of respondents applied for a state of Montana tax credit.

Table 592: Funding Applied For, among Business Renewable Participants

Other Funding Sources (Allowed Multiple)	Weighted Percent (n=16)
State of Montana Tax Credit (n=16)	51%
Federal funding or tax credits (n=16)	37%
State of Montana Alternative Energy Revolving Loan (n=16)	18%
Property tax exemption (n=16)	5%
Other funding (n=16)	38%
None (n=16)	26%

All but two respondents met with a NWE inspector of the work done through the program, and 90% highly agreed the inspector was prompt and courteous.

Each step in the development process was typically given good marks by the majority (Figure 198). However, about one third were dissatisfied with the handling of site assessment and of project setbacks.

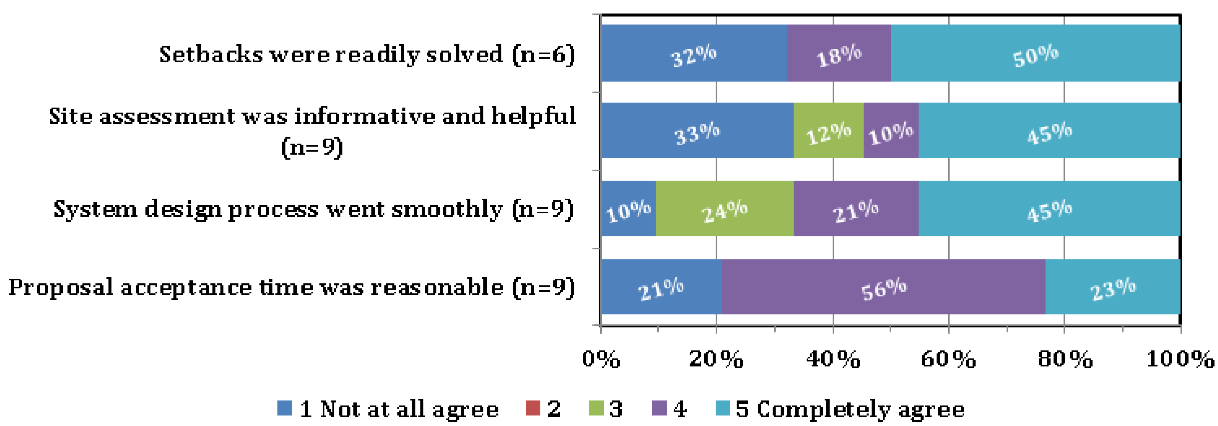

Figure 198: Satisfaction with Project Development, among Business Renewable Participants

Respondents were highly satisfied with the actual installation process (Figure 199).

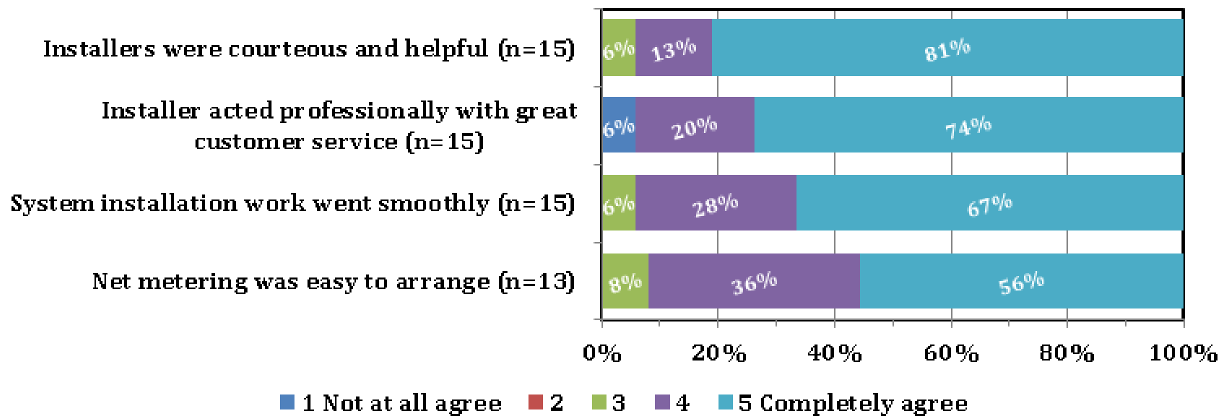

Figure 199: Satisfaction with Installation Process, among Business Renewable Participants

The actual annual energy output of the renewable system met or exceeded all but one participant's expectations (Table 593).

Table 593: View of Energy Output, among Business Renewable Participants

Annual Energy Output	Weighted Percent (n=13)
Met expectations	69%
Exceeded expectations	23%
Fell short of expectations	8%

As an indicator of overall satisfaction with NWE's efficiency activities, the evaluation team also asked respondents whether they would be likely to participate in future programs (Figure 200). Nearly 90% of respondents said that they would be likely or very likely to participate in other NWE efficiency or renewable programs.

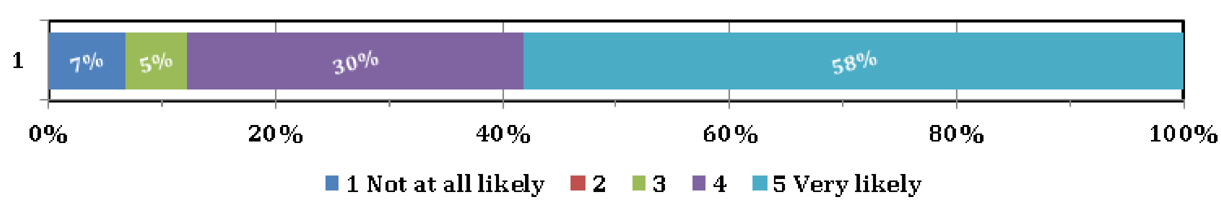

Figure 200: Likelihood of Future Participation, among Business Renewable Participants

23.3.4. Trade Ally Findings

We contacted high volume installers of PV and wind systems comprising 16 solar PV installers and 2 wind installers and were able to complete 7 surveys with the PV installers; we were not able to survey the wind installers, but a few of the PV installers have had experience with wind systems. The focus of the survey was to collect feedback on topics including program procedures, ease of working with program staff, level of satisfaction with NWE's program, and information on market characteristics for PV and wind technologies in NWE's service territory.

23.3.4.1. Provision of Renewable Systems Services

The seven solar PV firms we interviewed all specify, sell, install, and maintain equipment for both residential and commercial PV projects. In addition, all of the firms had the capacity to install both net-metered (or grid-inter-tied) systems and stand-alone systems. Additional services varied across our sample. One of the firms also installs hydropower systems, one installs geothermal systems, and one installs solar thermal systems.

Five of the firms reported working with wind systems. Three reported installing wind systems, although one reported not completing installations through the program and one reported intending to stop installing wind systems altogether. Additionally, two respondents reported that they consulted on new systems or worked on already-installed wind systems (one of these two was certified to install new systems, but did not).

Respondents reported a wide range of solar system installations during 2010 and 2011 ranging from 6 to 104 projects. Program records for this period show that these trade allies installed 120 E+ Renewable projects: 119 PV and one wind system. Only one respondent's firm served more than one location in Montana.

23.3.4.2. Program Awareness and Activity

Most respondents became aware of the program through long-term relationships with the NWE E+ Renewable program and its predecessor programs, although one respondent learned about the program through the NWE website.

All respondents reported that other employees in their firm were aware of NWE E+ Renewable program and almost all had had their employees installing renewable energy equipment or applying for funding for their customers.

We also asked these respondents if there was anything that raised questions or concerns for them or their customers in regard to installing renewable energy equipment using NWE's program. Six of seven respondents responded that they had questions or concerns and five of seven stated that customers had questions or concerns. Respondent concerns were as follows:

- Program viability/sustainability
- Lack of consistency in the grant program
- Keeping program qualifications up to date
- Non-qualified installers receiving program funds
- Ensuring customers can use respondent as their preferred vendor

Respondent views of typical customer concerns included:

- Desire to see savings from renewable project on their utility bill
- Securing program funding or ensuring program funding availability
- The system's capacity to withstand severe weather including wind and hail
- System longevity
- Impact of installation on roof

We also asked respondents about why their customers installed renewable systems. We asked respondents to rank five possible reasons customers might have for installing a renewable energy system. Respondents ranked the following reasons in this order of importance:

1. Interest in reducing electric energy costs
2. Concern about the environment (including global warming)
3. As a back-up power supply in case utility provided power is lost
4. Curiosity about the technology and how well it works
5. To be independent of the utility company

Responses were mixed on the topic of who typically brings up the possibility of utility rebates: three contacts reported initiating the discussion about half of the time, two almost always brought up the topic, and two said the customer almost always initiates that discussion.

Six of seven respondents reported preparing the funding application for their customers; the other prepared it jointly with the customer. Only one respondent reported that it was ever necessary to change the type of equipment from what the customer first had in mind in order to qualify for program incentives and that occurred in situations in which customers wanted an off-grid system, but had to go grid-tied instead.

23.3.4.3. Program Information, Communication, and Feedback

Trade allies also indicated their opinions of the clarity of program information provided by NWE. Most respondents thought the information provided by NWE to trade allies clearly explained program protocols, including system specification, how to apply for funding, and the fact that funding was based on system output, as well as how to contact NWE.

We asked these respondents to rate their agreement with several statements regarding program funding, system costs, the application process, equipment quality and availability, system maintenance and return on investment. The following is a summary of their agreement with seven statements:

- Most "strongly agreed" or "agreed" that "NorthWestern Energy funding increases the chances of installing renewable energy equipment"
- The majority "did not agree" or "disagreed" that "the cost of renewable energy installations is too high even with partial funding"

- Most “strongly agreed” or “agreed” that “NorthWestern Energy’s funding application process is relatively straightforward”
- All “strongly agreed” that “renewable energy equipment is often high quality”
- Most ”strongly disagreed” or “disagreed” that “renewable energy equipment is not readily available and takes too long to ship”
- Most “disagreed” or “strongly disagreed” that “customers are concerned they won’t be able to maintain or operate renewable energy equipment properly”
- Most “strongly disagreed” or “disagreed” that “most customers are worried renewable energy equipment won’t save enough to warrant the extra cost”

Although all respondents agreed that renewable equipment is often high quality, in comments about their installation of wind systems, two respondents mentioned that they do not do program work or no longer install wind systems because of the poor quality of the equipment.

Trade allies reported communication with program staff for several reasons. All respondents reported contacting the program to find out the status of a funding application and almost all had contacted the program either to find out more about how the program works, inquire about the status of a payment, or to resolve a problem.

Respondents in general expressed a high level of satisfaction with the program and its representatives. Using a 5-point satisfaction scale with ‘1’ meaning “not at all satisfied” and 5 meaning “very satisfied,” all respondents reported being ”very satisfied” or “satisfied” (a “4” rating) with the ease of finding the right program representative to speak with when they had questions or concerns. Most respondents were “very satisfied” or “satisfied” with the outcome of their contact with program representatives. However, most respondents provided “3” or “4” satisfaction ratings on the speed with which their rebate was received; two specifically commented rebates are processed too slowly and one made the point that rebates have been processed more slowly in the last 6 months (since May 2012).

Most respondents said they were “very likely” to encourage their customers to install renewable energy equipment and to participate in NWE’s programs. Respondents provided a few ideas for NWE to consider for attracting more businesses like theirs to encourage their customers to take advantage of this renewable energy program. Suggestions included changing funding rules to increase the availability of program funding (by reducing the rebate level to serve more customers or by increasing program funding). In another’s view, NWE might also consider adopting the Midwest Renewable Energy Association recommendation of grant size.

23.4. Recommendations

23.4.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Alternative savings methodology:** The evaluation found that the program overestimated renewable production in cases where the renewable systems were not installed to realize their full potential. Update UES values for wind and PV systems based on the results of this evaluation. Also consider using the evaluation analysis method for program implementation in future years. Although the evaluation method is more complex than a simple UES formula, it is straightforward to use, so it would not create an undue burden on program implementers.
- **Visibility for public projects:** Consider installing a readily visible sign or display board for projects likely to be viewed by the public, particularly those installed on public buildings. The signage could describe the project, outline project objectives, and summarize project expectations, and would inform other NWE customers about the benefits of these technologies. This recommendation came forth after inspecting numerous residential and commercial renewable energy projects and interacting with participants.
- **Commercial funding decisions:** Funding for commercial customers is approved on a case-by-case basis at semi-annual USB advisory sub-committee meetings. This procedure creates funding uncertainty that reduces program participation. Consider reexamining this approval process, and making revisions necessary to provide a greater degree of certainty for perspective participants.

23.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. It follows best practices for program management and administration, including offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through qualified installers, disseminating case studies, and conducting cross-program marketing. NWE follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed E+ Renewable residential participants expressed greater interest than participants of other programs in events or trainings on efficiency and renewable energy. The residential participants reported very positive program outcomes overall, but gave very low ratings to the information they received about the proposal process. Nearly half of residential participants reported not receiving this information, and among those that did, just one-third rated this information as clear. Commercial participants also found unclear the information about following up with utility and determining whether the project was appropriate. (The evaluators note that program application materials clearly state how to reach program staff.) Four-fifths of residential participants heard of the program through a trade ally, although most were interested in installing a renewable energy system before hearing about the program. Qualified installers were more involved in suggesting systems to commercial participants: the most commonly reported means of finding a contractor was that the contractor contacted the participant. Participants (particularly residential ones) reported that qualified installers played a key role in navigating the application process, with over half of participants reporting that their contractor completed the proposal for them, and very few participants reporting completing the proposal without assistance. Just one-tenth of residential and one-fourth of commercial participants reported that NWE was the sole source of funding they applied for.

Surveyed renewable qualified installers reported high satisfaction with the program and plan to continue to promote it to customers. They agree that NWE funding increases renewable system installations. The two most common suggestions made by qualified installers were to adjust incentive levels to allow more end-users to participate, and to speed up payment processes. Although all interviewed qualified installers agreed that the incented solar systems are of high quality, a few mentioned that the quality of incented wind systems is poor.

Based on these conclusions, we offer the following recommendations for improving the renewable program.

- **Info by mail:** Consider ways to provide participants with more information about efficiency opportunities through mail. Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective. Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and installer attention to the topic of efficiency.
- **E-mails to qualified installers:** Consider notifying participating qualified installers by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network.

Surveyed qualified installers typically reported serving both commercial and residential customers.

- **Workshops for qualified installers, customers:** Consider offering workshops at NWE's division offices or webinars to qualified installers and customers targeted by this program.
- **Immediate customer feedback:** Consider adopting a fast-feedback approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

24. Building Operator Certification

24.1. Program Description

Building Operator Certification (BOC) is a professional development program for managers and operating engineers of commercial and public facilities sponsored by NWE since 2004[13]. The program is affiliated with the nationally recognized and accredited BOC training program. NWE contracts with the International Building Operator Association to conduct the training. The program is designed to teach best practices for optimizing energy and resource efficiency in the operation and maintenance of buildings. The program is open to commercial customers and qualified installers. The program is funded through USB.

NWE sponsors two levels of BOC training:

- Level I BOC requires one week of classroom instruction. Course curricula provide an overview of building systems, operations and maintenance practices, and energy management techniques.
- Level II requires one week of combined classroom and field instruction. Level II curricula provide a more in-depth assessment of HVAC systems, building automated control systems, and advanced energy management strategies.

Both levels require that participants pass an exam on each topic to receive certification. Enrollment in Level II requires Level I certification or passing a challenge test. Level 1 graduates must wait a period of time before taking Level II in order to apply learning from Level 1. NWE offers tuition and travel scholarships for a limited number of participants from public schools, state and local governments, and non-profit hospitals. Other participants pay an enrollment fee. The scholarships are funded through USB.

Certification must be renewed annually; Level I certification renewal requires five hours/year of continuing education credits (CEUs) and Level II renewals require ten hours/year of CEUs.

Over the five program years 2006–2011, about 190 participants graduated from NWE-sponsored BOC training programs with an average of 154,000 ft^2 of facility area per participant.

Additional services offered

BOC participants receive information about NWE's commercial audit and incentive programs and other training opportunities.

[13] NWE participated in BOC as a NEEA initiative prior to 2004.

24.1.1. Energy Savings

Program energy savings estimation methods evolved over the course of the 2006–2011 program years.

- 2006: No BOC program savings were claimed.
- 2007–2008: The program applied a standard unit energy savings of 142,001 kWh per participant based on NEEA's Long Term Monitoring and Tracking (LTMT) Report for 2005 (Summit Blue 2006). No gas savings were claimed. The basis for this assumption is (1) the average area of a BOC participant's facility is 355,000 ft^2, (2) the average building EUI is 16 kWh/ft^2/year, and (3) savings produced by a BOC graduate are 2.5%.
- 2008–2009: The program applied unit energy savings of 0.4 kWh/ft^2 and 0.0008 dkt/ft^2 per area controlled by each BOC graduate. Electrical savings are based on the 2008 LTMT (Summit Blue 2008) and the 2005 LTMT (Summit Blue 2006) for gas savings. The 2008 LTMT reduced the average area controlled by each BOC participant to 286,000 ft The savings assumption remained at 2.5% BOC graduate. savings remained, however electrical savings are the same as for the 2007–2008.
- The 2009–2011 program years applied the unit energy savings of 0.4 kWh/ft^2 and 0.0008 dkt/ft^2 per BOC graduate. Each participant provided the square footage for their facility which was applied to the electric unit energy savings value and a gas-heated area for the gas unit energy savings value.

Program participants are screened to be NorthWestern Energy electric and/or natural gas customers for savings to be claimed. To the extent that more than one building operator from the same facility attends, the savings are split based upon the square footage of the facilities.

24.1.2. History

The BOC curricula receive periodical updates to keep up with changes in technologies and best practices.

24.1.3. Marketing

Direct marketing for BOC training is done with organizations such as the Montana State School Board Association, the Montana Hospital Association, the Montana DEQ, and local governments. BOC is promoted at trade shows, and through email notifications, electronic newsletters, the NWE website, and direct mailings.

As BOC annual re-certification requires continuing education, NWE maintains contact with past participants to inform them of training opportunities with, for example, the lighting design labs, NEEA webinars and on-site trainings, and NWE Motor Training classes.

24.1.4. Program Steps

Pre-approval is required and applicants must submit applications by a deadline in advance of the training date. Class size is limited to about 30 participants.

24.2. Impact Evaluation

24.2.1. Methodology

24.2.1.1. Estimation of Gross Savings

There is a substantial body of work on the energy impacts associated with BOC training. We examined most of the BOC studies over the past 10 years and selected several recent studies for in-depth review and comparison for a possible revision to the program UES values. Further, we contacted the Northwest Energy Efficiency Council (BOC's parent organization) to find out if they knew of any recent studies we were not aware of, and they were not.

As described above in the Program Description, the current NWE BOC program UES values are 0.4 kWh/ft² and 0.0008 dkt/ft² multiplied by the building area directly under the control of a BOC graduate for each fuel. Underlying the UES values is an average building area of 286,000 ft², building EUI of 16.7 kWh/ft²/year for electricity and 0.32 therms/ft²/year, 2.5% savings per BOC graduate, and a measure life of five years.

We selected three studies for review; two evaluations and a survey of six evaluations which includes the first two evaluations. Each is discussed below.

1. "Long Term Monitoring and Tracking Report (LTMT) for 2011 Activities," prepared for NEEA, by Navigant Consulting, July 23, 2012.
   - This study is the latest in a series of NEEA's LTMT reports with BOC studies. Earlier LTMTs are the basis of NWE's current program savings assumptions, the 2008 LTMT (Summit Blue 2008) for electrical savings and the 2005 LTMT for gas savings (Summit Blue 2006). Summit Blue is now part of Navigant Consulting.
   - The study incorporated a scoring tool developed for their 2011 Midwest Energy Efficiency Alliance (MEEA) report, discussed immediately below, which converts questionnaire responses into energy savings through engineering based algorithms.
   - The study used two UES calculation approaches which resulted in both higher and lower savings than the 2010 LTMT's electric UES value. Navigant elected to take the middle ground and retain the 2010 UES (Navigant Consulting, Inc. 2011) of 0.42 kWh/ft²/year. This is based on an average of 286,000 ft² managed by each BOC-certified operator, a building EUI of 16.7 kWh/ft²/year, a measure life of five years, and savings of 2.5%.
   - The authors of the report were contacted for this evaluation and asked if these savings represent all savings attributed to BOC training or savings net of utility incentives. The authors responded that the savings represent "total market activity" related to BOC

training and therefore include savings attributed to participation in utility incentive programs.

- The study surveyed participants (N=20) and non-participants (N=17) and found significant differences between the two groups with respect to energy savings practices, suggesting a zero baseline is justified.

2. "Evaluation of MN BOC Training," prepared for the Midwest Energy Efficiency Alliance and Minnesota Office of Energy and Security, by Navigant Consulting, March 24, 2011.

- The sample of 50 BOC participants in Minnesota employed engineering calculations applied to detailed participant surveys to estimate energy savings. The surveys were administered six months after BOC certification.
- The average facility area for the sample was 194,500 ft^2.
- The study concluded that BOC attributable savings are in a range of 0.237 – 0.721 per kWh/ft^2/participant and 0.0013-0.0018 dkt/ft^2/participant. The nature of the range is explained thus, "BOC Attributable Savings are considered the top end of the BOC program net savings range while BOC Attributable Savings Net of Utility Rebated Projects represents the minimum attributable savings."

3. "Summary of Building Operator Certification Evaluations," prepared for Consumer's Energy, by Energy Market Innovations and Research Into Action, November 28, 2011.

- This was a survey of six BOC program evaluations for a Michigan utility with a BOC pilot program. The study was commissioned to develop recommendations for UES values and to synthesize lessons learned and best practices from the other studies. Two of the evaluations in this survey are the two Navigant evaluations discussed above.
- The study recommended the O&M-only UES values from the Minnesota BOC program in the interest of conservatism from three perspectives, savings estimates relative to the other studies, findings from their engineering desk review, and the average square footage each building operator is assumed to influence.

We compared the findings from the three studies and considered their applicability to the BOC program at NWE. We concluded that the Minnesota study is most appropriate evaluation to apply to the NWE BOC program. This study had 50 participants, an average facility size closer to NWE's average of 154,000 ft^2 than the 2011 LTMT study, and BOC-attributable savings which were net of utility rebated projects. The study by Energy Market Innovations concluded that Navigant's Minnesota study provided the most reliable energy savings estimates but took a more conservative stance by recommending the O&M-only savings

The Navigant Minnesota study presents BOC savings estimates as a range; the high end of the range includes all BOC activity and the low end of the range is net of measures receiving utility incentives. In our judgment, the low end of the range best represents the BOC program savings for NWE, net of other NWE rebate program savings. Accordingly, we re-calculated program savings for each year with the UES values of 0.24 kWh/ft^2 and 0.0013 dkt/ft^2 from the Navigant Minnesota/MEEA study. This is the low end of the savings range presented by Navigant and represents BOC attributable savings net of utility rebated projects, a combination of non-rebated capital measures and O&M savings.

We're confident that utility interest in the BOC program and associated energy savings will continue to generate more refined evaluation models and recommend NWE continue to periodically review new studies and revise UES values when justified.

24.2.1.2. Free Ridership

No customer surveys were possible for this program. Therefore, we were not able to estimate free ridership.

24.2.1.3. Spillover

No customer surveys or site visits were possible for this program. Therefore, we were not able to estimate spillover.

24.2.1.4. Leakage

No customer surveys were possible for this program. Therefore, we were not able to estimate leakage.

24.2.1.5. Estimation of Program Savings

The methods described in 2.2.2 Estimation of Program-Level Impacts were used to estimate program-level savings from the results of the file review, site visit, free ridership and spillover data collection and analysis.

24.2.2. Energy and Demand Impacts

24.2.2.1. Estimation of Gross Savings

We compared the UES findings from three studies and considered their applicability to the BOC program at NWE. We concluded that the Minnesota study is most appropriate evaluation to apply to the NWE BOC program. We re-estimated program savings for each year to reflect the UES values of 0.24 kWh/ft^2 and 0.0013 dkt/ft^2 from the study. The revised program savings are presented in the table below.

Energy Savings for the Program

The following table provides information on the savings adjustment rate for each study that contributed file review results for this program. The table compares the reported savings to those adjusted for changes based on our file review. All results shown are for gross savings claimed for Level 1 and 2 BOC graduates and are not adjusted for free ridership or spillover.

Table 594: File Review Adjustment to Savings for Building Operator Certification

Funding	Study Name	Units	Savings		Savings Adjustment Rates
			Reported	Final	Final
Electric					
	Building Operator Certification	kWh	16,230,170	7,998,922	0.49
Natural Gas					
	Building Operator Certification	dkt	17,864	36,223	2.03

24.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings.

Table 595: Savings Adjustments by Calendar Year for Building Operator Certification

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric - USB										
	Building Operator Certification	kWh	2007	5,112,036	0.49	-	-	0.49	2,519,430	288
	Building Operator Certification	kWh	2008	3,851,497	0.49	-	-	0.49	1,898,182	217
	Building Operator Certification	kWh	2009	3,744,748	0.49	-	-	0.49	1,845,572	211
	Building Operator Certification	kWh	2010	2,509,146	0.49	-	-	0.49	1,236,614	141
	Building Operator Certification	kWh	2011	1,012,744	0.49	-	-	0.49	499,123	57
	Building Operator Certification	kWh	All Years	16,230,170	0.49	-	-	0.49	7,998,922	913
Natural Gas - USB										
	Building Operator Certification	dkt	2008	7,703	2.03	-	-	2.03	15,619	
	Building Operator Certification	dkt	2009	7,414	2.03	-	-	2.03	15,034	
	Building Operator Certification	dkt	2010	2,266	2.03	-	-	2.03	4,595	
	Building Operator Certification	dkt	2011	481	2.03	-	-	2.03	976	
	Building Operator Certification	dkt	All Years	17,864	2.03	-	-	2.03	36,223	
Electric										

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	Building Operator Certification	kWh	All Years	16,230,170	0.49	-	-	0.49	7,998,922	913
Natural Gas										
	Building Operator Certification	dkt	All Years	17,864	2.03	-	-	2.03	36,223	

24.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 596: Net Savings and Benefit/Cost Ratios by Calendar Year for Building Operator Certification

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric - USB								
	Building Operator Certification	kWh	2007	2,519,430	7.22	7.22	1.35	7.95
	Building Operator Certification	kWh	2008	1,898,182	9.09	9.09	1.72	10.00
	Building Operator Certification	kWh	2009	1,845,572	6.56	6.56	1.66	7.22
	Building Operator Certification	kWh	2010	1,236,614	3.62	3.62	1.46	3.99
	Building Operator Certification	kWh	2011	499,123	3.60	3.60	1.75	3.96
	Building Operator Certification	kWh	All Years	7,998,922	6.05	6.05	1.55	6.65
Natural Gas - USB								
	Building Operator Certification	dkt	2008	15,619	-0.00	-0.00	2.40	-0.00
	Building Operator Certification	dkt	2009	15,034	-0.00	-0.00	2.33	-0.00
	Building Operator Certification	dkt	2010	4,595	-0.00	-0.00	2.86	-0.00
	Building Operator	dkt	2011	976	-0.00	-0.00	3.14	-0.00

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	Certification							
	Building Operator Certification	dkt	All Years	36,223			2.43	
Electric								
	Building Operator Certification	kWh	All Years	7,998,922	6.05	6.05	1.55	6.65
Natural Gas								
	Building Operator Certification	dkt	All Years	36,223			2.43	

24.3. Process Evaluation

24.3.1. Methodology

We met with all key members of NWE's program team, both NWE and implementation contractor staff. To inform our implementation findings for this program, we interviewed those team members involved with the program.

For market findings, the research team surveyed 30 attendees of the Building Operator Certification (BOC) courses conducted in 2010 and 2011. No trade allies were involved with this program.

24.3.2. Implementation Findings

24.3.2.1. Interview Findings

NWE supports two courses that lead to Building Operator Certification upon successful completion of the course tests. The Level I course covers operation and maintenance basics relating to HVAC, controls, lighting, energy, and management techniques. The Level II course provides more advanced training in the efficient operation and maintenance of HVAC systems and covers energy management, management strategies, and energy conservation methods. Both courses span five consecutive days. NWE typically offers two to five classes a year, with the majority of them Level I classes. Each class has 15 to 30 attendees.

The trainings are spread out geographically across Montana to reduce participant travel.

The trainings are designed for facilities managers and staff responsible for operations and maintenance of equipment and systems in commercial and public facilities. NWE promotes these trainings at trade shows for architects and engineers, as well as the Montana Hospital Association, and through Montana's Department of Environmental Quality. Additionally, NWE staff send emails, includes training information in electronic newsletters to customers, and calls facilities that have previously expressed interest in sending an employee to the training. To fill any vacancies at select training, the implementation contractor recruits additional trainees through one-on-one outreach to targeted customer sector locations. Currently, course registrations are processed online, a change from registrations previously being completed over the telephone, by fax, or by mail.

It is a significant commitment for a business to send facility staff to week-long, off-site training sessions. This is especially true in a region with a low population density where many facilities may be managed by one staff member. To reduce the burden of training costs and encourage attendance, NWE offers scholarships for attendees from the local government, public school, and hospital sectors. Scholarships include tuition waivers, meals, mileage, and lodging. Montana's Department of Environmental Quality also sponsors some scholarships and NWE partners with them to leverage funds.

In addition to information presented on building operations and maintenance, a NWE representative presents attendees with information on applicable utility programs. Both the participants and NWE benefit from the presence of staff because staff inform participants of further opportunities and staff may also learn about opportunities for new measures to add to existing programs.

The certification license that participants can earn requires continuing education in energy management to maintain the certification. In addition to sponsoring Level II BOC courses, other trainings are available to NWE's customers and trade allies, including motors and motor rewind, lighting design, and NEEA sponsored webinars and workshops, and other local activities.

BOC training and certification is available throughout most of the country. In Montana, the training is conducted through the International Building Operators Association (IBOA). The instructor has extensive education and experience in commercial and industrial energy efficiency, including an Energy Management Diploma from the University of Wisconsin, Madison, an Energy Auditor Certificate from the state of Washington, and many specialized classes, such as Boilers, Cogeneration Technology, Energy Analysis for Industrial Refrigeration Systems, HVAC Design and others.

In addition to these program-specific implementation processes, section **31** discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

24.3.2.2. Best Practices Assessment

Previous evaluations have established many best practices for the design and delivery of adult education and training classes. Components key to successful adult training and education (T&E) courses include:

1. Intentional incorporation of best practices from adult learning theory into T&E activities so they are relevant and accessible to the adults that attend them. These practices increase the likelihood that T&E will result in behavior change:
   a. Offering information and experiences that show how to solve real problems that occur in daily work life,
   b. Providing opportunities during the training for attendees to practice new skills and receive feedback,
   c. Including small group activities and concrete experiences rather than relying solely on expert lecture, and
   d. Providing limited or focused content that does not overwhelm attendees.
2. Market transformation is a frequent driver for non-residential T&E programs. In addition to educating key market actors on desired energy efficiency practices, they serve as a vehicle for disseminating program information to the market and making market actors aware of program opportunities.
3. Effective T&E programs provide value to the target market specifically, not just the utility. Training approaches and content can be enhanced by market research, baseline studies, partnerships with professional organizations, and early evaluation efforts to create training programs that provide significant value to market actors. Coordination with professional organizations can qualify T&E courses for continuing education (CEU) credits, increasing the appeal and value of the program.
4. Successful T&E programs require a long-term commitment from implementing organizations. The multi-year commitment is important in building expertise among trainers, refining curriculum and leveraging word-of-mouth communication. It can take years to build the program, the organizational capacity and the program reputation to the point where the training effort is poised to influence a discernible portion of the targeted market.

   The BOC training program was developed, in part, through funding provided by NEEA, and incorporated all of these best practices into the program. NWE's decision to deliver operations and maintenance training by offering the BOC program automatically delivers multiple best practices.

   Additionally, NWE further supports the second best practices by sending a representative to BOC trainings for delivery of utility program information, and supports the fourth best practice by continuing it history of offering BOC training continuously since 2007.

24.3.3. Participant Findings

The research team surveyed 30 attendees of the Building Operator Certification (BOC) courses conducted in 2010 and 2011.

Interpreting Response Frequencies

This program has a smaller target market than other programs and a correspondingly smaller number of survey respondents. We encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

24.3.3.1. Trainee Characteristics

All of these attendees either conducted or directed operations and maintenance activities at their facilities. Surveyed trainees had been in the building operations and maintenance field for between two and 36 years (Table 597).

Table 597: Building Operations and Maintenance Experience, among Building Operator Certification Trainees

Years in Field	Percent (n=29)
Two to five	31%
More than twenty	21%
Six to ten	17%
Sixteen to twenty	17%
Eleven to fifteen	14%

Trainees were associated with various types of facilities, including educational and medical (Table 598). Most trainees reported (Table 599) being responsible for between one and three buildings with an average of 745,779 square feet of conditioned space.

Table 598: Facility Types, among Building Operator Certification Trainees

Facility Type	Percent (n=30)
Educational	52%
Medical	17%
Office building	11%
Prison/jail	10%
Government/community	7%
Mixed	3%

Table 599: Building Responsibilities, among Building Operator Certification Trainees

Number of Buildings	Percent (n=29)
One to three	62%
More than ten	21%
Four to ten	17%

Most trainees worked for facilities with three to five total operations and maintenance staff (Table 600).

Table 600: Number of Operations and Maintenance Staff, among Building Operator Certification Trainees

Number of Staff	Percent (n=29)
1	17%
2	28%
3 to 5	34%
6 to 10	7%
11 to 20	3%
more than 20	10%

Trainees had various responsibilities at their facilities. Most reported involvement with and/or controlling energy use in their facilities (Table 601).

Table 601: Responsibilities at Facility, among Building Operator Certification Trainees

Responsibility at Facility	Percent (n=30)
Monitoring energy use	83%
Controlling energy use	77%
Payment for energy bills	30%

Over half (53%) of trainees represented facilities which had qualified for a rebate or incentive from NWE within the past two years. Of those who had not received a rebate or incentive at their facility, half reported being aware that rebates or incentives are available.

24.3.3.2. Trainee Experience

Most respondents had attended only Level 1 training (Table 602). Of those who had not attended Level 2 training, 68% of trainees indicated that they did not intend to take Level 2 training.

Table 602: Course Attended, among Building Operator Certification Trainees

What level of training course did you attend?	Percent (n=30)
Level I	70%
Both Level I and Level II	23%
Level II	7%

Most trainees heard about the BOC training courses from their supervisor (Table 603).

Table 603: Awareness of Training, among Building Operator Certification Trainees

Source of Awareness	Percent (n=30)
Supervisor	44%
NorthWestern Energy	33%
Word of mouth	13%
Government office	7%
Co-worker/colleague	3%

Eighty percent of respondents reported that no area of the course needed to be improved. Those trainees who thought some area could be improved suggested improvements to the pace of the course, materials (such as textbooks), or applicability to their industry.

We asked participants how satisfied they were with elements of the trainings experience. Most trainees reported being satisfied with the training location and the class length (Figure 201).

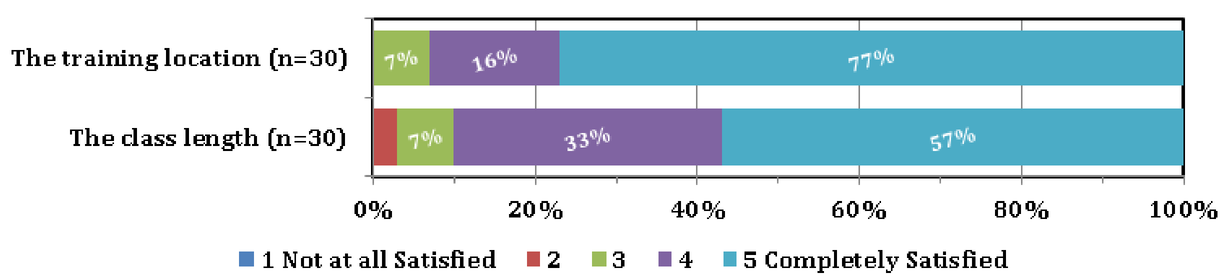

Figure 201: Training Satisfaction, among Building Operator Certification Trainees

Nearly all (29 of 30) surveyed trainees reported that they would recommend the BOC training to their colleagues. Almost all surveyed trainees (28 of 30) indicated that they had applied the concepts or methods from the training at their facilities or shared the concepts with their coworkers (29 of 30). Most trainees reported that their facilities had started or completed at least one project aimed at increasing energy efficiency since they received the training (Table 604).

Table 604: Type of Project Started, among Building Operator Certification Trainees

Project Type (multiple responses allowed)	Percent (n=30)
Boilers	30%
Monitoring	17%
Motors (including fans)	13%
Windows	13%
Variable Frequency Drives (VFDs)	10%
Energy Audit	7%
Electrical	7%
Toilets/faucets	7%

Other projects included roofing, laundry equipment, HVAC upgrades, and air handlers.

Of the participants who had started a project (25) just over half (52%) had completed at least one project (Table 605).

Table 605: Project Status, among Building Operator Certification Trainees

Is project complete?	Pecent
Yes	52%
Some are complete, some are not	40%
No	8%

Half of the trainees reported that the training was influential in their current or recent project (Figure 202). More than half (62%) of trainees indicated that the BOC training has been influential in the likelihood of their organization completing energy efficiency projects in the future.

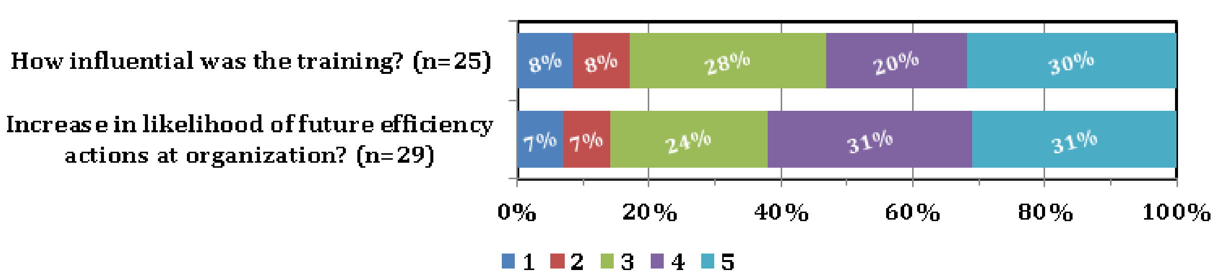

Figure 202: Influence of Training on Projects and Future Actions, among Building Operator Certification Trainees

One-third of trainees indicated that they experienced a job advancement after attending the training (Table 606). However, only 20% of trainees thought that it was likely that the BOC training contributed to the advancement.

Table 606: Job Advancement, among Building Operator Certification Trainees

Advancement (Multiple Responses Allowed)	Percent (n=30)
No change	67%
Increase in pay	23%
Increase in responsibility	17%
New title	10%

24.3.4. Trade Ally Findings

There are no trade allies for this program.

24.4. Recommendations

Below are recommendations for the BOC program.

24.4.1. Impact Evaluation

We compared the findings from three recent BOC savings studies and considered their applicability to the BOC program at NWE. We concluded that Navigant's 2011 Minnesota study is most appropriate evaluation to apply to the NWE BOC program. The Minnesota study had the most participants (N=50), an average facility size closer to NWE's average of 154,000 ft^2 than NEEA's 2011 LTMT report, and unlike NEEA's BOC attributable savings, did not include utility rebated projects.

Based on the impact evaluation findings, we offer the following recommendation for improving the program.

- NWE replace the current UES values from NEEA with the MEEA study UES values of 0.24 kWh/ft^2 and 0.0013 dkt/ft^2 for electrical and gas savings respectively.
- As NWE has used BOC UES values provided by NEEA, we suggest contacting NEEA and exploring the feasibility of developing regional BOC UES values which do not include measures receiving utility incentives.
- We're confident that utility interest in the BOC program and associated energy savings will continue to generate more refined evaluation models in the future.

24.4.2. Process Evaluation

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices for content and delivery of educational programs. It follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, and conducting cross-program marketing. Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Surveyed BOC trainees reported positive experiences with BOC trainings, and nearly 90% reported having initiated efficiency projects since attending. Over half of trainees reported that the training would increase the likelihood of future efficiency actions at their organization. Half of surveyed trainees worked in schools.

Based on these conclusions, we offer the following recommendations for improving the program.

- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

25. Motor Management Training

25.1. Program Description

The Motor Management Training program began in 2006. It is a professional development program designed for those involved in electric motor system operation, maintenance, purchasing, or repair. The one day training program is presented in various locations around the state each year by the Green Motors Practices Group. Motor management training is open to all and tuition is waived for NWE commercial and industrial customers. Participants are primarily electricians, technicians, and managers from broad range of private and public sector organizations. The program is funded through USB.

Topics include motor operating costs, motor systems improvements, motor operating characteristics, rewinds and repair specifications, and legislation pertinent to the field. In addition to motor-specific information, the training includes discussion of motor driven applications such as fans, pumps, and compressed air. The instructor stresses the importance of keeping the training interactive and relevant to the participants. The agenda is somewhat flexible to allow time for discussing issues of interest to the participants.

The training is approved for electrician license CEU credits by the Montana State Electrical Board.

Over the 2006–2011 program years, NWE sponsored 22 classes with over 400 participants.

Additional services offered

Motor management training participants receive information about the E+ Electric Motor/Rewind Rebate program, other commercial incentive programs, and additional training opportunities.

25.1.1. Energy Savings

No savings are claimed for this program.

25.1.2. History

The Motor Management curricula receive periodic updates to keep up with changes in technologies and best practices.

25.1.3. Marketing

Targeted marketing is done to licensed electricians, electrical equipment retailers, motor repair and rewind shops, and the Montana Joint Apprenticeship Training Council.

Mass marketing for the training is done through the NWE website, an electronic newsletter, trade shows, and mailings.

NWE personnel or their contract marketing team are present at every training session as host and as a resource for the participants on NWE's energy efficiency programs.

25.1.4. Program Steps

Advance registration is required and applications are accepted by phone, mail, fax, and on-line at the NWE website.

25.2. Impact Evaluation

25.2.1. Methodology

NWE does not claim savings for the program. We attempted, without success, to locate sources which quantify the benefits from attending the training. We completed a thorough literature search to locate previous evaluation work for this program and/or other motor training programs with similar curricula. We contacted the executive director of the Green Motors Practices Group, Motor Management Training's parent organization, to find out if he knew of any evaluations or other studies which would provide estimates of savings. He was not aware of any such studies.

25.2.2. Energy and Demand Impacts

No energy or demand savings were claimed for this program. Further, the evaluation did not find a basis for any evaluation savings.

25.2.3. Economic Analysis

No economic analysis was performed given the absence of savings.

25.3. Process Evaluation

25.3.1. Methodology

To understand the process of participation and the experiences of participants, we conducted phone surveys with 47 participants. Additionally, we interviewed two staff members and the instructor of the program. No trade allies were involved in this program.

25.3.2. Implementation Findings

25.3.2.1. Interview Findings

Motors management is a one-day training course in efficient operation and maintenance of motors. The curriculum is divided into a non-technical portion in the morning followed by more technical, professional education in the afternoon. This course is approved by the state electrical board for continuing education for electricians.

These classes are held during the spring, and when funding and interest permits, during the fall. During one week, the trainer and a NWE representative travel a circuit, providing training in different areas of the state during the week, teaching from four to ten sessions a year. There are anywhere from 10 to 70 participants in each class.

A NWE representative attends these events. This is either a member of the NWE staff, implementation staff, or more often, both. The representative handles introductions, registration, and hospitality, as well as describing applicable programs related to motors and motor rewind offered by NWE. The instructor reports that the training both participants and NWE benefit from the presence of staff because staff inform participants of further opportunities and staff may also learn about opportunities for new measures to add to existing programs.

NWE advertises this program through direct mailings, email, and electronic newsletters. NWE also contacts electric and motor supply shops, individual customers, and trade associations. NWE takes opportunities to promote the program when possible, even if indirectly, by word-of-mouth through trade associations.

Registration is handled primarily through fax, mail-in and over the phone registrations. Online registration is increasing but still a minority because this population is less likely than other groups to have internet access at their place of business due to the size of the operations and because the work of maintaining motors does not require internet access.

While a methodology for verification of savings has yet to be developed for motor management training programs, NWE staff believe the training is affecting how participants think about and approach the operations and maintenance of motors.

In addition to these program-specific implementation processes, section 31 discusses NWE's activities in support of all programs, including planning and evaluation, tracking, and branding, marketing, outreach, and media use.

25.3.2.2. Best Practices Assessment

The motor training program incorporates many best practices associated with adult training and education programs. For example, the program delivers relevant information that is readily applicable to real-world working conditions, leverages motor training to deliver information on applicable NWE efficiency programs, promotes the program through a wide variety of sources to reach potentially hard to reach segments in this population (for example, rural and/or small shops), delivers the program at different times of the year across the state to overcome potential attendance barriers related to geographic location and limited release-time from work.

25.3.3. Participant Findings

The research team surveyed 47 attendees of the Motor Management Training courses sponsored by NWE 2010 and 2011.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all program participants.

Finally, many survey questions allowed the participant to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

25.3.3.1. Trainee Characteristics

Motors training attendees had responsibility for their own firm's motors, client or customer motors, or were apprenticing for future motors work (Table 607).

Table 607: Motors Responsibility, among Motor Management Trainees

What type of motors do you have resonsibilty for?	Percent (n=47)
Client or customer motors	77%
My own firm's motors	21%
I am an apprentice	2%

Trainees represented various types of facilities, including electrical services companies or electrical contracting companies (Table 608). Most trainees reported being responsible for varying numbers of motors, depending on circumstances. Trainees reported being responsible for between one and 900 total motors with horsepower ranging from 0.33 to 3,500.

Table 608: Facility Types, among Motor Management Trainees

Facility type	Percent (n=47)
Electrical services company/Electrical contractor/Electrician	62%
National Park Concessionaire/Resorts	7%
Government/Community services	5%
Medical	4%
Schools/Colleges/Universities	4%
Irrigation	4%

Facility type	Percent (n=47)
Consulting engineer	4%
Other	10%

Few (28%) of the trainees reported being responsible for monitoring energy use at their facility (Table 609).

Table 609: Energy Monitoring Responsibilities, among Motor Management Trainees

Responsible for Energy Monitoring	Percent (n=47)
No	72%
Yes	28%

Compared to monitoring responsibilities, more trainees (40%) reported controlling or sharing responsibility for controlling energy use at their facility (Table 610). A majority of surveyed trainees (92%) indicated that they were not responsible for paying energy bills at their facility.

Table 610: Energy Use Control or Responsibility, among Motor Management Trainees

Control or Responsibilty for Energy Use	Percent (n=47)
No	60%
Yes	40%

Trainees had been responsible for servicing or maintaining motors for anywhere from a few months to fifty years (Table 611).

Table 611: Years Working with Motors, among Motor Management Trainees

Years Servicing or Maintaining Motors	Percent (n=47)
More than Twenty	38%
One to Five	28%
Six to Ten	15%
Eleven to Twenty	13%
Less than 1	6%

25.3.3.2. Training Experience

Most training attendees heard about the training from NWE materials (Table 612). Most trainees reported being aware that NWE offers rebates for NEMA premium motors (85%) and motors that meet Green Motors Practices (92%). Over half (53%) of trainees surveyed knew of at least one shop that does energy-efficient motor rewinds.

Table 612: Awareness of Training, among Motor Management Trainees

Sources of Awareness	Percent (n=47)
NWE materials	66%
School or training center	10%
Co-worker or colleague	9%
Supervisor	6%
Another electric business	5%
Magazine	2%
Internet	2%

We asked motors trainees about how well the course materials met various needs. Most trainees indicated that the materials addressed their needs (Figure 203). Trainees whose needs were not met explained that the training moved too fast (2 trainees), too slowly (1 trainee) or that specific topics of interest were not covered (4 trainees).

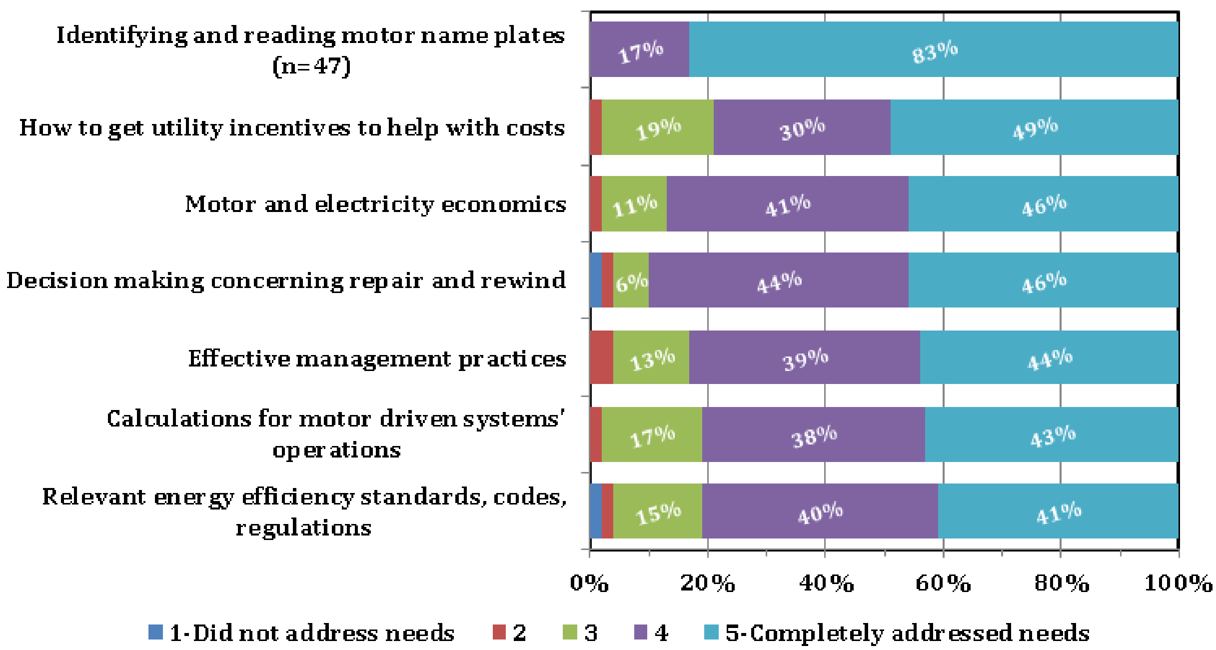

Figure 203: Effectiveness of Green Motors Training Materials, among Motor Management Trainees

We asked how well various elements of the training supported or detracted from the quality of the training. Most trainees felt that all elements of the training supported the quality, including the handouts and materials (89%), the pace of course delivery (87%), and the instructors (89%).

More than half of trainees indicated that the Continuing Education Credits (CEUs) were important in their decision to attend the training, but 20% reported that the credits were not at all important (Figure 204).

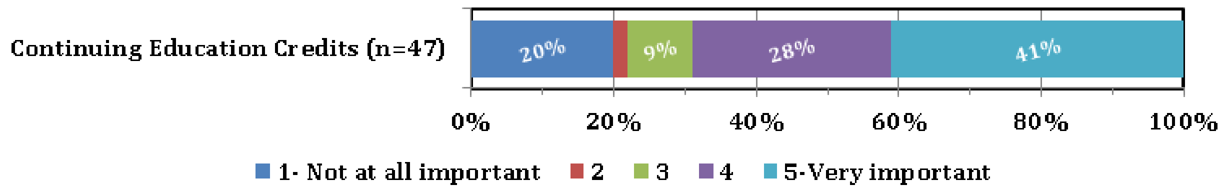

Figure 204: Importance of Green Motors Continuing Education Credits, among Motor Management Trainees

Motors trainees indicated that they have used the information from the training in various ways, including continuous improvement activities and performing calculations of operations costs (Table 613).

Table 613: Use of Motors Training Information, among Motor Management Trainees

Uses of Motors Information	Percent (n=47)
Review the information on motor name plates	83%
Consider current and pending motor codes and standards for purchasing	62%
Continuous improvement activities with motors	60%
Calculations of operations costs for motor systems	56%
Develop motor purchasing plans using projected costs	26%

Most (70%) of trainees indicated that the training has influenced their use of, or plans for use of, motors (Table 614). Those trainees who reported not being influenced by the training reported that they do not do work related to the training.

Table 614: Influence of Training on Motors Use or Planned Use, among Motor Management Trainees

The training course has influenced me to…	Percent (n=33)
Replace motors with premium efficiency motors	76%
Conduct green rewind	58%
Retire motors earlier than planned	36%

25.3.4. Trade Ally Findings

No trade allies were involved in this program.

25.4. Recommendations

The conclusions that we have reached from the process evaluation of this program are as follows.

NWE follows best practices for content and delivery of educational programs. It follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. NWE follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, supporting and working through trade allies, and conducting cross-program marketing. Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

Over three-fourths of surveyed Motor Management trainees reported that all training elements were effective. Reviewing motor name plate information was most frequently mentioned by trainees as one of the skills they had already put into use. Two-thirds of contacts identified as electrical contractors or engineers and said they were responsible for their clients' motors, rather than their own firm's motors. Less than half of trainees reported that they had responsibility for energy monitoring or control over motor energy use.

Based on these conclusions, we offer the following recommendations for improving the program.

- **E-mails to trade allies:** Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities -- the information NWE currently provides the members of its Lighting Trade Ally Network. Surveyed trade allies typically reported serving both commercial and residential customers.
- **Internet:** Consider ways to increase the use of internet tools to facilitate participation.
- **Written program plans:** Consider developing written program plans. Consistency of objectives/ goals and strategies / tactics can be confirmed through a description of program theory/ logic.
- **Written process plans:** Consider written process plans (detailed implementation activities and roles and responsibilities).

26. NEEA INITIATIVES

26.1. Program Description

The Northwest Energy Efficiency Alliance (NEEA) is a regional non-profit organization that works in collaboration with its funders and other strategic market partners to accelerate the adoption of energy-efficient products, services, and practices across the Northwest. NEEA does this by leveraging the influence of the region and the region's electric utilities to build strategic partnerships, design and execute market interventions, and identify and advance emerging technologies. NEEA is funded by the electric utilities in the states of Washington, Idaho, Oregon, NorthWestern Energy and the Western Montana electric cooperatives in Montana, Bonneville Power Administration (BPA), and the Energy Trust of Oregon (ETO). NEEA works in cooperation with northwest utilities, public interest groups, manufacturers, retailers, regulatory agencies, and others on market transformation activities.

NEEA initiatives are funded by all of NEEA's funding utilities, BPA, and the ETO (funders) through multi-year contracts. Occasionally, additional initiatives are identified requiring funding above the multi-year contract commitments. In such occasions, funders are invited to opt-in, separate of their multi-year NEEA contract, and may individually choose to fund, or opt-in, for these supplemental activities. NEEA allocates annual initiative savings estimates in a number of ways:

- Funder Share: Savings are reported to the utility on an initiative level based upon the funding share which is a percentage of the funder's contribution to NEEA's budget. To the extent that NEEA has more specific information about how an initiative delivers savings in a funder's market, this information is provided to the funder.
- In 2010–2011, NEEA modified reporting systems and data acquisition processes to better define savings at the initiative level and by utility service territory. While savings based upon funder share continue to be provided, if possible or cost-effectively available, NEEA also collects and provides to the funder:
    - Data sorted by state
    - Zip codes: Point of sale data mapped to residential and commercial users and direct place of use data mapped to utility service territories
    - Data sorted by utility service territory
    - Data sorted by utility service territory and/or market share
    - Individual participant

Rather than reporting NEEA savings at the funder share level, NWE has historically worked with NEEA to evaluate the savings by initiative as reported by NEEA and determine how much, if any of the savings reported are appropriate as part of NWE's DSM portfolio. NWE evaluates whether NEEA initiative savings reflect verifiable activities in their service territory and, if so, may further true up the NEEA estimates to NWE's specific market characteristics. For example, since the electric water heat saturation in NWE's market is lower than the regional average used in calculating NEEA's savings for dishwashers, NWE reapportions the energy savings per dishwasher reported as sold in NWE's territory to better represent the mix of electric and natural gas hot water heating.

NEEA's annual energy savings are reported based on the calendar year. NWE applies these savings to the tracker period of July 1 through June 30. For example, the NEEA savings for calendar year 2011 are reported as the NEEA savings for the tracker period of July 1, 2011 through June 30, 2012.

NEEA reports savings associated with current investments and previous investments. Current investments are initiatives that are part of the 2010-2014 Business Plan. Tracking and reporting these savings enables NEEA to assess its progress in meeting its Business Plan goals. NEEA also continues to track and report the annual incremental savings from previous investments (prior to 2010) to assess the influence on accelerating the adoption of energy efficient products and behaviors.

This section reviews 18 NEEA initiatives and the energy savings claimed by NWE for all or part of the 2006–2011 program years. Each of the initiatives described below equate to program components discussed elsewhere in this report.

26.1.1. Commercial Commissioning Public Buildings

The initiative for Commissioning in Public Buildings began in 1998 and continued through 2011. It is intended make the commissioning process a standard practice for newly constructed public buildings. Building commissioning provides documented confirmation that building systems function according to project documents and the owner's operational needs. This systematic process begins early in the building design process and extends up to and sometimes after the constructed building is occupied.

Initiative objectives include:

- The education of design professionals, facility managers, and administrators on the benefits of commissioning
- Demonstrating commissioning and analyzing results
- Adoption of state requirements and model policies for commissioning for local government facilities and schools
- Disseminating commissioning results and model policies, including case studies describing the costs and benefits associated with demonstration projects.

Initiative Savings

NEEA assigned savings to NWE based on funder share. In all years but one, NWE claimed no savings because no commissioning of public buildings had taken place in NWE territory.

26.1.2. Commercial Verdiem

NEEA provided funding to Verdiem from 2001 through 2003. The Verdiem initiative, a partnership with a software developer, introduced a software product that manages energy in computer network environments. The product enables network administrators to remotely control the power management functions of personal computers linked to a central network. The program was designed to lower the projected growth in energy consumption caused by the rapid expansion of computers and associated technology in the workplace.

Initiative Savings

In 2006 and 2007 NWE claimed the savings assigned to NWE by NEEA based on funder share. In 2009 NEEA assigned savings to NWE, but NWE found no Verdiem license activity in their territory and did not claim any savings. In all other years, NEEA assigned no savings to NWE, and NWE did not claim savings.

26.1.3. Energy Codes 1997–2004

NEEA has supported non-residential energy code activities in the Northwest since 1997, principally by funding staff positions or organizations responsible for code adoption and education. This initiative provided support for non-residential energy code support and enforcement activities from 1997 through 2004.

NEEA impacts energy codes through the following actions (Cadmus 2009):

- Increasing Stringency: NEEA support of code upgrades has been a critical factor in developing more stringent energy codes in the Northwest. Codes that have either gone into effect or will go into effect soon are between 15% and 30% more stringent than current levels.
- Supporting Compliance: NEEA-funded training supports understanding of energy codes by building officials and builders alike. Analysis of the training data showed building officials from all four states are attending NEEA-sponsored training, with Oregon and Washington training sessions the most well attended. Overall, trained building officials served Northwest counties (both urban and rural) that had the greatest number of building starts. Additionally, anecdotal evidence from visits to several jurisdictions, and associated discussions with local energy code compliance officials, indicates they have a high degree of energy code knowledge and a solid depth of understanding.
- Supporting Code Infrastructure: The process of developing and implementing energy codes that are technically feasible and easy to comply with requires very specific knowledge and understanding. The group of people who can be considered experts in energy codes is quite small. NEEA has retained the expertise of these experts for the region, either as contractors or as code specialists within state energy agencies, when cyclical funding from other sources has diminished.

Initiative Savings

In 2006 NWE updated the NEEA reported savings based on methodology documents provided by NEEA. From 2007–2009, NWE reported the savings assigned by NEEA based on funder share. In 2010, NEEA assigned savings to NWE based on construction activity in NWE territory. In 2011 NEEA assigned no savings and NWE claimed no savings.

26.1.4. Energy Codes 1997–2011

NEEA has supported non-residential energy code activities in the Northwest since 1997, principally by funding staff positions or organizations responsible for code adoption and education. This initiative provided support for non-residential energy code support and enforcement activities from 1997 through 2011.

NEEA impacts the energy code through the following actions (Cadmus 2009):

- Increasing Stringency: NEEA support of code upgrades has been a critical factor in developing more stringent energy codes in the Northwest. Codes that have either gone into effect or will go into effect soon are between 15% and 30% more stringent than current levels.
- Supporting Compliance: NEEA-funded training supports understanding of energy codes by building officials and builders alike. Analysis of the training data showed building officials from all four states are attending NEEA-sponsored training, with Oregon and Washington training sessions the most well attended. Overall, trained building officials served Northwest counties (both urban and rural) that had the greatest number of building starts. Additionally, anecdotal evidence from visits to several jurisdictions, and associated discussions with local energy code compliance officials, indicates they have a high degree of energy code knowledge and a solid depth of understanding.
- Supporting Code Infrastructure: The process of developing and implementing energy codes that are technically feasible and easy to comply with requires very specific knowledge and understanding. The group of people who can be considered experts in energy codes is quite small. NEEA has retained the expertise of these experts for the region, either as contractors or as code specialists within state energy agencies, when cyclical funding from other sources has diminished.

Initiative Savings

In 2011, NWE claimed the electric savings assigned by NEEA, based on a percentage of the state level allocation. In addition, NWE claimed gas savings based on a therms per square foot savings reported to NEEA by Mike Kennedy, Inc. (2005, 2009). In earlier years no savings were claimed.

26.1.5. Residential Multi-Family Codes > 2004

NEEA has supported residential multi-family energy code activities in the Northwest since 2004, principally by funding staff positions or organizations to influence code adoption and to provide education and training. This initiative provides support for residential multifamily (> 4 units) energy code support and enforcement.

NEEA impacts the energy code through the following actions (Cadmus 2009):

- Increasing Stringency: NEEA support of code upgrades has been a critical factor in developing more stringent energy codes in the Northwest. Codes that have either gone into effect or will go into effect soon are between 15% and 30% more stringent than current levels.
- Supporting Compliance: NEEA-funded training supports understanding of energy codes by building officials and builders alike. Analysis of the training data showed building officials from all four states are attending NEEA-sponsored training, with Oregon and Washington training sessions the most well attended. Overall, trained building officials served Northwest counties (both urban and rural) that had the greatest number of building starts. Additionally, anecdotal evidence from visits to several jurisdictions, and associated discussions with local energy code compliance officials, indicates they have a high degree of energy code knowledge and a solid depth of understanding.
- Supporting Code Infrastructure: The process of developing and implementing energy codes that are technically feasible and easy to comply with requires very specific knowledge and understanding. The group of people who can be considered experts in energy codes is quite small. NEEA has retained the expertise of these experts for the region, either as contractors or as code specialists within state energy agencies, when cyclical funding from other sources has diminished.

Initiative Savings

In 2010 and 2011, NWE claimed the NEEA assigned values based on NWE's net share of state new construction. Data came from HUD, and were reported by Ecotope. In earlier years no savings were claimed.

26.1.6. Residential Single-Family Codes > 2004

NEEA has supported residential single family energy code activities in the Northwest since 2004, principally by funding staff positions or organizations responsible for code adoption and education. This initiative provides support for residential single family (≤ 4 units) energy code support and enforcement.

NEEA impacts the energy code through the following actions (Cadmus 2009):

- Increasing Stringency: NEEA support of code upgrades has been a critical factor in developing more stringent energy codes in the Northwest. Codes that have either gone into effect or will go into effect soon are between 15% and 30% more stringent than current levels.
- Supporting Compliance: NEEA-funded training supports understanding of energy codes by building officials and builders alike. Analysis of the training data showed building officials from all four states are attending NEEA-sponsored training, with Oregon and Washington

training sessions the most well attended. Overall, trained building officials served Northwest counties (both urban and rural) that had the greatest number of building starts. Additionally, anecdotal evidence from visits to several jurisdictions, and associated discussions with local energy code compliance officials, indicates they have a high degree of energy code knowledge and a solid depth of understanding.

- Supporting Code Infrastructure: The process of developing and implementing energy codes that are technically feasible and easy to comply with requires very specific knowledge and understanding. The group of people who can be considered experts in energy codes is quite small. NEEA has retained the expertise of these experts for the region, either as contractors or as code specialists within state energy agencies, when cyclical funding from other sources has diminished.

Initiative Savings

In 2010 and 2011, NWE claimed the NEEA assigned values based on NWE’s net share of state new construction. Data came from HUD, and were reported by Ecotope. In earlier years no savings were claimed.

26.1.7. Irrigation Soil Moisture Data Logger

The Irrigation Soil Moisture Data Logger initiative operated from 2002 through 2004 and was designed to increase the reach of an earlier initiative, Scientific Irrigation Scheduling (1997–2000). The initiative supports the AM400 irrigation data logger, a data processing and storage device, which receives data inputs from nearby buried soil moisture sensors and weather data from remote agricultural weather stations to control irrigation pumping equipment. Energy savings are achieved by matching irrigation pump operation to the exact water requirements for the crops, thus minimizing unnecessary pump operation.

Initiative Savings

In 2006, NWE updated the NEEA-assigned value (based on funder share) according to data on actual units shipped. In 2007–2009 and 2011, NEEA assigned savings based on funder share, but NWE claimed no savings due to a lack of activity in NWE territory. In 2010, NWE claimed the NEEA-assigned value based on the place of use zip code of shipped units.

26.1.8. 80 Plus Power Supply

The 80 Plus Power Supply, a supplemental initiative from 2004 through 2011, conducts market transformation activities to improve the power supply efficiencies for desktop PCs and servers through partnerships with power supply manufacturers, system integrators, original computer equipment manufacturers, and large end-use consumers. As a sponsor of 80 PLUS, NEEA provides financial incentives to computer manufacturers for commercial sales of desktop PCs and servers incorporating 80 PLUS certified power supplies within the Northwest region. Additionally, NEEA works closely with the Environmental Protection Agency to incorporate efficient power supply specifications into the Energy Star standard for desktop PCs.

The original 80 PLUS specification for desktop PC power supplies required 80% efficiency. Over the following years, the program added new certification levels to push the market toward higher efficiencies.

Initiative Savings

In 2009 NEEA assigned savings to NWE based on opt-in funder share. NWE updated savings according to a NEEA-provided count of net units shipped to the NWE territory combined with a NEEA-provided unit savings. In 2010, NWE reported the savings attributed by NEEA for 80+ computers, Energy Star (ES) 5.0 computers, ES 5+10% monitors, and ES 1.0 servers. NEEA based the counts on zip code level data of units sold. In 2011, NEEA reported NWE savings based on the opt-in funder share for 80+ computers and ES 5.0 computers, and NWE claimed these amounts. NWE also claimed savings for ES 5+10% monitors and ES 1.0 servers according to the unit savings and count of net units reported by Ecova.

26.1.9. Residential Ductless Heat Pump

The Residential Ductless Heat Pump (DHP) initiative seeks to spur the adoption of zonal residential cold climate heat pump technology in the region to displace electric resistance heat. DHPs provide high efficiency heating and air conditioning in homes on a zone by zone basis. The primary goals of the initiative are to increase electric energy savings by displacing electric resistance heat by raising consumer awareness of the benefits of owning ductless heat pumps, developing a trained installer network, increasing product availability, and supporting utility programs providing incentives for higher efficiency DHPs. NEEA works to achieve these goals through partnerships with manufacturers, utilities, retailers, and consumers.

In NWE’s service territory, emphasis has been placed on training installers and educating customers on DHPs rated for high efficiency in cold climates. No NWE incentives are offered to customers or installers. The savings reported are associated with units tied to sales data acquired by NEEA. Residential electric heat saturation is very low in NWE’s service territory. Separate of the primary regional initiative, NWE provided supplemental funding to NEEA for the cold climate DHP pilot with six residential customers for whom electric resistance heat was their sole heating source. The pilot sites were equipped with interval metering equipment on the DHPs and electric resistance heat. Savings for this pilot are not yet available.

Initiative Savings

In 2011, NWE claimed the NEEA-assigned service territory allocation of savings. Previously, no savings were claimed.

26.1.10. Residential Energy Star CFL Bulbs

NEEA conducted CFL marketing initiatives from 1997 through 2008 to advance availability, affordability and product quality while building consumer awareness of qualifying CFL technology and increase the use of CFLs in the Northwest region. This initiative affects screw-in twist-style CFL < 25 Watts, the approximate equivalent of a 60 Watt incandescent bulb.

The overarching initiative goals (KEMA 2008 (a)) were to:

- Increase product market penetration through increased sales
- Reduce product price
- Increase product availability both in the variety of product and the number of retailers stocking product
- Increase consumer awareness of CFLs
- Drive improvement of Energy Star product quality

To achieve these goals, NEEA worked with CFL manufacturers, the EPA, large retailers, small retailers, and consumers.

Initiative Savings

Program savings methodologies varied over the 2006–2011 program years as described below:

- In the 2006–2008 program years, NEEA provided CFL bulb savings for a regional funder share of 2.7% of savings net of baseline sales estimates and NWE’s CFL rebates.
- In program year 2009, the CFL bulb counts were based on sales by Montana retailers. After subtracting buy-down bulbs, NWE further reduced NEEA’s net allocation by subtracting the number of CFLs credited to the NWE rebate program. NWE then increased the unitized savings for each CFL from NEEA’s 30.1 to 62.1 kWh/year, based on an increase in the deemed operating hours from 1.3 to 3.7 hours/day as recommended in NWE’s 2007 DSM portfolio evaluation (Nexant 2007).
- In 2010, approximately 3% of regional CFL sales occurred in the NWE service territory. The percentage was based on NEEA's Residential Mapping System, which uses zip-code sales data to allocate the savings to the service territory. NEEA subtracted CFL retirement estimates and NWE-reported rebated units from the gross sales data, and applied a retirement estimate to the NWE rebated units. NWE recalculated savings, increasing the unitized savings from NEEA’s 30.1 to 62.1 kWh/year per the 2007 DSM evaluation (Nexant 2007).
- In 2011, NEEA again allocated CFL units to NWE based on zip code sales. NEEA adjusted the gross NWE bulb allocation by subtracting out baseline and retirement bulbs. NEEA then subtracted the NWE-incented bulbs and subtracted the same retirement proportion as the gross unit sales. NWE recalculated savings increasing the unitized savings from NEEA’s 30.1 to 62.1 kWh/year per the 2007 DSM evaluation (Nexant 2007).

For all years, NEEA assumed 100% of the CFLs went to residential use.

26.1.11. Residential Energy Star CFL Fixture

NEEA operated CFL marketing initiatives from 1997 through 2008 to advance consumer awareness of CFL technology and increase the use of qualifying CFLs in the Northwest region. This initiative affects lighting fixtures designed exclusively for CFLs of various wattages, typically with pin-based CFL bulbs.

The overarching initiative goals (KEMA 2008 (a)) were to:

- Increase product market penetration through increased sales
- Reduce product price
- Increase product availability
- Increase retailer and consumer awareness of CFL fixtures
- Drive improvement of Energy Star product quality

To achieve these goals, NEEA worked with CFL manufacturers, the EPA, large retailers, small retailers, and consumers to achieve these goals.

Initiative Savings

Program savings were claimed only in 2007 and were based NEEA calculated savings for a 2.7% funder share of regional initiative savings. The net savings were reduced by NEEA for estimates of baseline sales and NWE utility rebates.

26.1.12. Residential Energy Star Specialty CFL Bulbs

NEEA operated CFL marketing initiatives from 1997 through 2008 to advance consumer awareness of CFL technology and increase the use of qualifying CFLs in the Northwest region. This initiative addresses CFL specialty bulbs, not the generic screw-in twist-style, but CFLs such as 3-way bulbs, candelabra, globe, dimmable units, 3-way, CFLs for outdoor applications, and reflector down lights. Specialty CFLs were a significant part of the CFL buy-downs, regional retail CFL cost markdowns.

The overarching initiative goals (KEMA 2008 (a)) were to:

- Increase product market penetration through increased sales
- Reduce product price
- Increase product availability
- Increase retailer and consumer awareness of CFLs
- Drive improvement of Energy Star product quality

To achieve these goals, NEEA worked with CFL manufacturers, the EPA, large retailers, small retailers, and consumers to achieve these goals.

Initiative Savings

The program operated in the 2010–2011 program years. Savings were derived through the following process.

- In 2010, approximately 3% of regional CFL sales occurred in the NWE service territory. The percentage was based on NEEA's Residential Mapping System, which uses zip-code sales data to allocate the savings to the service territory. NEEA subtracted CFL retirement estimates and NWE-reported rebated units from the gross sales data, and applied a retirement estimate to the NWE rebated units. NWE recalculated savings, increasing the unitized savings from NEEA's 30.1 to 62.1 kWh/year per the 2007 DSM evaluation (Nexant 2007).

- In 2011, NEEA continued to allocate CFL units to NWE based on zip code sales. NEEA adjusted the gross NWE bulb allocation by subtracting out baseline and retirement bulbs. They then subtracted the NWE-incented bulbs and subtracted the same retirement proportion as the gross unit sales. NWE recalculated savings increasing the unitized savings from NEEA's 30.1 to 62.1 kWh/year per the 2007 DSM evaluation (Nexant 2007).

For all years, NEEA assumed 100% of the CFLs went to residential use.

26.1.13. Residential Energy Star Clothes Washers

There have been several NEEA initiatives either exclusively for, or including clothes washers, beginning in 1997. In chronological order, the initiatives were WashWise, Energy Star Home Products, and the Residential Sector Initiative. All share the common goals of driving manufacturers to produce higher efficiency clothes washers, raising consumer awareness of the benefits of owning a high efficiency clothes washer. The initiatives focused on partnerships with manufacturers, utilities, retailers and consumers. Targeted public outreach campaigns were conducted to raise consumer awareness of Energy Star clothes washers. NEEA promoted ultra-high efficiency clothes washers and influenced the adoption of more stringent Energy Star specifications for clothes washers.

Initiative Savings

NEEA reported savings were based on the region-wide mix of gas/electric residential water heating (DHW), as well as the region-wide mix of gas/electric dryers (washer savings include dryer savings due to reduced moisture content). In all years NWE reapportioned the NEEA reported savings according to the mix of gas/electric DHW in NWE territory. From 2006–2008, NWE included the gas/electric dryer mix in their calculations as well. These calculations were based on the 2005 Market Activities Report (MAR) of the WashWise/Energy Star efficient washers program, which reported unit savings for each tier of washer, each combination of gas/electric DHW and dryer, as well as the region-wide gas/electric DHW and dryer percentages. Starting in 2009, NEEA reported tiers did not match those in the MAR, and NWE did a simpler reallocation of NEEA-reported electric savings to the NWE gas/electric mix. In 2006 and 2007, NEEA did not report the count of units – NWE derived these from the NEEA savings values, which were based on funder share. From 2008 onward, NEEA reported counts of net units for NWE based on NWE's share of units shipped in Montana.

26.1.14. Residential Energy Star Dishwashers

Residential Energy Star Dishwashers were part of the Energy Star Home Products initiative from 2001 to 2004. The initiative sought to increase product quality and availability while raising consumer awareness on the benefits of owning a high efficiency Energy Star rated dishwasher. The initiative focused on partnerships with manufacturers, utilities, and retailers. Targeted public outreach campaigns were conducted to raise consumer awareness about Energy Star dishwashers.

Initiative Savings

From 2006–2009, NEEA assigned savings to NWE based on funder share. NWE reapportioned the electric savings to a mix of gas and electric savings based on the mix of gas/electric residential water heating in NWE territory versus the gas/electric mix assumed by NEEA for the entire region. In 2010, NEEA used AHAM data to estimate net shipments to NWE territory, and NWE reapportioned the savings according to their own gas/electric mix. In 2011, NWE used the NEEA-reported count of units, which was based on a state level allocation, and reapportioned savings to NWE's gas/electric mix. In 2010 and 2011, appliances rebated through NWE programs are subtracted.

26.1.15. Residential Energy Star New Construction

The Residential Energy Star New Construction initiative (2005–2009) promotes the construction and sale of new homes built to the Energy Star Homes Northwest specification. NEEA helps adapt and advance the Federal Energy Star Homes specification for the states of Washington, Oregon, Idaho, and Montana. Site-built and manufactured homes built to this specification are at least 15% more energy-efficient than state energy codes in the region. Energy Star Homes include high-efficiency lighting, windows, appliances, water heaters, insulation, and heating and cooling equipment (ECO Northwest 2010).

In addition to prescriptive measures, activities include:

- Training and education for builders, HVAC contractors and performance testers
- A quality assurance process:
  - Central HVAC system performance testing
  - Inspection by a certified verifier for compliance with program specifications
  - Inspection and certification by an approved third party contractor
- Marketing, outreach, promotion, and consumer education

In the NWE service territory, the initiative funds a contract with NCAT for training, education, and certification in Montana. NWE has provided rebates over the 2006–2011 program years for site-built and manufactured homes with the Northwest Energy Star certification through the E+ New Homes, E+ Residential New Electric Rebate, and E+ Residential New Gas Rebate programs.

Initiative Savings

For all years, savings are based on records of new construction in NWE territory combined with NEEA or Ecotope reported savings values per home type. Homes rebated through NWE's E+ New Homes program are not included.

26.1.16. Residential Energy Star Refrigerators

Residential Energy Star Refrigerators were part of the Energy Star Home Products initiative from 2001 to 2004. The initiative sought to increase energy efficiency and availability while raising consumer awareness of the benefits of owning a high efficiency Energy Star rated refrigerator. The initiative focused on partnerships with utilities and retailers. Targeted public outreach campaigns were conducted to raise consumer awareness about Energy Star refrigerators.

Initiative Savings

From 2006–2009, NWE reported the NEEA assigned savings based on funder share. In 2010, NEEA allocated savings to NWE based on AHAM data of units shipped. The count of units does not include appliances from the DEQ appliance program or NWE rebate programs. In 2011 no units were claimed.

26.1.17. Residential Energy Star TVs

From 2009 through 2011, NEEA worked with a group of west coast utilities to influence manufacturers to produce and retailers to stock, sell, and promote the most efficient Energy Star rated TVs through retailer incentives, sales associate training, regional marketing and point-of-sale product identification. Previously, retailers, manufacturers and consumers had not prioritized energy-efficient TVs.

Initiative Savings

NWE claimed savings for three years, 2009–2011:

- In 2009, NWE participated in the NEEA supplemental or opt-in residential Energy Star Television initiative with a funder share of 1.40%. NEEA reported savings to NWE based on the funder share as well as based on the number of units actually sold in NWE territory. NWE claimed savings were based on the number of units sold in NWE territory, combined with a NEEA-provided UES value.
- In 2010, NEEA tracked upstream incented TVs by zip code, assigning a count of units to NWE based on the number of NWE customer accounts per region. In this savings year, the gross number of units was the same as the net number, i.e. all savings were attributed to the initiative and no discounting is evident due to the naturally occurring baseline.
- In 2011, NEEA again apportioned units to NWE based on zip code. In this year savings were broken out by Energy Star tier, with five levels of savings. For each level of savings, NEEA discounted the number of units according to varying levels of naturally occurring sales to find the net market effects of the initiative.

26.1.18. Residential Energy Star Windows

The Residential Energy Star Windows initiative was funded by NEEA from 1998 to 2001 to build product image, brand association, product availability, and to increase consumer awareness of the value of premium energy-efficient windows. The goals for the initiative were to increase product availability, increase the market share for high-efficiency fenestration products in the residential market and to decrease two market barriers, lack of awareness and initial cost premiums.

The program developed partnerships to leverage change in the marketplace. Key partners and allies included window product manufacturers, regional utilities, retailers, wholesalers, distributors, builders, the manufactured housing industry, building code agencies, and other government agencies. Partners used the Energy Star logo in advertising, educational, and promotional materials, and labeled qualified Energy Star products.

Initiative Savings

In 2006 and 2007, NWE used the NEEA reported savings assigned to NWE, based on funder share, to calculate a net window square footage, using NEEA-reported values for savings per square foot. From 2008–2011, NWE used net square footage values for NWE territory reported by NEEA. For all years, NWE reapportioned the electric savings according to the gas/electric space heating mix in NWE territory.

26.2. Impact Evaluation

26.2.1. Methodology

We performed an impact evaluation of this program to assess energy savings for each initiative. Our analysis was scaled to the initiatives with the largest savings. In many cases, initiatives with modest savings were only evaluated for reasonableness. Five initiatives with the largest savings received detailed savings reviews: Residential Energy Star Specialty CFL Bulbs, Residential Energy Star Clothes Washers, 80 Plus Power Supply, and Residential Energy Star TVs. Collectively these initiatives represent 89% of the electrical savings and 77% of the gas savings for the program

26.2.1.1. Commercial Commissioning Public Buildings

We reviewed for reasonableness NWE’s reassessment of NEEA assigned savings. In all years but one, NWE claimed no savings because no commissioning of public buildings had taken place in NWE territory.

26.2.1.2. Commercial Verdiem

We reviewed for reasonableness NWE’s assessment of the actual Verdiem license count in their territory, and the UES value assigned by NEEA to a Verdiem installation.

26.2.1.3. Energy Codes 1997–2004

We reviewed for reasonableness the counts and savings assigned by NEEA as well as the re-calculation made in one year by NWE to NEEA’s assigned savings.

26.2.1.4. Energy Codes 1997–2011

We reviewed for reasonableness the NEEA and Ecotope provided counts and savings for the two years of claimed savings.

26.2.1.5. Residential Multi-Family Codes > 2004

We reviewed for reasonableness the NEEA and Ecotope provided counts and savings for the two years of claimed savings.

26.2.1.6. Residential Single-Family Codes > 2004

We reviewed for reasonableness the NEEA and Ecotope provided counts and savings for the two years of claimed savings.

26.2.1.7. Irrigation Soil Moisture Data Logger

We reviewed for reasonableness the change made by NWE in 2006 to the NEEA assigned count as well as the counts and savings provided by NEEA for all years.

26.2.1.8. 80 Plus Power Supply

We reviewed for reasonableness the NEEA provided counts and unit savings. We checked the NWE re-calculation of savings based on counts rather than funder share in 2009. For 2011, we re-calculated savings based on a change in the unit count. NEEA provided unit counts to NWE for this year based on the opt-in funder share. We changed the basis for the counts to be NWE's share of commercial accounts in Montana, combined with the NEEA estimate of shipments in Montana. We found in discussion with NEEA that the Montana sales estimate was not considered reliable by NEEA because it was based on zip code level data for just 10% of total shipments. However, we considered this value to be a closer estimate of activity in NWE territory than the funder share, which was close to 20% of region-wide funding for ES 5.0 computers (and 2.7% for 80+ computers). We also checked the NEEA-provided unit savings for reasonableness by comparison with Energy Star calculator values.

26.2.1.9. Residential Ductless Heat Pump

We reviewed for reasonableness the count and savings provided by NEEA for the one year of claimed savings.

26.2.1.10. Residential Energy Star CFL Bulbs

We reviewed the NEEA provided counts, UES values, and initiative evaluation literature. We compared NEEA's NWE-incented bulb counts to NWE's reported tracking data bulb counts for the CFL Buy-down, Mail-in Rebate and In-Store Coupons. Since prior to 2009 NEEA did not report counts, counts were estimated by dividing the NEEA-reported savings by the unitized savings NEEA used for CFLs in each of those years. For years 2009–2011 we adjusted the gross count of incentivized units based on tracking data, which showed a different value for NWE rebated CFLs than that used by NEEA. We made the same retirement adjustment to the count of gross incentivized units as was made by NEEA.

Based on a survey of retailers, we found that the end-use of CFLs purchased is similar to those under NEEA's umbrella which had an 81%/19% residential/non-residential split. We computed the average delta watts using data from the NWE CFL Buy-down initiative and found it to be 45.4 watts. For Residential CFLs, we derived the average daily operating hours as described in section 18.2.1. For the non-residential bulbs, based on customer reported operating hours during the evaluation site visits for commercial direct install CFLs, we found the average daily operating time to be 6.14 hours/day.

26.2.1.11. Residential Energy Star CFL Fixture

Savings were claimed only for the 2007 program year. NEEA provided net savings based on NWE's funder share. The savings were discounted for baseline sales and utility rebates. We derived the count of fixtures from the savings values.

Based on a survey of retailers, we found that the end-use of CFLs purchased is similar to those under NEEA's umbrella which had an 81%/19% residential/non-residential split. We computed the average delta watts using data from the NWE CFL Buy-down initiative and found it to be 45.4 watts. For Residential CFLs, we derived the average daily operating hours as described in section 18.2.1. For the non-residential bulbs, based on customer reported operating hours during the evaluation site visits for commercial direct install CFLs, we found the average daily operating time to be 6.14 hours/day.

26.2.1.12. Residential Energy Star Specialty CFL Bulbs

We reviewed the NEEA provided counts, UES values, and initiative evaluation literature. We compared NEEA's NWE-incented bulb counts to NWE's reported tracking data bulb counts for the CFL Buy-down, Mail-in Rebate and In-Store Coupons. For years 2010 and 2011 we adjusted the count of gross incentivized units based on tracking data. We made the same retirement adjustment to the count of gross incentivized units as was made by NEEA.

Based on a survey of retailers, we found that the end-use of CFLs purchased is similar to those under NEEA's umbrella which had an 81%/19% residential/non-residential split. We computed the average delta watts using data from the NWE CFL Buy-down initiative and found it to be 45.4 watts. For Residential CFLs, we derived the average daily operating hours as described in section 18.2.1. For the non-residential bulbs, based on customer reported operating hours during the evaluation site visits for commercial direct install CFLs, we found the average daily operating time to be 6.14 hours/day.

26.2.1.13. Residential Energy Star Clothes Washers

We reviewed for reasonableness the NEEA provided count of net units in NWE territory. We compared the unit savings provided by NEEA with Energy Star calculator values. We reviewed and accepted the methodology in the 2005 Market Activities Report (MAR) of the WashWise/Energy Star program (WashWise 2005), which counts both washer and dryer savings and apportions savings to gas and electric according to a mix of gas/electric DHW and gas/electric dryers. We reviewed NWE's implementation of this methodology from 2006–2008.

We re-calculated savings for 2009–2011 to produce savings estimates which more closely match the MAR methodology. The MAR method finds overall average gas and electric savings specific to a given mix of gas/electric DHW and dryers. With this method, NWE was able to input the NEEA-provided average electric savings and produce NWE-specific gas and electric savings. NWE stopped using this method in 2009, since the NEEA tiers no longer matched those in the MAR. We found the ratio of the new tier electric unit savings with the closest previous electric unit savings, and multiplied the previously calculated gas and electric savings by this ratio.

26.2.1.14. Residential Energy Star Dishwashers

We reviewed for reasonableness the counts and unit savings provided by NEEA, as well as NWE reapportioning of the savings to the gas/electric DHW mix in NWE territory.

26.2.1.15. Residential Energy Star New Construction

We reviewed for reasonableness the counts and unit savings provided by NEEA, as well as NWE reapportioning of the savings to the gas/electric space-heating mix in NWE territory.

26.2.1.16. Residential Energy Star Refrigerators

We reviewed for reasonableness the counts and unit savings provided by NEEA as well as the change in number of units made by NWE in 2009.

26.2.1.17. Residential Energy Star TVs

We reviewed the NEEA provided counts and UES values, and reviewed the literature evaluating this initiative. NEEA's first Market Progress Evaluation Report (MPER) for TVs (Energy Market Innovations, Inc. 2011) recommended the following changes NEEA's Alliance Cost Effectiveness (ACE) model: 1) inclusion of qualifying units in the baseline unit energy consumption values, which is inconsistent with the savings calculation, 2) overestimation of the Northwest market size, 3) inconsistent and dated datasets, 4) missing retailer data, 5) using a single manufacturer for information on sales to the commercial market, and 6) omission of savings from non-qualified units. One purpose of the MPER study is to provide NEEA with information to update its ACE model assumptions for TVs. We checked the UES values used in the savings claim with the Energy Star 4.1 Calculator (July, 2011). The Calculator shows savings of 119 kWh/year (with default assumptions of a 40 inch screen size and five hours per day on-time), which closely matches the values assumed by NEEA. Savings vary by year and efficiency tier, and with the baseline level appropriate for the year and tier.

26.2.1.18. Residential Energy Star Windows

We reviewed for reasonableness the NWE re-calculation of savings based on window square footage calculations or provided values. We also reviewed for reasonableness the NWE reapportionment of electric savings to gas and electric.

26.2.2. Energy and Demand Impacts

26.2.2.1. Estimation of Gross Savings

The following table provides information on the savings adjustment rate for each NEEA Initiative that contributed to the savings adjustment rate for this program. The table compares the reported savings to those adjusted for changes based on our evaluation of each initiative. All results shown are for gross savings and are not adjusted for free ridership or spillover.

Table 615: NEEA Initiatives Savings Adjustments

Funding	Initiative	Units	Savings		Savings Adjustment Rate
			Reported	Evaluation	
Electric					
	80 Plus Power Supply	kWh	5,417,285	4,239,904	0.78
	Commercial Commissioning Public Buildings	kWh	82,218	82,218	1.00
	Commercial Verdiem	kWh	72,569	72,569	1.00
	Energy Codes 1997-2004	kWh	3,970,054	3,970,054	1.00
	Energy Codes 1997-2011	kWh	199,919	199,919	1.00
	Irrigation Soil Moisture Data Logger	kWh	316,960	316,960	1.00
	Residential Ductless Heat Pump	kWh	96,962	96,962	1.00
	Residential Energy Star CFL Bulbs	kWh	41,353,675	47,910,564	1.16
	Residential Energy Star CFL Fixtures	kWh	488,836	755,631	1.55
	Residential Energy Star Clothes Washers	kWh	7,006,608	13,057,556	1.86
	Residential Energy Star Dishwashers	kWh	512,860	512,860	1.00
	Residential Energy Star New Construction	kWh	626,196	626,196	1.00
	Residential Energy Star Refrigerators	kWh	1,913,851	1,913,851	1.00
	Residential Energy Star Specialty CFL Bulbs	kWh	8,015,813	8,479,794	1.06
	Residential Energy Star TVs	kWh	15,114,714	15,114,714	1.00
	Residential Energy Star Windows	kWh	168,255	168,255	1.00
	Residential Multi-Family Codes > 2004	kWh	824,302	824,302	1.00

Funding	Initiative	Units	Savings		Savings Adjustment Rate
			Reported	Evaluation	
	Residential Single-Family Codes > 2004	kWh	358,204	358,204	1.00
	All Programs Electric	kWh	86,539,281	98,700,512	1.14
Natural Gas					
	Energy Codes 1997-2004	dkt	122	122	1.00
	Energy Codes 1997-2011	dkt	115	115	1.00
	Residential Energy Star Clothes Washers	dkt	75,065	58,590	0.78
	Residential Energy Star Dishwashers	dkt	1,985	1,985	1.00
	Residential Energy Star New Construction	dkt	5,145	5,145	1.00
	Residential Energy Star Windows	dkt	13,376	13,376	1.00
	Residential Multi-Family Codes > 2004	dkt	107	107	1.00
	Residential Single-Family Codes > 2004	dkt	1,272	1,272	1.00
	All Programs Natural Gas	dkt	97,186	80,711	0.83

26.2.2.2. Estimation of Net Savings

The following table shows the savings adjustment rates for this program determined by our evaluation. The savings realization rate reflects our findings from file reviews. The table shows for each funding source and calendar year, the net adjusted savings, which equals the net savings adjustment rate times the reported energy savings.

Table 616: Savings Adjustments by Calendar Year for NEEA Initiatives

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	NEEA Initiatives	kWh	2007	10,433,316	1.14	-	-	1.14	11,899,494	1,358
	NEEA Initiatives	kWh	2008	11,752,089	1.14	-	-	1.14	13,403,592	1,530
	NEEA Initiatives	kWh	2009	19,442,276	1.14	-	-	1.14	22,174,468	2,531
	NEEA Initiatives	kWh	2010	19,946,293	1.14	-	-	1.14	22,749,315	2,597
	NEEA Initiatives	kWh	2011	16,091,924	1.14	-	-	1.14	18,353,297	2,095
	NEEA Initiatives	kWh	All Years	77,665,897	1.14	-	-	1.14	88,580,165	10,112
Natural Gas Supply - DSM										
	NEEA Initiatives	dkt	2007	7,594	0.83	-	-	0.83	6,307	
	NEEA Initiatives	dkt	2008	10,847	0.83	-	-	0.83	9,008	
	NEEA Initiatives	dkt	2009	36,190	0.83	-	-	0.83	30,055	
	NEEA Initiatives	dkt	2010	32,371	0.83	-	-	0.83	26,883	
	NEEA Initiatives	dkt	2011	4,179	0.83	-	-	0.83	3,471	

Funding	Program	Units	Year	Reported Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	NEEA Initiatives	dkt	All Years	91,181	0.83	-	-	0.83	75,724	
Electric - USB										
	NEEA Initiatives	kWh	2009	1,936,613	1.14	-	-	1.14	2,208,763	252
	NEEA Initiatives	kWh	All Years	1,936,613	1.14	-	-	1.14	2,208,763	252
Electric										
	NEEA Initiatives	kWh	All Years	79,602,511	1.14	-	-	1.14	90,788,928	10,364
Natural Gas										
	NEEA Initiatives	dkt	All Years	91,181	0.83	-	-	0.83	75,724	

26.2.3. Economic Analysis

The following table shows the results of our cost-effectiveness analysis for this program. We computed four different tests of cost-effectiveness based on cost data provided by NWE, our estimates of net adjusted savings for the program and the definition of each test. The table shows the benefit-to-cost ratio for each test. Results are provided for each funding source and calendar year.

Table 617: Net Savings and Benefit/Cost Ratios by Calendar Year for NEEA Initiatives

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
Electric Supply - DSM								
	NEEA Initiatives	kWh	2007	12,845,036	21.76	21.76	2.25	23.94
	NEEA Initiatives	kWh	2008	12,230,995	12.88	12.88	2.55	14.17
	NEEA Initiatives	kWh	2009	21,905,217	42.38	42.38	4.38	46.61
	NEEA Initiatives	kWh	2010	14,244,908	6.17	6.17	3.10	6.79
	NEEA Initiatives	kWh	2011	21,387,559	8.23	8.23	4.15	9.05
	NEEA Initiatives	kWh	All Years	82,613,716	11.33	11.33	3.38	12.46
Natural Gas Supply - DSM								
	NEEA Initiatives	dkt	2007	6,307	-0.00	-0.00	2.23	-0.00
	NEEA Initiatives	dkt	2008	9,008	-0.00	-0.00	4.43	-0.00
	NEEA Initiatives	dkt	2009	30,055	-0.00	-0.00	4.16	-0.00
	NEEA Initiatives	dkt	2010	26,883	-0.00	-0.00	5.39	-0.00
	NEEA Initiatives	dkt	2011	3,471	-0.00	-0.00	8.03	-0.00
	NEEA Initiatives	dkt	All Years	75,724			4.41	
Electric - USB								
	NEEA Initiatives	kWh	2009	265,068	2.92	2.92	1.34	3.21

Funding	Program	Units	Year	Net Adjusted Energy Savings	Benefit/Cost Ratios			
					Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
	NEEA Initiatives	kWh	All Years	265,068	1.40	1.40	0.89	1.54
Electric								
	NEEA Initiatives	kWh	All Years	82,878,784	11.16	11.16	3.36	12.27
Natural Gas								
	NEEA Initiatives	dkt	All Years	75,724			4.41	

NEEA Initiatives costs do not include Incremental Participant costs because None were provided.

26.2.4. Impact Findings for Individual Initiatives

Our impact evaluation of this program assessed energy savings for each initiative. Five initiatives which collectively represent 89% of the electrical savings and 77% of the gas savings for the program received detailed savings reviews. Those five initiatives are: Residential Energy Star CFL Bulbs, Residential Energy Star Specialty CFL Bulbs, Residential Energy Star Clothes Washers, 80 Plus Power Supply, and Residential Energy Star TVs. The remaining initiatives were reviewed for reasonableness.

26.2.4.1. Commercial Commissioning Public Buildings

NEEA assigned savings of 1,092,536 kWh for all years for this initiative. NWE modified the claim to be 82,218 kWh due to a low level of commissioning of public buildings in NWE territory. We found the NWE claim to be reasonable.

26.2.4.2. Commercial Verdiem

NEEA assigned savings of 150,272 kWh for all years. NWE modified the claim to be 26,855 kWh due to a low level of Verdiem licenses in NWE territory. We found the NWE claim to be reasonable. In 2006 and 2007 NWE reported savings for this initiative together with savings for the 80+ initiative for a combined savings of 72,569 kWh.

26.2.4.3. Energy Codes 1997–2004

NEEA assigned savings of 3,112,562 kWh for all years. NWE re-calculated the savings in 2006, and claimed 3,970,054 kWh and 122 dkt for all years. We found the NWE claim to be reasonable.

26.2.4.4. Energy Codes 1997–2011

NEEA assigned savings of 199,919 kWh for the one year. NWE claimed 199,919 kWh and 115 dkt. We found the NWE claim to be reasonable.

26.2.4.5. Residential Multi-Family Codes > 2004

NEEA assigned savings of 824,302 kWh for the two years. NWE claimed 824,302 kWh and 107 dkt. We found the NWE claim to be reasonable.

26.2.4.6. Residential Single-Family Codes > 2004

NEEA assigned savings of 358,204 kWh for the two years. NWE claimed 358,204 kWh and 1272 dkt. We found the NWE claim to be reasonable.

26.2.4.7. Irrigation Soil Moisture Data Logger

NEEA assigned savings of 77,486 kWh for the two years. NWE claimed 316,960 kWh. We found the NWE claim to be reasonable.

26.2.4.8. 80 Plus Power Supply

Our re-calculation of the unit count based on the NWE share of estimated Montana shipments for 2011 computers (as discussed in section 26.2.1.8) reduced the count of ES 5.0 computers from 80,990 to 18,782, while increasing the count of 80+ computers from 12,353 to 18,274. For other years we made no changes to the NWE claim. Table 618 shows the effect our changes had on savings for this initiative.

Table 618: Impact of Evaluation Changes on 80 Plus Power Supply

Year	Initiative	Program Savings (kWh / Year)	Evaluation Savings (kWh / Year)
2006	Commercial - Verdiem (80+ power supply)	6,414	6,414
2007	Commercial - Verdiem (80+ power supply)	39,301	39,301
2008	Commercial - Verdiem (80+ power supply)	-	-
2009	Residential & Commercial - 80 Plus	306,042	306,042
2010	Commercial - 80 Plus	1,193,875	1,193,875
2011	Commercial - 80 Plus	3,917,369	2,739,987
Totals		5,463,000	4,285,618

The net effect of the evaluation change in count was a 21% decrease in savings for this initiative over the entire period.

26.2.4.9. Residential Ductless Heat Pump

NEEA assigned savings of 96,962 kWh for the one year. NWE claimed 96,962 kWh. We found the NWE claim to be reasonable.

26.2.4.10. Residential Energy Star CFL Bulbs

For the years 2006–2008, based on NEEA-reported total savings and the NEEA-reported unit savings, we were able to derive counts of gross bulbs, baseline bulbs, and incentivized bulbs. However, the count of incentivized bulbs derived in this manner was roughly one-third the program tracking count of bulbs. Without more information about the actual total count of bulbs installed in NWE territory, we decided to make no adjustments to the program values for this year.

In 2009, NEEA reported gross Montana sales, and subtracted units attributed to "Change-a-Light" (CAL) incentives. NEEA applied a 67% NWE share of the reduced Montana sales. NWE further subtracted NWE incentivized bulbs. We found that the count of program bulbs subtracted by NWE included the CAL bulbs, which had already been subtracted by NEEA. We adjusted the count accordingly.

In 2010 NEEA reported gross sales in NWE territory according to sales zip code data. NEEA also reported counts of retirements and incentivized units. The count of incentivized units was reduced by subtracting the retirements from this population (at the same rate as the general population). We adjusted the count of program bulbs using counts from tracking data, replacing the NEEA reported count of incentivized units with the count from tracking data.

In 2011 NEEA reported gross sales in NWE territory according to sales zip code data. NEEA also reported counts of baseline, retirements and incentivized units. The count of incentivized units was reduced by subtracting the retirements from this population (at the same rate as the general population). We adjusted the count of program bulbs using counts from tracking data.

For the years 2009–2011 we re-calculated savings based on the Evaluation UES. Table 619 summarizes the adjustments we made for this initiative.

Table 619: Summary of UES and count adjustments for Residential Energy Star CFL Bulbs

Year	NEEA UES	Program UES	Evaluation UES	Program Count of Net Units	Evaluation Count of Net Units
2006	33.6	33.6	33.6	143,027	143,027
2007	35.5	35.5	35.5	219,191	219,191
2008	33.5	33.5	33.5	258,078	258,078
2009	30.5	62.1	51.9	240,801	443,075
2010	30.1	62.1	51.9	70,128	54,239
2011	30.1	62.1	51.9	12,954	16,990

The net impacts of these adjustments are shown in Table 620.

Table 620: Summary of Evaluation Impacts for Residential Energy Star CFL Bulbs

Year	Initiative	Program Savings (kWh / Year)	Evaluation Savings (kWh / Year)
2006	Res ES CFL Bulbs	4,799,491	4,799,491
2007	Res ES CFL Bulbs	7,787,963	7,787,963
2008	Res ES CFL Bulbs	8,645,628	8,645,628
2009	Res ES CFL Bulbs	14,959,296	22,982,757
2010	Res ES CFL Bulbs	4,356,534	2,813,448
2011	Res ES CFL Bulbs	804,763	881,276
Totals	-	41,353,675	47,910,564

The net effect of the evaluation changes was a 9% increase in savings for this initiative over the entire period.

26.2.4.11. Residential Energy Star CFL Fixture

For the only program year, we derived the count of fixtures using the NEEA-reported count of net units and the NEEA-reported UES. We re-calculated savings based on the Evaluation UES. Savings increased proportionally to the increase in the Evaluation UES compared with the NEEA UES as shown in Table 621.

Table 621: Summary of Evaluation Impacts for Residential Energy Star CFL Fixture

ProgramYear	Initiative	Program Savings (kWh)	Evaluation Savings (kWh)
2006	Res ES CFL Fixtures	488,836	755,631
2007	Res ES CFL Fixtures	-	-
Totals	-	488,836	755,631

The net effect of the evaluation change in UES was a 37% increase in savings for this initiative over the entire period.

26.2.4.12. Residential Energy Star Specialty CFL Bulbs

In 2010 NEEA reported gross sales in NWE territory according to sales zip code data. NEEA also reported counts of retirements and incentivized units. The count of incentivized units was reduced by subtracting the retirements from this population (at the same rate as the general population). We adjusted the gross count of program bulbs using counts from tracking data, and made the same retirement adjustment as was made by NEEA.

In 2011 NEEA reported gross sales in NWE territory according to sales zip code data. NEEA also reported counts of baseline, retirements and incentivized units. The count of incentivized units was reduced by subtracting the retirements from this population (at the same rate as the general population). We adjusted the gross count of program bulbs using counts from tracking data, and made the same retirement adjustment as was made by NEEA.

For the years 2010–2011 we re-calculated savings based on the Evaluation UES. Table 622 summarizes the adjustments we made for this initiative.

Table 622: Summary of UES and count adjustments for Residential Energy Star Specialty CFL Bulbs

Year	NEEA UES	Program UES	Evaluation UES	Program Count of Net Units	Evaluation Count of Net Units
2010	30.1	62.1	51.9	35,633	15,925
2011	30.1	62.1	51.9	93,399	147,553

The net impacts of these adjustments are shown in Table 623.

Table 623: Summary of Evaluation Impacts for Residential Energy Star Specialty CFL Bulbs

ProgramYear	Initiative	Program Savings (kWh)	Evaluation Savings (kWh)
2010	Res ES Specialty CFL Bulbs	2,213,614	826,043
2011	Res ES Specialty CFL Bulbs	5,802,200	7,653,750
Totals	-	8,015,813	8,479,794

The net effect of the evaluation changes in UES and counts was a 6% decrease in savings for this initiative over the entire period.

26.2.4.13. Residential Energy Star Clothes Washers

The result of our re-calculation of savings for 2009–2011 was a significant shift in savings from gas to electric. The methodology in use from 2006–2008, which we applied as well as we could give the available data, counts electric savings even for households with gas DHW due to washer machine energy savings and dryer savings. The effective changes to the annual UES values are summarized below.

Table 624: UES Adjustments for Residential Energy Star Clothes Washers

Year	Measure	Program UES (kWh/year)	Program UES (dkt/year)	Evaluation UES (kWh/year)	Evaluation UES (dkt/year)
2006	MEF 1.26+ Energy Star Clothes Washers	158	1.46	158	1.46
	MEF 1.42+ Energy Star Clothes Washers	77	0.07	77	0.07
	MEF 1.80+ Energy Star Clothes Washers	63	0.06	63	0.06
	MEF 2.00+ Energy Star Clothes Washers				
2007	MEF 1.26+ Energy Star Clothes Washers	158	1.46	158	1.46
	MEF 1.42+ Energy Star Clothes Washers	77	0.07	77	0.07
	MEF 1.80+ Energy Star Clothes Washers	63	0.06	63	0.06
	MEF 2.00+ Energy Star Clothes Washers				
2008	MEF 1.26+ Energy Star Clothes Washers	158	1.46	158	1.46
	MEF 1.42+ Energy Star Clothes Washers	77	0.07	77	0.07
	MEF 1.80+ Energy Star Clothes Washers	63	0.06	63	0.06
	MEF 2.00+ Energy Star Clothes Washers	63	0.06	42	0.04
2009	MEF 1.26+ Energy Star Clothes Washers	66	1.50	158	1.46
	MEF 1.42+ Energy Star Clothes Washers	23	0.51	114	0.10
	MEF 1.80+ Energy Star Clothes Washers	20	0.46	102	0.09
	MEF 2.00+ Energy Star Clothes Washers	8	0.19	42	0.04
2010	MEF 1.26+ Energy Star Clothes Washers	72	1.43	158	1.46
	MEF 1.42+ Energy Star Clothes Washers	25	0.49	114	0.10
	MEF 1.80+ Energy Star Clothes Washers	22	0.43	102	0.09
	MEF 2.00+ Energy Star Clothes Washers	9	0.18	42	0.04
2011	MEF 1.26+ Energy Star Clothes Washers	72	1.43	158	1.46

Year	Measure	Program UES (kWh/year)	Program UES (dkt/year)	Evaluation UES (kWh/year)	Evaluation UES (dkt/year)
	MEF 1.42+ Energy Star Clothes Washers	25	0.49	114	0.10
	MEF 1.80+ Energy Star Clothes Washers	22	0.43	102	0.09
	MEF 2.00+ Energy Star Clothes Washers	9	0.18	42	0.04

The net impacts of these adjustments are shown in Table 625.

Table 625: Summary of Evaluation Impacts for Residential Energy Star Clothes Washers

Year	Measure	Program savings (kWh/year)	Program savings (dkt/year)	Evaluation savings (kWh/year)	Evaluation savings (dkt/year)
2006	Energy Star Clothes Washers	151,584	864	151,584	864
2007	Energy Star Clothes Washers	1,727,409	5,672	1,727,409	5,672
2008	Energy Star Clothes Washers	2,286,221	7,913	2,227,112	7,860
2009	Energy Star Clothes Washers	1,433,388	32,574	4,591,594	23,960
2010	Energy Star Clothes Washers	1,350,143	26,890	4,092,759	20,004
2011	Energy Star Clothes Washers	57,784	1,151	267,098	230
Totals		7,006,529	75,063	13,057,556	58,590

The net effect of the evaluation changes in UES was an 86% increase in kWh savings and a 22% decrease in dkt savings for this initiative over the entire period.

26.2.4.14. Residential Energy Star Dishwashers

NEEA assigned savings of 1,318,524 kWh for all years. NWE claimed 512,860 kWh and 1,985 dkt. We found the NWE claim to be reasonable.

26.2.4.15. Residential Energy Star New Construction

NEEA assigned savings of 222,917 kWh for all years. NWE claimed 626,195 kWh and 5,145 dkt. We found the NWE claim to be reasonable.

26.2.4.16. Residential Energy Star Refrigerators

NEEA assigned savings of 869,562 kWh for all years. NWE claimed 1,913,851 kWh. We found the NWE claim to be reasonable.

26.2.4.17. Residential Energy Star TVs

We found that the UES values and counts used in the savings claim for this initiative were reasonable.

26.2.4.18. Residential Energy Star Windows

NEEA assigned savings of 2,168,951 kWh for all years. NWE claimed 168,255 kWh and 13,377 dkt. We found the NWE claim to be reasonable.

26.3. Process Evaluation

No process evaluation was done for this section as NEEA initiatives are part of region-wide efforts and outside of the scope of this evaluation.

26.4. Recommendations

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **NorthWestern service territory sales data:** Savings claims for all NEEA initiatives should be based on actual NWE service territory sales data. Continue to encourage NEEA to gather NWE-specific sales data where possible and cost-effective.
- **Savings accounting transparency:** Understanding the NEEA savings accounting system was very difficult. Consider working with NEEA to increase the transparency of their savings analyses. This will reduce the cost and increase the accuracy of future evaluations.
- **NEEA adjustments to NWE claimed CFLs:** NWE submits claimed CFL bulb counts to NEEA from which NEEA develops net CFL sales estimates for NWE's service territory. Part of NEEA's process involves adjusting NWE's claimed savings numbers downward for regional CFL retirements. The reasoning for this isn't clear but bears further examination. We recommend that NWE work with NEEA to define an appropriate process to determine NWE CFL sales net of claimed bulbs.

27. Residential CFL Operating Hours Study

27.1. Methodology

The objective of this study was to determine the daily hours of use (HOU), averaged over a year, for a typical CFL in a NWE program participant residence. The components of the E+ Residential Lighting program that provided CFLs to residential customers were:

1. Upstream CFL Buy-down
2. Residential CFL Direct Install
3. Residential CFL Owner Install
    a. In-Store Coupon
    b. Mail-in
    c. Mail-out
    d. Trade Show

The study sample design excluded (1) Upstream CFL Buy-down, because it is impossible to track program participants for this element. It is important to note, however, that while these program components provided a basis for sampling, the metering encompassed not only program CFLs, but also any other CFLs installed in the residences. In this way, the effects of the Upstream CFL Buy-down component are implicitly included.

From the phone interview and site inspection sample, we recruited a sub-sample of 76 residences to be metered for up to three months. During the site visit, we assessed the lighting fixtures throughout the residence, determined which lighting fixtures and lamps contained CFLs, and randomly selected three or so of these for metering. Meter equipment consisted of either light loggers affixed near the CFL, or current loggers attached to the lamp power cord.

We cleaned and aggregated data from a final validated sample of 220 metered CFLs. We then adopted a two-pronged approach to develop the most reliable means to annualize the metered data—that is, to extrapolate the summer metering data to the rest of the year. The first approach examined monthly usage profiles from other lighting metering studies that logged usage over longer periods. The second applied linear regression and analysis of covariance techniques to analyze individual meter data and aggregate data, respectively, in hopes of finding robust statistical models that provided reasonable extrapolation results. Annualized data was extrapolated using standard statistical methods to estimate average daily hours of use, as well as the associated variance, for each domain, and overall for all residential CFLs.

How we accomplished each of these aspects of the study is described below.

27.1.1. Sampling

This study relied on a two-stage cluster design, with separate samples drawn from two domains, Residential CFL Direct Install and Residential CFL Owner Install participants. The nominal sample sizes of 20 and 50 residences, respectively, were intended to provide less than 20% sampling error at 80% confidence for Direct Install and less than 10% error at 90% confidence for Owner Install. We targeted four additional residences in each domain to allow for attrition from customer refusals and meter failures. For the first stage, we stratified residences within each program element, based on ex ante savings. The methodology and rationale for this sampling approach is documented in more detail in section 2.1.

Within each stratum, we randomly sampled and recruited residences. For each willing residence, we conducted an on-site visit, during which time we surveyed the lighting systems to identify all installed CFLs. This latter group constituted the second stage, for which we drew a systematic random sample of three or more CFLs at each residence for metering.

Table 626: Residential CFL Metering Sampling Design

				Targets		
Domain	**Sampling stratum**		**Records**	Phone surveys	On-site recruits	Metering recruits
Res DI CFL	1	Small saver	2,111	44	27	16
	2	Medium saver	513	11	7	4
	3	Large saver	100	4	3	2
	8	Excluded	27	--	--	--
	9	Certainty (largest savers)	4	4	4	2
	All		2,755			
	Non-excluded		2,728	63	41	24
Res Owner CFL	1	Very small saver	35,831	69	56	33
	2	Small saver	2,675	7	6	4
	3	Medium saver	253	6	5	3
	4	Large saver	113	6	5	3
	5	Very large saver	61	6	5	3
	8	Excluded	78	--	--	--
	9	Certainty (largest savers)	13	13	13	8
	All		39,024			
	Non-excluded		38,946	107	90	54
ALL			**41,674**	**170**	**131**	**78**

27.1.2. Recruitment

We screened and recruited potential participants in the metering study via telephone calls. Sampled customers who were willing to have measures in their residences inspected received a follow-up call from field surveyors. This call explained that they had been selected for metering in addition to the inspection, and offered them gift cards in exchange for the additional inconvenience. Customers who accepted the offer received a confirmation letter. In some cases, such as with tenant-occupied dwellings, recruitment was a multi-step process. The recruitment script and confirmation letter can be found in the Field Survey Procedures in section 33.3.1.

27.1.3. Onsite Visits

At the initial on-site visit, after explaining the metering process to the customer, we assessed the interior and exterior lighting at the residence. We then prepared a sketch showing floor layouts, and indicating rooms that contained fixtures and lamps with CFLs. Next we applied a predetermined sampling scheme (described in the next section) to select CFLs to monitor. While the metering was in place, we checked the information obtained during the initial visit and noted additional data that be gathered. Once the metering period concluded after two to three months, we recontacted each customer to retrieve the loggers and collect the remaining data. We again performed quality control checks on the final information obtained on site.

27.1.4. Metering

In-field sampling of CFLs at each residence relied on a table developed for each site with a randomly-generated start number and a sampling interval proportional to the number of lamps, so that each residence could have had no more than five metered CFLs, with a target average of three[14]. Once the surveyor mapped the layout of the residence, determined the location and number of CFLs in the household and assigned numbers to each one, they then used the site lookup table to determine which fixtures were to be metered.

We applied a combination of two methods to meter sampled CFLs, depending on the type of fixture—either DENT lighting on/off time-of-use loggers, with fiber optics extension tubes as needed, or Veris Industries current switches and Onset HOBO state loggers, which we installed in a custom protective housing for installation between a plug-in lamp and the power receptacle to log when the fixture is on. Before leaving the metering location, surveyors checked to ensure loggers were secure and photographed the installations. They also reminded customers to avoid disturbing loggers, but otherwise use their lights as they normally would. Surveyors entered information about each metering site into a standardized Excel worksheet.

The desired metering period was about three months, between May and August. At the conclusion of the period for each site, surveyors returned to the site, retrieved and downloaded the loggers, and asked follow-up questions of occupants. Details of on-site sampling and metering procedures can be found in the Field Survey Procedures in section 33.3.1.

Once data were extracted from site workbooks and loggers, we performed an extensive aggregation and quality control process. By analyzing the logger data and comparing it with other information surveyors obtained, we were able to verify the reasonableness of the metered data, and in a few instances, identify data problems that we subsequently rectified.

[14] The random start interval was set up according to standard statistical practice as follows:
$k=N/n$ where: k=the sampling interval; N=population of CFLs in the residence; n=desired sample size.
The random start number for each residence was an integer between 1 and k.

27.1.5. Annualization of Operating Hours

We adopted a two-pronged approach to develop the most reliable means to annualize the metered data—that is, to extrapolate the summer metering data to the rest of the year. The first approach examined monthly usage profiles from other lighting metering studies that logged usage over longer periods. The second applied linear regression and analysis of covariance techniques to analyze individual meter data and aggregate data, respectively, in hopes of finding robust statistical models that provided reasonable extrapolation results. Each approach is described below.

27.1.5.1. Data from Other Studies

We performed a literature search to find other metering studies of residential lighting that developed robust, measurement-based estimates of the relative changes in hours of use across different seasons or months. These other results formed the basis for calculating an HOU adjustment factor that we applied to nearly all of the average hours of operation values derived from the logged CFLs over the metering period. We ultimately relied on two studies conducted in California (KEMA 2010) and New England (Nexus Market Research, Inc. and RLW Analytics, Inc. 2004) (Nexus Market Research, Inc. and RLW Analytics, Inc. 2005) over the past decade, for which distributions of hours of use by month had been calculated. The ratio of average hours/day for all months in the year, divided by the averaged hours/day during the June-August metering period, yielded the adjustment factor, which when multiplied by the metering period HOU value, provided an annualized estimate of average daily hours of use.

27.1.5.2. Linear Regression

As the earth moves around the sun, its relative position changes within the year. This is called the declination angle and is equal to the latitude at which the sun is directly overhead on a given day. The declination angle varies from 23.5° on June 21 to -23.5° on December 21.

The daylight hours in any given location will vary by latitude but typically has a similar shape to the solar declination angle.[15]

Empirical data has shown an inverse relationship between the number of daylight hours and the number of hours that lights are on within a home.

The following model was used:

$$HD = \alpha + \beta \sin(\phi d) + \varepsilon \qquad (45)$$

where:

HD	= hours of use on day d
α and β	= coefficient determined by the model

[15] The following website has daylight hour data: http://aa.usno.navy.mil/data/docs/Dur_OneYear.php.

ϕd	= angle for day d, where θd is 0 at the spring and fall equinox, π/2 for d = December 21, and 3π/2 for d = June 21
ε	= residual error

The intercept of the weekday (weekend) model is the average weekday (weekend) use over the year. The slope of each day type's model is the difference between use on the solstice (the days of maximum and minimum daylight) and the average use. The average annual daily hours of use is calculated by averaging the weekday and weekend/holiday intercepts in proportion to the number of each day type in the year. Because logger data are only available for a part of the year, we created a model that allowed us to extrapolate hours of use to the remaining part of the year.

To annualize data from lighting loggers, the following steps were performed:

1. Summarize lighting logger data into hourly-on periods for each logger. Results will be something like January 1, hour 1, January 1, hour 2, etc. By obtaining this information at the hourly level, we can see profile information. However, the data to be used in the regression will be daily hours on, so create this in the next step.
2. Create a day of the year variable that corresponds to the specific day (i.e., January 1 is 1, February 1 is 32, December 31 is 365, etc.) this will be specific to the year as leap year will have an additional day. Create daily hours-on for each logger. Generate a variable to assign that day of the week to be either weekday or weekend (as this will affect hours of use).
3. Obtain daylight hours for location where loggers were placed (or location at the nearest latitude), using Internet site indicated above.
4. Merge in the hours of daylight per day to all data based on the day of year
5. Generate the daily solar declination angle for each day of the year and normalize it or merge in the solar information from this file.
6. Estimate a linear regression model for each logger. The first involved estimating a regression model for each logger. In this model, the dependent variable was the hours on for each day from the loggers. The independent variable was the solar declination or hours of daylight per day for two models (one for weekday and one for weekend).
7. Test results for a model with solar declination and a model with hours of daylight.
8. Run diagnostics to address missing data, autocorrelation, outliers and any other specific modeling issues encountered.
9. The results of the model were then extrapolated into the periods not covered by the loggers. Apply the coefficients of the estimated model to each day of the year, sum the data and divide by 365 to obtain the annual hours.
10. Model evaluation included the examination of the R^2, t values, slopes on the sine coefficient, and the standard error of the sine coefficient.

A second type of model was estimated that incorporated all of the logger data in a single model. To estimate this time series cross sectional model, the data from each of the loggers were pooled into a single dataset containing over 18,700 observations covering 220 unique loggers. Within this data structure, four additional variables could now be added to the regression model:

- Room type
- Day type (weekday/weekend)
- Lamp type
- Number of CFLs in dwelling

The addition of these four variables was expected to improve the fit of the model.

27.1.6. Extrapolation to Program Components

Once the hours of use were annualized for each metered CFL within each stratum for each program component, we next estimated the overall annual operating hours across both program components. This involved three steps:

1. Within each stratum for each program component, estimate the mean daily hours of use using the two-stage design.
2. Within each program component, calculate the overall mean across strata and the associated variance.
3. Estimate the overall mean daily hours of use across both program components.

Each step is described in more detail in the following sections.

27.1.6.1. Program-Stratum Estimates

The unbiased estimator of the total y-value for the i[th] primary unit is the sample is (Thompson 2002):

$$\hat{y}_i = \frac{M_i}{m_i}\sum_{j=i}^{m_i} y_{i,j} = M_i\bar{y}_i \qquad \textbf{(46)}$$

where

$$\bar{y}_i \qquad = \left(\frac{1}{m_i}\right)\sum_{j=1}^{m_i} y_{i,j} = \frac{\hat{y}_i}{M_i}$$

Unbiased estimator of the population total is:

$$\hat{\tau} = \frac{N}{n}\sum_{i=1}^{n} \hat{y}_i \qquad \textbf{(47)}$$

The variance $\hat{\tau}$ is:

$$var(\hat{\tau}) = N(N-n)\frac{\sigma_u^2}{n} + \frac{N}{n}\sum_{i=1}^{N} M_i(M_i - m_i)\frac{\sigma_i^2}{m_i} \qquad \textbf{(48)}$$

where

$$\sigma_u^2 = \frac{1}{N-1}\sum_{i=1}^{N}(y_i - u_i)^2 \qquad \textbf{(49)}$$

And for i = 1…N,

$$\sigma_i^2 = \left(\frac{1}{M_i - 1}\right) \sum_{j=1}^{M_i} \left(y_{i,j} - u_i\right)^2 \quad \textbf{(50)}$$

An unbiased estimator of the variance of $\hat{\tau}$ is obtained by replacing the population variances with the sample variances:

$$\widehat{var}(\hat{\tau}) = N(N-n)\frac{s_u^2}{n} + \frac{N}{n}\sum_{i=1}^{n} M_i(M_i - m_i)\frac{s_i^2}{m_i} \quad \textbf{(51)}$$

$$s_u^2 = \frac{1}{n-1}\sum_{i=1}^{n}(\hat{y}_i - \hat{u}_1)^2 \quad \textbf{(52)}$$

$$s_i^2 = \left(\frac{1}{m_i - 1}\right)\sum_{j=1}^{m_i}\left(y_{ij} - \bar{y}_i\right)^2 \quad \textbf{(53)}$$

and

$$\hat{u}_1 = \frac{1}{n}\sum_{i=1}^{n} \hat{y}_i$$

To estimate the population means, $\hat{u}_1 = \frac{\hat{\tau}}{N}$ is an unbiased estimator of the population mean per primary unit u_1, for which the variance expressions above would be divided by N^2., and $\hat{\tau} = \frac{\hat{\tau}}{M}$ is an unbiased for the mean per secondary unit u, with the variance divided by M^2, where the total number of secondary units in the population is $M = \sum_{i=1}^{N} M_i$

27.1.6.2. Program-Level Estimates

Calculation of Mean

The mean daily operating hours across strata for a given program was calculated as (Cochran 1977):

$$\bar{y}_{st} = \sum_{h=1}^{L} W_h \bar{y}_h \quad \textbf{(54)}$$

where

$W_h \quad = \frac{N_h}{N}$ which is the stratum weight

$\bar{y}_h \quad$ = the mean of y for stratum h

$\bar{y}_{st} \quad$ = the mean resulting from a stratified random sample (*st* for *stratified*).

Calculation of Variance of the Mean

With stratified random sampling, an unbiased estimate of the variance of $\bar{y}_{st}$ is:

$$s_2(\bar{y}_{st}) = \sum_{h=1}^{L}\frac{W_h^2 s_h^2}{n_h} - \sum_{h=1}^{L}\frac{W_h s_h^2}{N} \quad \textbf{(55)}$$

Note that the second term in this equation represents the finite population correction.

Calculation of Confidence Intervals

The formula for the confidence intervals is:

$$\bar{y}_{st} \pm ts(\bar{y}_{st}) \tag{56}$$

where

t = the critical value from the t distribution

s = the standard error of $\bar{y}_{st}$.

The critical values for the 90% is 1.645.

Cross-Program Estimates

The weighted mean daily operating hours is calculated using this equation:

$$\bar{y}_{Overall} = \sum_{j=1}^{2} W_j \bar{y}_j \tag{57}$$

where

W_j = $\frac{N_j}{N}$ which is the weight assigned to each program

$\bar{y}_j$ = the mean of y for program j

$\bar{y}_{Overall}$ = the overall mean resulting for the combination of the two programs

The confidence interval around this overall mean is calculated using this equation, which takes the propagation of error into account.

$$RP\ \mathrm{OpHours}_{Overall} = \sqrt{(\mathrm{rp}(\mathrm{OpHours}_{DI})^2 + \mathrm{rp}(\mathrm{OpHours}_{Owner})^2)} \tag{58}$$

where

$\mathrm{rp}(\mathrm{OpHours}_{Overall})$ = The relative precision of the estimated mean annual operating hours for CFL installed by participants in both Programs

$\mathrm{rp}(\mathrm{OpHours}_{DI})$ = The relative precision of the estimated mean annual operating hours for CFL installed by participants in the Direct-Install Program

$\mathrm{rp}(\mathrm{OpHours}_{Owner})$ = The relative precision of the estimated mean annual operating hours for CFL installed by participants in the Owner-Install Program

27.2. Findings

27.2.1. Metering Results

Site visits to sampled customer households, and the deployment of meters at these sites, generally went smoothly. We ultimately installed 236 loggers at 76 sites. The number of sites exceeded our sample target size of 70. We eliminated data from 16 loggers from the sample that after careful review, we deemed to be unreliable (e.g., the meter did not appear to be capturing CFL on-off patterns properly). For outliers with very high or very low usage, we examined photos of the meter installation and referred to field notes about likely hours of operation in an attempt to corroborate this information with logger data. We lost only one logger that could not be retrieved from its original installation location. The overall metering for the final sample of 220 CFLs at 76 sites extended for about three and a half months, from May 14 – August 29, 2012. Table 627 shows that most households were metered for more than three months, with average of 2.8 months.

Table 627: Duration of CFL Metering

Months	# of loggers	% of loggers
1-2	36	16.4%
2-3	53	24.1%
3 or more	131	59.5%
Total	220	100.0%

Table 628 summarizes the locations of the 220 metered CFLs, as well as the presence of space heating and/or cooling where they were installed. A significant majority of these (73%) were installed in one of four space types, namely, living rooms, bathrooms, bedrooms, and kitchens. Nearly all of these were in conditioned spaces, as 70% were in spaces that were heated, and another 23% were in spaces that were both heated and cooled, leaving only 6% in unconditioned spaces.

Table 628: CFL Locations and Presence of Space Conditioning

	Space conditioning				
Space	Heated	Heated & cooled	None	Total	% of total
Living Room	33	19	-	52	24%
Bathroom	28	13	-	41	19%
Bedroom	31	4	-	35	16%
Kitchen	26	5	-	31	14%
Dining Room	16	3	-	19	9%
Hall/Entrance	12	1	-	13	6%

	Space conditioning				
Space	Heated	Heated & cooled	None	Total	% of total
Other	3	4	4	11	5%
Exterior	-	-	7	7	3%
Office	6	2	-	8	4%
Garage	-	-	3	3	1%
Total	155	51	14	220	100%
% of total	70%	23%	6%	100%	

The types of fixtures and lamps encountered in the metered sample are shown in Table 629. The CFLs were most commonly found in ceiling fixtures (33%), followed by free-standing lights (20%), and wall fixtures (16%). Most lamps were spiral (79%), with globes, reflectors, decorative, and other unclassified lamps also appearing. Virtually all of these lamps were controlled by simple on-off switches, as shown in Table 630. The number of fixtures with three-way, motion sensor, timer, or photocell control was negligible, with these controls affecting less than 4% of the sampled CFLs.

Table 629: CFL Fixture and Lamp Types

	Lamp type						
Fixture type	Spiral	Other	Globe	Reflector	Decorative	Total	% of total
Ceiling	55	20	3	1	1	80	36%
Floor/Table/Desk	44	1	-	-	-	45	20%
Wall	30	-	4	-	1	35	16%
Ceiling Fan	19	-	1	-	-	20	9%
Suspended	18	-	2	-	-	20	9%
Recessed	5	-	-	9	1	15	7%
Other	3	-	1	-	-	4	2%
Torchiere	-	-	-	-	1	1	0.5%
Total	174	21	11	10	4	220	100%
% of total	79%	10%	5%	5%	2%		

Table 630: CFL Controls

Lamp type		
Fixture type	**Total**	**% of total**
On/Off	212	96.4%
Three-way	5	2.3%
Motion Sensor	1	0.5%
Timer	1	0.5%
Photocell	1	0.5%
Total	220	100%

We were able to determine, by talking with household occupants, the program component through which they obtained the metered CFLs. As Table 631 shows, 25% of the bulbs were directly installed, while another 55% were installed by residents. Trade show giveaways and in-store coupons were the more common means by which residents obtained the latter. For 20% of the metered CFLs, the lamps had been obtained outside of these program components, or the origin could not be established. For the former, it was still possible that the CFL buy-down program had influence, though residents could not have known about this. Table 631 also shows that nearly two-thirds of the metered CFLs had nominal Wattages of 13W or 14W, consistent with the most common Wattages distributed by the direct-install and trade show program components.

Table 631: CFL Wattages, by Program/Component

	Program / Component								
Lamp wattage	Direct Install	Tradeshow	In-Store	Mail-Out	Mail-In	Buy-down	Not program or unknown	Total	% of total
9-11	2	1	3	3	1	-	-	10	5%
13	35	25	14	-	6	3	21	104	47%
14	5	15	8	2	3	1	7	41	19%
15-19	7	-	2	5	-	4	2	20	9%
20-25	1	7	4	1	3	1	5	22	10%
26-42	4	1	5	1	1	1	10	23	10%
Total	54	49	36	12	14	10	45	220	100%
% of total	25%	22%	16%	5%	6%	5%	20%		

Table 632: Installed CFLs per Household

Installed CFLs in household	Number of households
1-5	4
6-10	21
11-15	13
16-20	14
21-25	13
26-30	5
31-35	3
36-40	1
41-45	-
46-50	1
51-55	-
56-60	-
61-65	1
Total	76
Household average	17.1

The average household in our metering sample had slightly more than 17 installed CFLs. The largest number we encountered was 64 CFLs installed in one home. The distribution is shown in Table 632. We metered 2.9 loggers per household, or about 17% of all CFLs we found.

Table 633 shows unweighted average annual hours of use determined from metering for various room types. As noted previously, nearly three-quarters of the metered CFLs were installed in living rooms, bathrooms, bedrooms, or kitchens. Usage in those room types were slightly less than average, with room type averages ranging from 1.24 to 1.87 hours/day. Though the sample sizes are relatively small, it appears that some of the less frequently encountered room types, such as dining rooms, halls, and entry ways, have above-average hours of use. Exterior lights stood out as having particular high usage, as six of the seven metered fixtures exceeded four hours/day, and one of the six was on continuously.

During the site visit, we asked occupants to estimate hours of use for metered fixtures. For about 75% of the cases, they were able to give us a quantity. We compared those quantities with the actual metered usage, and calculated a ratio between metered and reported usage (a ratio exceeding one indicates the occupant underestimated usage, while a ratio below one indicates the occupant overestimated usage). The results shown in Table 634 indicate that occupants tended to overestimate hours for the areas where the CFLs were most commonly installed, but tended to underestimate in the less common areas, such as garages, hallways, and entrances. Figure 205 shows these data, aggregated by metered hours of use ranges in graphical form. The graph clearly demonstrates that occupants dramatically overestimated usage for lightly-used CFLs. (less than two hours a day). The leftmost group on the graph shows that occupants estimated 1.9 hours/day on average, but actual usage was 0.4 hours/day, or just 23%. By contrast, occupants tended to underestimate usage for more heavily-used CFLs.

Table 633: CFL Hours of Use, by Room Type

Room type	# of metered CFLs	% of total	Unweighted average annual hours of use
Living Room	52	24%	1.24
Bathroom	41	19%	1.75
Bedroom	35	16%	1.27
Kitchen	31	14%	1.87
Dining Room	19	9%	2.51
Hall/Entrance	13	6%	3.20
Other	11	5%	2.80
Office	8	4%	1.96
Exterior	7	3%	8.60
Garage	3	1%	0.88
Total	220	100%	1.98

Table 634: Comparison of Metered to Reported Hours of Use, by Room Type

Room type	# of metered CFLs	Ratio of metered / reported HOU
Living Room	52	72%
Bathroom	41	74%
Bedroom	35	89%
Kitchen	31	86%
Dining Room	19	110%
Hall/Entrance	13	154%
Other	11	100%
Office	8	64%
Exterior	7	106%
Garage	3	303%
Total	220	91%

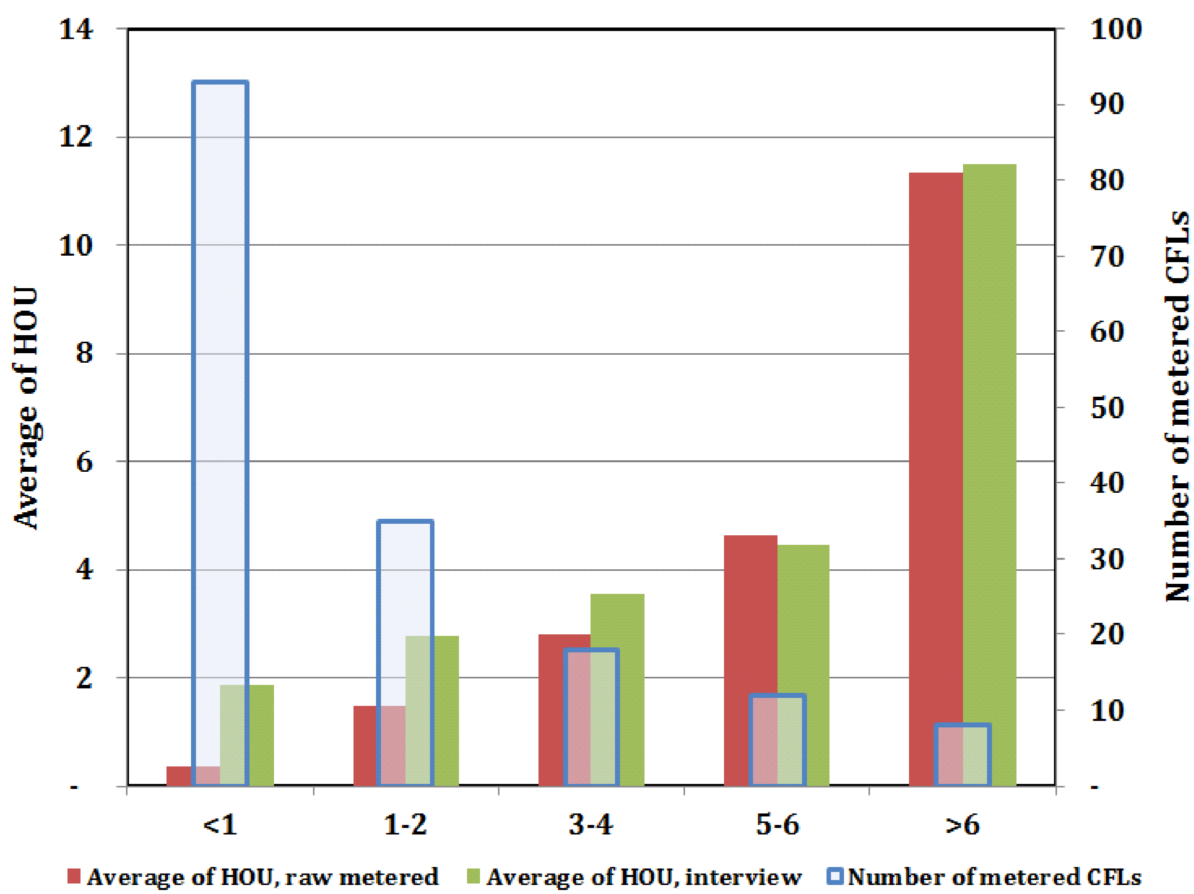

Figure 205: Comparison between Metered and Reported Hours of Use

More detailed comparisons of CFL locations and hours of use, by program/component are provided in Table 635 and Table 636. One observation of note in Table 636 is that the Direct Install program component indeed appears to be installing in higher-use fixtures, as per the program design. The average usage of 2.6 hours/day is the highest among groups where the program component is known. This average, however, is below the three hours/day threshold that installers were supposed to use to screen out lower-use fixtures, suggesting that for practical purposes, the threshold is set too high, or cannot be reliably ascertained by direct-install auditors.

Table 635: CFL Locations, by Program/Component

Location												
Program Component	Bathroom	Bedroom	Dining Room	Exterior	Garage	Hall / Entrance	Kitchen	Living Room	Office	Other	Other Living Room	Grand Total
Buy-down	1	1	-	1	-	-	3	1	1	1	1	10
Direct install	9	5	10	3	-	7	7	11	-	1	1	54
In-Store	8	4	-	2	1	1	3	13	1	3	-	36
Mail-In	2	4	1	-	-	1	-	4	1	1	-	14
Mail-Out	1	2	1	-	-	-	4	3	1	-	-	12
Not Applicable	8	7	3	-	2	1	7	6	1	-	-	35
Tradeshow	8	10	4	-	-	3	7	9	2	5	1	49
Unknown	4	2	-	1	-	-	-	2	1	-	-	10
Grand Total	**41**	**35**	**19**	**7**	**3**	**13**	**31**	**49**	**8**	**11**	**3**	**220**

Table 636: CFL Hours of Use, by Room Type and Program/Component

	Average of HOU, raw metered											
	Bathroom	Bedroom	Dining Room	Exterior	Garage	Hall / Entrance	Kitchen	Living Room	Office	Other	Other Living Room	Grand Total
Buy-down	0.1	1.5	-	4.1	-	-	0.6	0.4	0.7	0.4	0.2	0.9
Direct install	1.3	1.9	1.9	4.7	-	4.4	2.3	1.6	-	2.5	0.2	2.2
In-Store	3.0	0.8	-	6.5	1.2	0.1	2.6	0.4	1.7	0.1	-	1.6
Mail-In	1.1	1.6	0.3	-	-	0.1	-	0.1	0.2	0.8	-	0.8
Mail-Out	0.1	0.6	4.2	-	-	-	1.1	1.3	-	-	-	1.1
Not Applicable	1.2	0.7	2.0	-	0.5	2.1	2.1	2.0	1.3	-	-	1.5
Tradeshow	1.1	1.0	2.8	-	-	0.9	0.8	0.7	4.1	4.5	0.6	1.5
Unknown	1.3	0.5	-	24.0	-	-	-	4.2	1.3	-	-	4.0
Grand Total	**1.5**	**1.1**	**2.2**	**7.9**	**0.8**	**2.7**	**1.6**	**1.1**	**1.7**	**2.4**	**0.4**	**1.7**

27.2.2. Annualization of Operating Hours

27.2.2.1. Data from Other Studies

We reviewed two extensive metering studies conducted in California (KEMA 2010) and New England (Nexus Market Research, Inc. and RLW Analytics, Inc. 2005) (Nexus Market Research, Inc. and RLW Analytics, Inc. 2004) over the past decade, for which distributions of hours of use by month had been calculated. Some of the findings from the New England study formed the basis for the 3.7 hours/day figure that NorthWestern Energy has been using for their program estimates.

In the California study, seven fixtures (up to four with CFLs) in 1,200 households statewide were metered for at least six months during 2008–09. For the New England study, metering consisted of 233 time-of-use light loggers installed in 128 homes for two weeks during May-June 2004. For a subset of 44 of the homes metered above, 92 TOU light loggers were installed to continue the metering through February 2005.

As Figure 206 shows, although the average annual hours of use varied significantly between the two studies, the shapes of these distributions were quite similar, giving us confidence that the average values we derived would be applicable to this evaluation. The ratio of average hours/day for all months in the year, divided by the averaged hours/day during the June-August metering period, yielded the adjustment factor, which when multiplied by the metering period HOU value, provided an annualized estimate of average daily hours of use. We calculated a value of 1.165, meaning that increasing the summer metering values by 16.5% would account for increased winter usage and yield an average annual HOU value. We applied this factor to data for all but one of the 220 metered CFL. This one exception was already on continuously, and thus was already operating at the maximum possible number of hours.

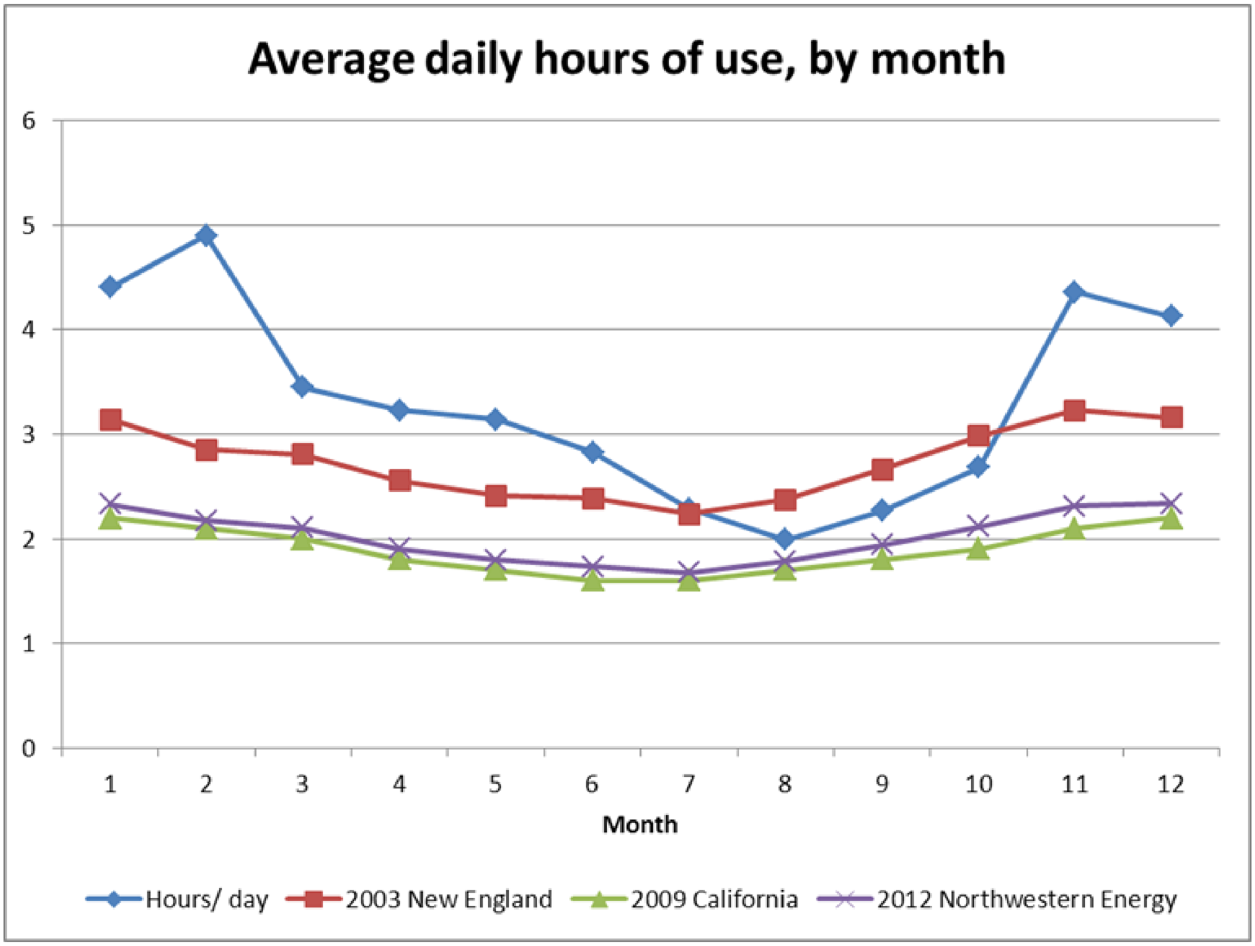

Figure 206: Graph of Average Daily Hours of Use by Month from Other Studies

Table 637: Average Daily Hours of Use by Month from Other Studies

		2003 New England			2009 California			2012 Northwestern Energy		
Month	**Days in month**	**Total hours**	**% hours**	**Hours/ day**	**Total hours**	**% hours**	**Hours/ day**	**Total hours**	**% hours**	**Hours/ day**
1	31	97	9.8%	3.14	68	9.9%	2.20	72	9.8%	2.33
2	28	80	8.0%	2.85	59	8.5%	2.10	61	8.3%	2.17
3	31	87	8.7%	2.81	62	9.0%	2.00	65	8.9%	2.10
4	30	77	7.7%	2.56	54	7.8%	1.80	57	7.8%	1.90
5	31	75	7.5%	2.41	53	7.6%	1.70	56	7.6%	1.80
6	30	72	7.2%	2.38	48	7.0%	1.60	52	7.1%	1.73
7	31	69	7.0%	2.24	50	7.2%	1.60	52	7.1%	1.68
8	31	74	7.4%	2.37	53	7.6%	1.70	55	7.5%	1.78
9	30	80	8.0%	2.66	54	7.8%	1.80	58	7.9%	1.94
10	31	92	9.3%	2.98	59	8.5%	1.90	66	8.9%	2.11

		2003 New England			2009 California			2012 Northwestern Energy		
Month	**Days in month**	**Total hours**	**% hours**	**Hours/ day**	**Total hours**	**% hours**	**Hours/ day**	**Total hours**	**% hours**	**Hours/ day**
11	30	97	9.7%	3.23	63	9.1%	2.10	69	9.4%	2.31
12	31	98	9.8%	3.16	68	9.9%	2.20	73	9.8%	2.34
All	**365**	**997**	**100.0%**	**2.73**	**690**	**100.0%**	**1.89**	**736**	**100.0%**	**2.02**
Summer average (Months 6-8)				2.33			1.63			1.73
Annualization ratio (Annual/summer avgs.)				117.2%			115.8%			116.5%

27.2.2.2. Linear Regression

We developed regression models for individual logger files to permit application of summer data to develop annualized daily hour of use estimates. The models generally had poor fits ($R^2 < .01$) and implausibly low HOUs.

We then analyzed the logger data in aggregate. With the addition of the four variables (room type, day type, lamp type, and number of CFLs in dwelling, the time series cross-sectional regression model performed better. The R^2 of this model was 0.23, with an F-value of 421 ($Pr > F < .0001$). Using these estimated parameters, the model was evaluated over the entire year using the means of the household variables and the solar declination values for all of 2012. The predicted hours of use estimated for each day was summed and divided by 365 to obtain the estimated daily hours of use. The result was a predicted average daily hours of use of 1.75. However, this underestimates the hours of use, since the loggers only recorded data for the summer of 2012. Ultimately, we concluded that the data from other studies described above provided a more robust basis for annualization of operating hours.

27.2.3. Program Results

To apply the program extrapolation methodology documented in section 27.1.5.2, we developed a spreadsheet that listed each CFL metering installation by site, logger, and domain. We multiplied the raw average hours of use per day value across the metering period by the annualization adjustment factor documented in section 27.2.2.1. These results were aggregated to the site, and then the strata level, with intermediate calculations of strata means, variance, standard error, and relative precision. Next, we combined the strata-level results into domain-level results, and lastly, derived the final evaluation estimate of residential CFL daily hours of use. These values, along with the relative precision and confidence intervals around these estimates, are shown in Table 638. The overall residential CFL usage figure is 2.02 hours/day. With a relative precision of 10%, we can say that with 90% confidence that the true value lies between 1.82–2.22 hours/day.

Table 638: Overall Residential CFL Hours of Operation

Domain	Population	Weighted mean	Relative precision	Upper bound	Lower bound
Res DI CFL	2,728	1.37	8.1%	1.48	1.26
Res Owner CFL	38,946	2.06	5.9%	2.18	1.94
Overall	41,674	2.02	10.0%	2.22	1.82

27.2.4. Conclusions

The evaluated residential CFL hours of use of 2.02 hours/day is 45% less than the 3.7 hours/day estimate that NorthWestern Energy used over the 2007–2011 study period. Our evaluated value falls within the lower end of the range of values reported in other metering studies of 1.8 to 3.2 hours/day reported in a recent national lighting market characterization (Navigant Consulting, Inc. 2012). That report also provided this caveat:

> *It is important to note that though this data is considered to be the best for the purposes of this report, operating hour data varies widely from source to source depending on the sample size, the residence types considered, the occupant's habits, the sample geographies, and other factors. For this reason it is suggested that when conducting any in depth analysis concerning the impact of energy conservation measures field work be conducted to gather operating hour data applicable the project.*

We believe that our CFL metering study follows the suggestion provided at the end of this excerpt. That being said, it is important to mention the following two uncertainties inherent in our analysis:

- **Winter usage**: Our annual adjustment factor drew upon data from California and New England. It is possible that because of the extreme cold and sparse settlement patterns in Montana, that inhabitants there might spend more time at home during the winter. This conceivably could result in higher wintertime lighting usage than seen in other parts of the country. Because of the lack of any empirical basis that we knew of for confirming this hypothesis, though, our analysis did not account for any such effects.
- **Early year installation patterns**: Our study examined the state of residential CFLs in 2012. The evaluation covered the years 2007–11, but the nature of the metering study was such that it could not provide information about the hours of use for CFLs installed earlier during the five-year period. Consequently, we performed a literature search to find other, earlier metering studies to serve as the basis for potential adjustments. The methodology and findings of this search can be found in section 18.2.1.1

28. Savings Persistence

The objective of the persistence study was to assess the claimed measures lives across the 2007–2011 NorthWestern Energy electric and gas savings portfolio. We did so by reviewing the programs and measure in the portfolio, identifying programs and measure of particular interest, and then inspecting a sample of such measures from the 2007–2008 program years to determine whether the measure was still operational and yielding substantial savings. By examining measures from the first two years of the five-year study period, we increased the odds of finding changes to measure performance that might shed light on their long-term persistence.

For measures where onsite inspections were unlikely to yield useful information--such as a boiler tune-up, for example--we instead performed literature reviews. We then analyzed both the onsite inspection and literature review data qualitatively and developed recommendations for maintaining or adjusting the portfolio measure lives.

28.1. Methodology

Key aspects of the savings persistence assessment methodology include the review to determine key measures to examine, data collection, and analysis. Each is described in a subsection below.

28.1.1. Measure Review

The initial evaluation plan specified 17 programs that should receive between three and eight on-site inspections each, for a total of 125 inspection. These programs are listed below:

- E+ Energy Appraisal for Small Businesses (Electric)
- Vending Miser
- E+ Electric Motor Rebate Program
- Commercial CFL Direct Install
- E+ Renewable Energy Program - Non-Residential
- E+ Commercial Natural Gas Savings Program (Existing)
- E+ Commercial Lighting Rebate Program
- E+ Irrigation
- E+ Business Partners Program
- E+ Audit for the Home (Electric and Gas)
- Residential CFL Direct Install
- Residential CFL Owner Install
- E+ New Homes Program (Legacy Electric)

- E+ Renewable Energy Program – Residential
- E+ Residential Existing Gas Free Kits
- E+ Residential Existing Gas Rebates
- E+ Residential Electric Savings Program

Once we sampled projects and measures for the impact portion of the evaluation, we obtained additional details that permitted us to refine our approach. We reviewed the measure types within each program, and carefully considered what measures would be feasible to observe and which measures had the greatest potential for being disabled or overridden. In addition to focusing our sample picks on these measures, we also developed a proposed reallocation of persistence sample points.

Some of the programs−such as the residential new construction and commercial gas programs−featured measures whose longevity is fairly well-established, such as new heating systems, or where on-site inspection would likely have yielded no useful information, such as boiler tune-ups. Consequently, we recommended moving sample points to programs where the dominant measure types accounted for significant portfolio savings, and failures were easily observable, such as control systems and CFLs. Additionally, we performed a review of industry-wide effective useful life findings for important measure types not amenable to onsite work for this evaluation—most notably, efficient T5/T8 lighting and heating systems/maintenance. This review examined measure lives developed by other states, utilities, and organizations, including the Regional Technical Forum (RTF).

The final inspection allocation is shown in Table 639. It summarizes the 14 programs (six residential, and eight non-residential) for which we aimed to perform 118 persistence onsite visits. It shows the measures of interest, where the probability of measure failure is reasonably high (occupancy sensors or showerheads, for instance, as compared to wall insulation or a new furnace). At audit sites, we only sampled sites where at least one direct-install (DI) measure was installed, though if additional indirect measures were implemented, we found out about those as well. The sampling was also skewed towards measures and programs that account for a significant fraction of energy savings. We ultimately assessed measure persistence for some aspect of each of the 17 programs via on-site visits, literature review, or some combination of the two.

Table 639: Persistence Study Measures and Quotas

#	Program Name	Sector	# of measures	% of elec savings	% of gas savings	Critical measure types for persistence	Strategy / Rationale	Final quota	Literature reviews
1	E+ Residential Lighting	Res	1	31%	-	CFL	Selection of file-reviewed projects. Increase sample size because this is a critical area - large savings % and high risk of measure failure.	18	
2	E+ Audit Home or Business	Res	1	4%	21%	Water DI measures	Selection of projects with DI measures (all DI are water-related, so important for gas).	16	
3	E+ Residential Lighting	Res	1	1%	-	CFL	Select projects with non-CFL DI measures.	8	
4	E+ New Homes	Res	2	0%	-	-	Reallocate points to other areas, since little to be gained through inspections.	-	Whole house measures
5	E+ Renewable	Res	3	1%	-	All (PV, wind, alternative generators)	Selection of file-reviewed projects.	8	
6	E+ Residential New Gas Rebate	Res	4	0%	0%	-	Likely not much to inspect and overall savings is small, so reallocate sample points.	-	Whole house measures
7	E+ Business Partners	Non-Res	91	14%	1%	Projects w/control elements	Select critical measure types from file-reviewed projects.	12	
8	E+ Residential Existing Gas Rebate	Res	14	-	18%	Thermostat controls	Recommend industry study for Heating System Maintenance measure. Sample already-reviewed Thermostat Control projects.	2	Heating systems, maintenance
9	E+ Residential Existing Electric Rebate	Res	17	0%	-	Thermostat controls	Select critical measure types from file-reviewed projects.	2	
10	E+ Commercial Lighting	Non-Res	19	32%	-	Occupancy sensors, CFLs	Literature review for T5/T8, inspections for OS, CFLs. Increased quota because program accounts for 32% of electric savings.	16	T8/T5 lighting
11	E+ Audit Home or Business	Non-Res	1	1%	1%	Audit (if non-CFL DI measures)	Selection of file-reviewed projects.	8	

#	Program Name	Sector	# of measures	% of elec savings	% of gas savings	Critical measure types for persistence	Strategy / Rationale	Final quota	Literature reviews
12	E+ Commercial Lighting	Non-Res	1	0%	-	CFL	Selection of file-reviewed projects.	8	
13	E+ Renewable	Non-Res	4	1%	-	All (PV, wind, alternative generators)	Selection of file-reviewed projects.	8	
14	E+ Irrigation	Non-Res	23	1%	0%	Projects w/VFD, control elements	Select critical measure types from file-reviewed projects.	5	
15	E+ Commercial Existing Gas Rebate	Non-Res	12	-	5%	-	Recommend industry study for Heating System Maintenance measure. Sample already-reviewed Thermostat Control projects.	-	Heating systems, maintenance
16	E+ Electric Motor/Rewind Rebate	Non-Res	1	0%	-	Motor	Selection of file-reviewed projects. This is a long-lived measure, so reduce to number of projects with files already.	4	
17	Vending Miser	Non-Res	1	0%	-	Vending Miser	Selection of file-reviewed projects.	3	
	All selected programs		**196**	**87%**	**46%**			**118**	

28.1.2. On-Site Visits

The first step in on-site data collection involved customer recruitment. From the sampling allocation developed in the previous list, we generated a randomly selected and ordered list of customers to recruit. Most of these cases were customers for which we had already performed file reviews, but in a few instances, we requested additional files from NorthWestern Energy.

Our recruitment team contacted sampled customers in the sampling order for each program quota. We recorded information about measure failures, even if the recruitment was unsuccessful. For example, if we contacted a customer to recruit them, and they said they were not interested in a visit them because they had removed the measures (say, a showerhead and aerators) a long time ago, then the phone recruiter would probe for further information and record what they found out. Although we did not visit the site, the knowledge that they removed the measure was essential for the overall persistence analysis.

We assigned recruited sites to a field inspector, who then obtained the relevant site files in the same manner as for the 2010–2011 inspections. These files provided detailed measure information to inform the inspection points, as well as to identify key parameters that could affect the realized savings, such as facility schedules and uses. Inspectors were instructed to keep in mind that the original baseline information no longer mattered, and that the installed case was the new baseline, for sake of assessing measure persistence.

Upon arrival at the site, the inspector worked with the contact to (1) visually verify the presence and function of the measure, and (2) learn about measure performance or modifications made since implementation. In cases where a measure was partially functioning, they performed a qualitative assessment, based on the evidence at hand, of whether at least half of the savings is still being realized. Because of the wide range of measures covered in this study, there were no standard questions, but they applied these general guidelines:

- Use a sampling strategy if there were large numbers of items to inspect, consistent with the amount of time available.
- For control measures, such as occupancy sensors or thermostats, do some impromptu testing if needed (e.g., walking into a few rooms to see if the occupancy sensors turn the light on) or checking of settings (e.g., looking at the schedule and setpoints on a programmable thermostat).
- Try to find the original equipment incented/installed by the program. If the equipment has been replaced (even by something similar or identical to the original), then for the sake of this effort, the measure is considered to have failed.

Inspectors recorded their findings in standardized site workbooks, similar to those used for the 2010–2011 project inspections. Key data fields included the following:

Current operation

- Is measure(s) still in place and operational?

- When was the measure(s) originally installed? Be as specific as you can, including the source of the information, which could be program documentation, tracking data, customer interviews, or some combination of these.
- Describe any changes to the measure(s), particularly if they have been replaced, removed, or disabled.
- Describe the timing of any measure changes as best you are able to find out.

Current savings

- Is measure(s) likely yielding at least 50% of the claimed savings? (based on field observations, technical judgment)
- Details on current savings status, i.e., a brief description of the factors underlying your yes/no assessment of 50% savings.

Future changes

- Are there future changes planned that could affect this measure(s)?
- Details on timing and nature of future changes
- How would these changes affect current savings?

Info sources

- List key general sources of information, e.g., interview, equipment observation, control system view, documentation, etc.

Other notes

- Provide any other pertinent information.

28.1.3. Literature Reviews

Literature reviews were done for a set of measures that did not receive site visits but which warranted additional research as discussed above. Studies funded by state governmental organizations provide most of the research material on measure life expectancy.

28.1.4. Analysis

Once field data collection was complete, we aggregated the data in a master matrix and performed quality control checks. We then assessed the evidence for each priority measure and determined if there was any basis for updating the corresponding measure life.

In the literature review, sources for many EUL estimates are the often-cited California Energy Commission DEER08 database and various state technical resource manuals. Research on some of the measures yielded results from many sources, typically with minimal variation on measure life expectancy, but nevertheless allowing us to survey a broad selection of source material. In three cases, electric and gas heated manufactured homes meeting the regional Northwest Energy Star Manufactured Home specification and residential boiler tune-ups, only one source for each measure EUL was located. In those instances, we made our recommendation based on our best conservative judgment. For one measure, high efficiency gas room heaters, no EUL sources were located and, without any basis for changing the status quo, we recommended remaining with the present EUL.

28.2. Findings

28.2.1. On-site Visits

We were able to assess the persistence of selected measures for 119 projects. This total exceeded our overall quota by one project, though we did make some slight adjustments to the program-level quotas in response to the number of applicable and recruited projects we were able to obtain. Of these 119 completed projects, we were able to obtain the pertinent measure persistence information without needing to visit the site for 22% of the cases (16% of the non-residential projects, and 30% of the residential ones). In most of these situations, respondents told us that they had removed the measure, so there was no need to visit the site. When this occurred, interviewers probed for additional information about the reasons for and timing of the measure failure.

Table 640 below summarizes our findings for each subject program and measure type. We defined a measure as still being operational if it was partially or fully in place, and also made a judgment as to whether or not at least half of the original savings were still being achieved. Not surprisingly, we found a high attrition rate among both residential and commercial CFLs, with half or more having been replaced or removed since their original installation.

Commercial and residential CFLs were assigned an EUL of five and six years, respectively. This may be optimistic for commercial CFLs, where virtually all of the program-installed CFLs were gone, suggesting five years is optimistic. This may reflect the much higher operating hours in the commercial sector. As part of the larger evaluation assessment beyond this study of EULs in use, we found that EUL assumptions are not always consistent across programs. For example, Energy Star CFLs promoted through NEEA got an EUL of 7.

We also saw some attrition in the direct-installed measures, such as showerheads, aerators, and hot water heater tank wrap. Combined with the fact that few customers implemented audit recommendations, the 10 year audit EUL may be optimistic and might deserve a closer look.

Further details of these conclusions can be found later in this section. Supporting data and example field notes from the on-site effort can be found in the technical appendix, section 33.4.

Table 640: Persistence Study On-Site Visit Results

#	Program name	Sector	Measure types investigated	Assigned EULs (years)	# of projects examined	Project status % operational	% still saving	% future changes	General conclusions
1	E+ Residential Lighting	Res	CFLs	6	16	54%	50%	0%	About half of the CFLs have been removed or replaced after 4-5 years, consistent with the assigned EUL of 6 years.
2	E+ Audit Home or Business	Res	Audits, some with direct-install measures (CFLs, aerators, showerheads, hot water insulation)	10	14	93%	86%	0%	Some attrition in the direct-installed measures occurred. Customers implemented few audit recommendations.
3	E+ Residential Lighting	Res	CFLs	6	10	75%	71%	0%	Somewhat less than half of the CFLs have been removed or replaced after 4-5 years, consistent with the assigned EUL of 6 years.
5	E+ Renewable	Res	Photovoltaics	20	8	100%	100%	13%	All projects remained operational, consistent with the long 20-year EUL.
7	E+ Business Partners	Non-Res	Lighting retrofits with control elements, HVAC control upgrades with variable frequency drives	20	9	100%	100%	22%	No major failures after 4-5 years. Some smaller measures failed, but overall, most savings is persisting, and should continue to do so. The assigned 20 year EUL seems appropriate.
8	E+ Residential Existing Gas Rebate	Res	Thermostat controls	12 for thermostats	6	83%	50%	0%	Thermostats may persist, but inappropriate programming can reduce savings.
9	E+ Residential Existing Electric Rebate	Res	Thermostat controls	15 for thermostats	2	50%	50%	0%	Thermostats may persist, but inappropriate programming can reduce savings.
10	E+ Commercial Lighting	Non-Res	CFLs and occupancy sensors	5 for CFLs, 9 for occupancy sensors	19	89%	68%	0%	Many of the CFLs have been removed or replaced after 4-5 years, consistent with the assigned EUL of 5 years. Occupancy sensors are

#	Program name	Sector	Measure types investigated	Assigned EULs (years)	# of projects examined	Project status % operational	% still saving	% future changes	General conclusions
									generally still in place and yielding savings.
11	E+ Audit Home or Business	Non-Res	Audits, some with direct-install measures (CFLs, hot water insulation)	10	10	30%	30%	0%	Half of the customers did not have any measures implemented. Some attrition in the direct-installed measures occurred. Customers implemented few audit recommendations.
12	E+ Commercial Lighting	Non-Res	CFLs	5	8	13%	0%	0%	Virtually all of the program-installed CFLs were gone, suggesting the 5-year EUL is optimistic, given the high burn hours in the commercial sector.
13	E+ Renewable	Non-Res	Photovoltaics, biodiesel generator (1)	20	8	88%	83%	0%	PV projects were all operational. Non-PV projects may be more problematic--for instance, the sampled biodiesel generator and a very large Stirling Engine project that was not in the sample, but is known to have failed.
14	E+ Irrigation	Non-Res	New pivots/pumps	16	3	100%	100%	33%	All projects remained operational, consistent with the long 16-year EUL.
16	E+ Electric Motor/Rewind Rebate	Non-Res	Efficient motors	20	3	100%	100%	0%	All projects remained operational, consistent with the long 20-year EUL.
17	Vending Miser	Non-Res	Vending Misers	3	3	100%	100%	0%	6 of the 7 Vending Misers installed for these 3 projects are still operational after five-plus years.
	TOTAL				**119**	**75%**	**67%**	**3%**	

28.2.2. Literature Reviews

We identified and reviewed six major sources of information to compare against selected program EULs. The EUL comparison, and our assessments of the validity of the program values, are shown in Table 641. The measures that received literature reviews included Northwest Energy Star manufactured homes, boilers and furnaces, gas room heaters, boiler and furnace maintenance, and linear lighting systems (T5 and T8 fluorescent).

Table 641: Persistence Study Literature Search Results

#	Program name	Literature Research Topic	NWE Measure Name	NWE EUL	Source EUL	Source 1	Source 2	Assessment
4	E+ New Homes	Whole House	Northwest Energy Star Manufactured Home (Electric Heat) Incentive	30	39	Northwest Power Planning Council, Regional Technical Forum		A 30 year life is reasonable and, while the Regional Technical Forum's longer life estimate is founded, 30 years is a practical maximum for any measure.
6	E+ Residential New Gas Rebate	Whole House	Northwest Energy Star Manufactured Home (Gas) Incentive	30	39	Northwest Power Planning Council, Regional Technical Forum		A 30 year life is reasonable and, while the Regional Technical Forum's longer life estimate is founded, 30 years is a practical maximum for any measure.
8	E+ Residential Existing Gas Rebate	Heating System	High Efficiency Condensing Boiler	20	18/18	Ohio Technical Resource Manual 2011	Mid-Atlantic Technical Reference Manual, 2011	Retain the 20 year EUL; there is no reason why a condensing boiler should have a shorter life than the non-condensing commercial boiler.
			High Efficiency Condensing Furnace	18	20/15	DEER08	Ohio Technical Resource Manual 2011	Increase the EUL to 20 years. It lines up with DEER08 and is consistent with the boiler EUL.
			High Efficiency Gas Room Heater	10	10	None found		No EUL studies could be located for this measure. In our opinion, the 10 year EUL currently in use is conservative and reasonable estimate.
			Boiler, furnace, room heater Diagnostics and Maintenance	5	2	Minnesota Technical Resource Manual 2012		Most utilities with this measure use a five year life, however the only EUL source located specified a 2 year life, the same as the commercial program equivalent of this measure.
10	E+ Commercial Lighting	T8 Lighting	Various T8 Measures	14	15/15	DEER08	Mass Technical Resource Manual, 2011	The standard EUL is 15 years. Increase the EUL to 15 years.
		T5 Lighting	Various T5 Measures	14	15/15	DEER08	Mass Technical Resource Manual,	The standard EUL is 15 years. Increase

#	Program name	Literature Research Topic	NWE Measure Name	NWE EUL	Source EUL	Source 1	Source 2	Assessment
							2011	the EUL to 15 years.
15	E+ Commercial Existing Gas Rebate	Efficient Heating System	High Efficiency Boiler	20	20/25	DEER08	Mass Technical Resource Manual, 2011	Retaining the 20 EUL would be consistent with DEER08 and the more conservative choice of the two.
		Efficient Heating System	High Efficiency Furnace	20	20/18	DEER08	Mass Technical Resource Manual, 2011	Retain the 20 EUL to be consistent with the boiler EUL.
		Boiler Tune-up	Boiler Tune-up	2	2/2	Minnesota Technical Resource Manual, 2012	Building Tune-Up and Operations Program Evaluation, for ETO, by Linda Dethman, Dethman & Assoc. and Rick Kunkle, Wash State University Energy Program, March 2007.	A 2 year EUL is the commercial standard.

28.2.3. Conclusions

For the programs and measures we studied, we generally found the applicable EULs to be reasonable. We did, however, find some areas worthy of additional scrutiny and possible adjustment for future program years. Our conclusions can be found in Table 642.

Table 642: Persistence Study Conclusions

#	Program name	Recommendations
1	E+ Residential Lighting	N/A
2	E+ Audit Home or Business	EULs for direct-install and audit elements are likely quite different and should be considered separately. 10 years may be an optimistic average EUL to use.
3	E+ Residential Lighting	N/A
4	E+ New Homes	N/A
5	E+ Renewable	N/A
6	E+ Residential New Gas Rebate	N/A
7	E+ Business Partners	N/A
8	E+ Residential Existing Gas Rebate	The thermostat control measure is the same across gas and electric residential rebate programs, so EULs should be made identical. The lower EUL of 12 is likely more realistic. We recommend an EUL of 20 years for the condensing furnace to line up with DEER08.
9	E+ Residential Existing Electric Rebate	The thermostat control measure is the same across gas and electric residential rebate programs, so EULs should be made identical. The lower EUL of 12 is likely more realistic.
10	E+ Commercial Lighting	The literature review indicates a 15 year EUL is standard for T8 and T5 electronic ballasts.
11	E+ Audit Home or Business	EULs for direct-install and audit elements are likely quite different and should be considered separately. 10 years may be an optimistic average EUL to use.
12	E+ Commercial Lighting	Commercial CFL EUL of 5 years should be reassessed to see if it is too long, considering the poor persistence seen in the sampled projects.
13	E+ Renewable	20-year EUL may be overoptimistic for unconventional (non-PV) renewable energy projects. Appropriate EULS for these might better be applied on a case-by-case basis.
14	E+ Irrigation	N/A
15	E+ Commercial Existing Gas Rebate	N/A
16	E+ Electric Motor/Rewind Rebate	N/A
17	Vending Miser	Consider increasing Vending Miser EUL beyond 3 years if corroborating evidence can be found.

28.3. Recommendations

Based on the impact evaluation findings, we offer the following recommendations for improving the program.

- **Consistent EULs:** Standardize EULS across programs for the same technologies and sectors, such as residential CFLs. Make small adjustments to some EULs, such as T5/T8 commercial lighting, to be consistent with the DEER08 EUL of 15 years.
- **Separate EULs for audit elements:** Consider creating separate EULs for the direct-installed and owner-installed elements of audits. We recommend additional research on this topic, which may indicate separate EULs are justified.
- **Reassess some EULs:** Reassess EULs for commercial CFLs and unconventional renewable energy projects. Persistence surveys suggested values for these technologies may be overly optimistic. For commercial CFLs, our study suggests an EUL of less than 5 years is warranted based on field observations and recommend additional research to develop an appropriate value. For the small number of renewable energy projects other than solar PV and wind turbines, we recommend individually assessing EULs on a project by project basis.

29. Installation vs. Rebate Date

NWE assigns each measure implemented under its programs to a program year. Portfolio savings for a program year are the sum of all measures implemented during that year. NWE makes the program year assignments based on the rebate date, which is the date that NWE provided the incentive associated with the measure. NWE selected rebate date for this purpose because it was a date that they assigned internally. They had complete control over the assignment so it could be consistently and reliably applied across the entire portfolio. It was done easily and cheaply, which helped to reduce program costs and therefore maximize the customer benefit.

For the savings claim, savings are assumed to start on the rebate date. However, in actuality, the savings for a measure would start on the installation date. For most measures, the installation date occurs prior to the rebate date because it takes time for NWE to process the application and incentive. Since measures are assigned to a program year regardless of when they were installed during that year, the difference in these dates is generally of little consequence. However, it is possible for a measure to be installed at the end of a program year (just prior to June 30) and assigned a rebate date in the beginning of the next program year. The consequence of this action is that savings are assigned to the next program year (because of the assigned rebate date) but actually started accruing during the previous year (based on the installation date). Savings are not lost in this process but shifted to the next program year.

29.1. Methodology

The scope of this evaluation included an examination of this issue for programs within the 2007–2011 portfolio, where both installation date and rebate date were easily and reliably obtained from the program tracking data or the project files. Our examination included the comparison of installation and rebate dates for the sample of measures that received the file reviews (see section 2.2). We took the rebate date from the program tracking database. We extracted the installation date from the project files, if it was not included in the tracking database. We subjected all dates to a quality control review and we corrected clerical errors. We calculated the numbers of days between the installation and rebate dates for each sampled measure and we computed a weighted average for each program. We also computed the frequency of the rebate date crossing into the next program year for each program.

29.2. Findings

The results from the comparison between measure installation date and rebate date analysis are shown in the two tables below. Table 643 shows that 653 sites in 14 programs in the portfolio were included in the analysis because they had reliable data for both installation date and rebate date. The weighted number of days between the installation date and rebate date varied widely between programs from a low of zero for the Vending Miser, E+ Residential Lighting and E+ Commercial Lighting Programs to a high of 181 and 147 days, respectively, for the E+ Commercial New Gas Rebate and E+ Residential New Gas Rebate programs. The three programs with zero days between the install and rebate dates have no difference between these two dates because they are direct install programs, where the measures are installed by NWE during a site visit. We observed the greatest differences for the commercial and residential rebate programs. The differences are caused by a combination of delays in the customer submission of the completed applications to NWE and processing time at NWE. The delay in customer submission is the greater contributor. We observed more modest differences for the remaining programs.

Table 643: Average Time between Installation and Rebate Dates by Program

Program Name	Sites Reviewed	Average of days between install and rebate date	Savings Weighted Average of days between install and rebate date
E+ Electric Motor/Rewind Rebate	2	51	41
E+ Audit Home or Business	68	26	25
E+ Commercial Lighting	50	0	0
E+ Commercial Existing Electric Rebate	19	104	123
E+ Commercial Existing Gas Rebate	46	92	119
E+ Commercial New Electric Rebate	5	130	93
E+ Commercial New Gas Rebate	13	176	181
E+ Audit Home or Business	128	24	24
E+ Residential Lighting	99	0	0
E+ Residential Existing Electric Rebate	49	98	66
E+ Residential Existing Gas Rebate	96	92	114
E+ Residential New Electric Rebate	5	130	146
E+ Residential New Gas Rebate	63	150	147
Vending Miser	12	0	0
	TOTAL 653	**AVERAGE 79**	**AVERAGE 115**

Table 644 shows the percent of sites in the sample where the rebate date crossed June 30 into the next program year. Data were compiled for 1031 measures across the 653 sites. As expected, the table shows no cross-over for the three direct install programs. No or very small cross-over is also noted for the E+ Electric Motor/Rewind Rebate program and other non-rebate programs. The largest cross-over is noted for the rebate programs (except E+ Electric

Motor/rewind Rebate), which is consistent with a large average number of days between the installation and rebate dates. The percent cross-over ranged from 30% to 71% for these programs. The consequence of this observed cross-over is that a portion of the program savings is shifted into the next year. This effect is counter-balanced to some degree for the multi-year programs by savings that were shifted forward from the previous year. It is important to note that the cross-over does not remove savings but shifts them forward into the next program year.

Table 644: Percent of Installation and Rebate Dates that Cross Program Years by Program

Program name	Total measures reviewed	Total measures that crossed 6/30	Total measures that crossed 6/30 as percentage
E+ Electric Motor/Rewind Rebate	2	0	0%
E+ Audit Home or Business (Com)	106	3	3%
E+ Commercial Lighting	193	0	0%
E+ Commercial Existing Electric Rebate	43	13	30%
E+ Commercial Existing Gas Rebate	69	29	42%
E+ Commercial New Electric Rebate	13	5	38%
E+ Commercial New Gas Rebate	20	10	50%
E+ Audit Home or Business (Res)	132	7	5%
E+ Residential Lighting	192	0	0%
E+ Residential Existing Electric Rebate	52	17	33%
E+ Residential Existing Gas Rebate	102	38	37%
E+ Residential New Electric Rebate	7	5	71%
E+ Residential New Gas Rebate	63	33	52%
Vending Miser	37	0	0%
TOTAL	**1031**	**160**	**28%**

29.3. Recommendations

Based on the above findings, we offer the following recommendations for improving the program.

- **Rebate dates:** Continue using the rebate date to assign program years. It is a low-cost method of assigning dates that can be reliably and consistently applied across all programs in the portfolio.

Accurate documentation of installation date for several programs does not exist, and would be expensive to compile in a reliable and consistent manner from customers and/or contractors. The added cost of obtaining accurate installation dates is not worth the benefit of a more accurate assignment of program year.

30. Portfolio Impact Evaluation

30.1. Energy and Demand Impacts

30.1.1. Summary Across Programs

We estimated energy and demand impacts for each program in the NWE portfolio as described in sections 3 thru 26. Our findings for each program are shown in those sections by year and funding source. Table 645 shows our estimate, for each program, of the total impact for the five years covered by this evaluation. The table includes the reported savings, the savings realization rate, the net adjustment rate, and the adjusted net savings for energy and demand. Free ridership and spillover rates are also shown, but they are zero based on the analysis and findings we describe in section 31.4. Table 646 provides our estimate of the relative error associated with the savings realization rate for each program.

Table 645: Portfolio Impact Summary for All Calendar Years

Funding	Program	Units	Reported Energy Savings	Evaluation Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
Electric Supply - DSM										
	E+ Building Blocks Pilot	kWh	-	9,639	NA	-	-	NA	9,639	1
	E+ Business Partners	kWh	18,501,340	17,536,943	0.95	-	-	0.95	17,536,943	2,002
	E+ Commercial Existing Electric Rebate	kWh	1,622,309	1,948,434	1.20	-	-	1.20	1,948,434	222
	E+ Commercial Lighting	kWh	49,205,493	47,417,555	0.96	-	-	0.96	47,417,555	5,413
	E+ Commercial New Electric Rebate	kWh	95,877	90,176	0.94	-	-	0.94	90,176	10
	E+ Electric Motor/Rewind Rebate	kWh	80,333	72,316	0.90	-	-	0.90	72,316	8
	E+ New Homes	kWh	412,911	186,607	0.45	-	-	0.45	186,607	21
	E+ Residential Existing Electric Rebate	kWh	460,654	421,763	0.92	-	-	0.92	421,763	48
	E+ Residential Lighting	kWh	126,978,876	98,105,956	0.78	-	-	0.78	98,105,956	11,199
	E+ Residential New Electric Rebate	kWh	36,210	43,797	1.21	-	-	1.21	43,797	5
	E+ Residential New Gas Rebate	kWh	13,786	16,113	1.17	-	-	1.17	16,113	2
	NEEA Initiatives	kWh	77,665,897	82,613,716	1.14	-	-	1.14	82,613,716	9,431
	All Programs Electric Supply - DSM	kWh	275,073,686	248,463,014	0.90			0.90	248,463,014	28,363
Natural Gas Supply - DSM										
	E+ Building Blocks Pilot	dkt	-	3	NA	-	-	NA	3	
	E+ Business Partners	dkt	9,206	10,473	1.14	-	-	1.14	10,473	

Funding	Program	Units	Reported Energy Savings	Evaluation Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	E+ Commercial Existing Gas Rebate	dkt	40,023	17,620	0.44	-	-	0.44	17,620	
	E+ Commercial New Gas Rebate	dkt	5,758	5,586	0.97	-	-	0.97	5,586	
	E+ Residential Existing Gas Rebate	dkt	401,258	232,572	0.58	-	-	0.58	232,572	
	E+ Residential New Gas Rebate	dkt	1,350	1,443	1.07	-	-	1.07	1,443	
	NEEA Initiatives	dkt	91,181	75,724	0.83	-	-	0.83	75,724	
	All Programs Natural Gas Supply - DSM	dkt	548,774	343,421	0.63			0.63	343,421	
Electric - USB										
	Building Operator Certification	kWh	16,230,170	7,998,922	0.49	-	-	0.49	7,998,922	913
	DEQ Appliance	kWh	612,924	871,219	1.42	-	-	1.42	871,219	99
	E+ Audit Home or Business	kWh	8,433,839	6,030,257	0.72	-	-	0.72	6,030,257	688
	E+ Commercial Lighting	kWh	1,176,772	1,134,013	0.96	-	-	0.96	1,134,013	129
	E+ Free Weatherization/Fuel Switch	kWh	1,442,579	1,442,579	1.00	-	-	1.00	1,442,579	165
	E+ Irrigation	kWh	1,576,697	1,621,603	1.03	-	-	1.03	1,621,603	185
	E+ New Homes	kWh	316,965	143,246	0.45	-	-	0.45	143,246	16
	E+ Renewable	kWh	2,404,557	2,375,013	0.99	-	-	0.99	2,375,013	271
	Low Income Appliance	kWh	12,350	134,134	10.86	-	-	10.86	134,134	15
	Motor Management Training	kWh								

Funding	Program	Units	Reported Energy Savings	Evaluation Energy Savings	Savings Realization Rate	Free Ridership Rate	Spillover Rate	Net Savings Adjustment Rate	Net Adjusted Energy Savings	Net Adjusted Demand Savings (kW)
	NEEA Initiatives	kWh	1,936,613	265,068	1.14	-	-	1.14	265,068	30
	Vending Miser	kWh	118,534	85,071	0.72	-	-	0.72	85,071	10
	All Programs Electric - USB	kWh	34,262,001	22,101,125	0.65			0.65	22,101,125	2,523
Natural Gas - USB										
	Building Operator Certification	dkt	17,864	36,223	2.03	-	-	2.03	36,223	
	DEQ Appliance	dkt	894	1,606	1.80	-	-	1.80	1,606	
	E+ Audit Home or Business	dkt	189,291	78,509	0.41	-	-	0.41	78,509	
	E+ Free Weatherization/Fuel Switch	dkt	117,486	117,486	1.00	-	-	1.00	117,486	
	All Programs Natural Gas - USB	dkt	325,536	233,824	0.72			0.72	233,824	
Electric										
	All Programs Electric	kWh	309,335,688	270,564,139	0.87			0.87	270,564,139	30,886
Natural Gas										
	All Programs Natural Gas	dkt	874,310	577,245	0.66			0.66	577,245	

Table 646: Portfolio Savings Realization Rate Relative Error

Funding	Program	Units	Reported Energy Savings	Evaluation Energy Savings	Savings Realization Rate	Relative Error
Electric						
	Building Operator Certification	kWh	16,230,170		0.49	NA
	DEQ Appliance	kWh	612,924		1.42	NA
	E+ Audit Home or Business	kWh	8,433,839		0.72	0.54
	E+ Building Blocks Pilot	kWh	-	9,639	NA	1.27
	E+ Business Partners	kWh	18,501,340		0.95	0.19
	E+ Commercial Existing Electric Rebate	kWh	1,622,309		1.20	0.21
	E+ Commercial Lighting	kWh	50,382,265		0.96	0.07
	E+ Commercial New Electric Rebate	kWh	95,877		0.94	0.03
	E+ Electric Motor/Rewind Rebate	kWh	80,333		0.90	0.04
	E+ Free Weatherization/Fuel Switch	kWh	1,442,579		1.00	-
	E+ Irrigation	kWh	1,576,697		1.03	0.10
	E+ New Homes	kWh	729,876		0.45	0.11
	E+ Renewable	kWh	2,404,557		0.99	0.04
	E+ Residential Existing Electric Rebate	kWh	460,654		0.92	0.15
	E+ Residential Lighting	kWh	126,978,876		0.78	0.05
	E+ Residential New Electric Rebate	kWh	36,210		1.21	0.03
	E+ Residential New Gas Rebate	kWh	13,786		1.17	-
	Low Income Appliance	kWh	12,350		10.86	NA
	Motor Management Training	kWh				
	NEEA Initiatives	kWh	79,602,511		1.14	NA
	Vending Miser	kWh	118,534		0.72	-
	All Programs Electric	kWh	309,335,688	9,639		
Natural Gas						
	Building Operator Certification	dkt	17,864		2.03	NA
	DEQ Appliance	dkt	894		1.80	NA
	E+ Audit Home or	dkt	189,291		0.41	0.14

Funding	Program	Units	Reported Energy Savings	Evaluation Energy Savings	Savings Realization Rate	Relative Error
	Business					
	E+ Building Blocks Pilot	dkt	-	3	NA	1.40
	E+ Business Partners	dkt	9,206		1.14	0.31
	E+ Commercial Existing Gas Rebate	dkt	40,023		0.44	0.20
	E+ Commercial New Gas Rebate	dkt	5,758		0.97	0.11
	E+ Free Weatherization/Fuel Switch	dkt	117,486		1.00	-
	E+ Residential Existing Gas Rebate	dkt	401,258		0.58	0.13
	E+ Residential New Gas Rebate	dkt	1,350		1.07	0.12
	NEEA Initiatives	dkt	91,181		0.83	NA
	All Programs Natural Gas	dkt	874,310	3		

30.1.2. Impacts of Individual Adjustments

The table below shows the impact of each adjustment on the reported energy savings. Based on the analysis and findings we describe in section 31.4 for free ridership and spillover, all of the adjustment to the reported energy savings is accounted for by the savings realization rate.

Table 647: Portfolio Savings Adjustment Scenarios for All Calendar Years

Funding	Program	Adjustment Scenario	Units	Reported Energy Savings	Adjusted Savings	% Change from Reported
Electric						
	All Programs Electric					
		Reported - No Adjustment	kWh	309,335,688	309,335,688	0%
		Savings Realization Rate (SRR)	kWh	309,335,688	270,564,139	-13%
		SRR plus Free Ridership (FR)	kWh	309,335,688	270,564,139	-13%
		SRR and FR plus Spillover	kWh	309,335,688	270,564,139	-13%
Natural Gas						
	All Programs Natural Gas					
		Reported - No Adjustment	dkt	874,310	874,310	0%

Funding	Program	Adjustment Scenario	Units	Reported Energy Savings	Adjusted Savings	% Change from Reported
		Savings Realization Rate (SRR)	dkt	874,310	577,245	-34%
		SRR plus Free Ridership (FR)	dkt	874,310	577,245	-34%
		SRR and FR plus Spillover	dkt	874,310	577,245	-34%

30.2. Economic Analysis

Table 648 summarizes the results of our economic analysis for the five-year portfolio. Benefit/Cost (B/C) ratios are shown for each of the four cost-effectiveness test. Results are shown by program and funding source.

Table 649 shows our estimates of the Cost of Saved Energy (CSE). These estimates are shown by program and funding source and cover energy savings and costs for the five years covered by this evaluation. The CSE was estimated twice, once using costs associated with the Total Resource Cost (TRC) test and again using the costs associated with Program Administrator Cost (PAC) test.

Table 648: Portfolio Cost-Effectiveness Summary for All Calendar Years

Funding	Program	Units	Net Adjusted Energy Savings	Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
				B/C Ratio	B/C Ratio	B/C Ratio	B/C Ratio
Electric Supply - DSM							
	E+ Building Blocks Pilot	kWh	9,639	0.13	0.13	0.12	0.14
	E+ Business Partners	kWh	17,536,943	1.08	1.56	1.23	1.18
	E+ Commercial Existing Electric Rebate	kWh	1,948,434	4.72	2.55	1.91	5.19
	E+ Commercial Lighting	kWh	47,417,555	0.98	3.13	1.89	1.08
	E+ Commercial New Electric Rebate	kWh	90,176	2.07	1.27	1.11	2.28
	E+ Electric Motor/Rewind Rebate	kWh	72,316	0.50	1.19	0.99	0.55
	E+ New Homes	kWh	186,607	5.94	2.74	1.58	6.53
	E+ Residential Existing Electric Rebate	kWh	421,763	0.66	0.82	0.68	0.73
	E+ Residential Lighting	kWh	98,105,956	2.62	3.26	1.20	2.88
	E+ Residential New Electric Rebate	kWh	43,797	0.99	0.96	0.87	1.09
	E+ Residential New Gas Rebate	kWh	16,113	NA	NA	7.03	NA
	NEEA Initiatives	kWh	82,613,716	11.33	11.33	3.38	12.46
	All Programs Electric Supply - DSM	kWh	248,463,014	2.14	3.66	1.81	2.36
Natural Gas Supply - DSM							
	E+ Building Blocks Pilot	dkt	3	0.00	0.00	0.00	0.00

Funding	Program	Units	Net Adjusted Energy Savings	Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
				B/C Ratio	B/C Ratio	B/C Ratio	B/C Ratio
	E+ Business Partners	dkt	10,473	1.44	2.04	1.62	1.58
	E+ Commercial Existing Gas Rebate	dkt	17,620	0.87	1.39	1.16	0.95
	E+ Commercial New Gas Rebate	dkt	5,586	3.12	3.72	2.52	3.44
	E+ Residential Existing Gas Rebate	dkt	232,572	0.68	1.00	0.80	0.75
	E+ Residential New Gas Rebate	dkt	1,443	0.48	1.27	1.09	0.53
	NEEA Initiatives	dkt	75,724	NA	NA	4.41	NA
	All Programs Natural Gas Supply - DSM	dkt	343,421	1.00	1.46	1.10	1.10
Electric - USB							
	Building Operator Certification	kWh	7,998,922	6.05	6.05	1.55	6.65
	DEQ Appliance	kWh	871,219	0.33	8.38	2.54	0.36
	E+ Audit Home or Business	kWh	6,030,257	0.36	0.36	0.32	0.39
	E+ Business Partners	kWh	-				
	E+ Commercial Lighting	kWh	1,134,013	0.74	1.69	1.30	0.81
	E+ Free Weatherization/Fuel Switch	kWh	1,442,579	0.35	0.35	0.33	0.39
	E+ Irrigation	kWh	1,621,603	0.51	1.41	1.12	0.56
	E+ New Homes	kWh	143,246	0.15	0.16	0.15	0.16
	E+ Renewable	kWh	2,375,013	0.09	0.30	0.28	0.10
	Low Income Appliance	kWh	134,134	0.23	0.23	0.23	0.26
	Motor Management Training	kWh					

Funding	Program	Units	Net Adjusted Energy Savings	Total Resource Cost (TRC) Test	Program Administrator Cost (PAC) Test	Ratepayer Impact Measure (RIM) Test	Societal Cost (SC) Test
				B/C Ratio	B/C Ratio	B/C Ratio	B/C Ratio
	NEEA Initiatives	kWh	265,068	1.40	1.40	0.89	1.54
	Vending Miser	kWh	85,071	NA	NA	1.85	NA
	All Programs Electric - USB	kWh	22,101,125	0.28	0.52	0.45	0.31
Natural Gas - USB							
	Building Operator Certification	dkt	36,223	NA	NA	2.43	NA
	DEQ Appliance	dkt	1,606	NA	NA	5.40	NA
	E+ Audit Home or Business	dkt	78,509	1.01	1.01	0.80	1.11
	E+ Free Weatherization/Fuel Switch	dkt	117,486	2.10	2.10	1.61	2.31
	All Programs Natural Gas - USB	dkt	233,824	1.77	1.77	1.32	1.95
Electric							
	All Programs Electric	kWh	270,564,139	1.41	2.49	1.46	1.56
Natural Gas							
	All Programs Natural Gas	dkt	577,245	1.28	1.60	1.20	1.41

NEEA Initiatives costs do not include Incremental Participant costs because none were provided.

Table 649: Portfolio Levelized Cost Summary for All Calendar Years

Funding	Program	Units	Net Adjusted Energy Savings	Cost of Saved Energy (CSE)		Costs	
				Based on Total Resource Costs (TRC)	Based on Program Administrator Costs (PAC)	TRC	PAC
Electric Supply - DSM							

Funding	Program	Units	Net Adjusted Energy Savings	Cost of Saved Energy (CSE)		Costs	
				Based on Total Resource Costs (TRC)	Based on Program Administrator Costs (PAC)	TRC	PAC
	E+ Building Blocks Pilot	kWh	9,639	0.456	0.456	31,346	31,346
	E+ Business Partners	kWh	17,536,943	0.059	0.040	10,571,160	7,311,132
	E+ Commercial Existing Electric Rebate	kWh	1,948,434	0.015	0.027	219,832	406,385
	E+ Commercial Lighting	kWh	47,417,555	0.062	0.019	22,831,457	7,125,674
	E+ Commercial New Electric Rebate	kWh	90,176	0.033	0.054	26,717	43,574
	E+ Electric Motor/Rewind Rebate	kWh	72,316	0.127	0.053	94,345	39,536
	E+ New Homes	kWh	186,607	0.010	0.022	19,428	42,071
	E+ Residential Existing Electric Rebate	kWh	421,763	0.096	0.077	417,225	335,455
	E+ Residential Lighting	kWh	98,105,956	0.021	0.017	9,987,607	8,008,442
	E+ Residential New Electric Rebate	kWh	43,797	0.082	0.084	41,330	42,334
	E+ Residential New Gas Rebate	kWh	16,113	-	-	-	-
	NEEA Initiatives	kWh	82,613,716	0.006	0.006	4,087,658	4,087,658
	All Programs Electric Supply - DSM	kWh	248,463,014	0.028	0.016	50,325,772	29,471,274
Natural Gas Supply - DSM							
	E+ Building Blocks Pilot	dkt	3	4,379.458	4,379.458	93,642	93,642
	E+ Business Partners	dkt	10,473	4.367	3.082	475,722	335,706
	E+ Commercial Existing Gas Rebate	dkt	17,620	7.433	4.633	1,123,650	700,344
	E+ Commercial New Gas Rebate	dkt	5,586	2.182	1.832	120,980	101,579
	E+ Residential Existing Gas Rebate	dkt	232,572	9.652	6.575	11,652,308	7,937,308

Funding	Program	Units	Net Adjusted Energy Savings	Cost of Saved Energy (CSE)		Costs	
				Based on Total Resource Costs (TRC)	Based on Program Administrator Costs (PAC)	TRC	PAC
	E+ Residential New Gas Rebate	dkt	1,443	13.869	5.233	201,079	75,875
	NEEA Initiatives	dkt	75,724	-	-	-	-
	All Programs Natural Gas Supply - DSM	dkt	343,421	6.605	4.508	13,929,222	9,506,295
Electric - USB							
	Building Operator Certification	kWh	7,998,922	0.008	0.008	289,165	289,165
	DEQ Appliance	kWh	871,219	0.185	0.007	1,239,323	48,143
	E+ Audit Home or Business	kWh	6,030,257	0.156	0.156	6,709,366	6,709,366
	E+ Business Partners	kWh	-			29,768	29,768
	E+ Commercial Lighting	kWh	1,134,013	0.084	0.036	807,319	350,431
	E+ Free Weatherization/Fuel Switch	kWh	1,442,579	0.199	0.199	3,309,983	3,309,983
	E+ Irrigation	kWh	1,621,603	0.123	0.045	1,866,016	675,873
	E+ New Homes	kWh	143,246	0.365	0.340	258,704	240,908
	E+ Renewable	kWh	2,375,013	0.706	0.213	17,254,195	5,210,696
	Low Income Appliance	kWh	134,134	0.317	0.317	438,257	438,257
	Motor Management Training	kWh					
	NEEA Initiatives	kWh	265,068	0.041	0.041	72,567	72,567
	Vending Miser	kWh	85,071	-	-	-	-
	All Programs Electric - USB	kWh	22,101,125	0.210	0.113	32,274,663	17,375,157
Natural Gas - USB							
	Building Operator Certification	dkt	36,223	-	-	-	-
	DEQ Appliance	dkt	1,606	-	-	-	-
	E+ Audit Home or Business	dkt	78,509	6.338	6.338	3,530,318	3,530,318
	E+ Free Weatherization/Fuel	dkt	117,486	3.479	3.479	4,657,420	4,657,420

Funding	Program	Units	Net Adjusted Energy Savings	Cost of Saved Energy (CSE)		Costs	
				Based on Total Resource Costs (TRC)	Based on Program Administrator Costs (PAC)	TRC	PAC
	Switch						
	All Programs Natural Gas - USB	dkt	233,824	3.971	3.971	8,187,738	8,187,738
Electric							
	All Programs Electric	kWh	270,564,139	0.042	0.024	82,600,435	46,846,431
Natural Gas							
	All Programs Natural Gas	dkt	577,245	5.303	4.242	22,116,959	17,694,032

NEEA Initiatives costs do not include Incremental Participant costs because none were provided.

31. Portfolio Process Evaluation

This chapter discusses NWE's activities that support all programs in its portfolio and compares them to established best practices. In summary, we identified that NWE's program practices adheres to over 50 established best practices, as shown in Table 650. The remainder of this chapter is organized into four sections, three of which present our detailed findings and best practices assessments of NWE's program activities by activity area; the concluding section presents our findings from nonparticipant surveys. The three activity areas we assess are:

- Program planning, design, and management
- Branding, marketing, outreach, and media use
- Quality control, data tracking, and evaluation

Table 650: Portfolio Process Evaluation NWE Efficiency Programs Adhere to Over 50 Best Practices

1	Develop a sound program plan
2	Understand local market conditions
3	Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints)
4	Maintain program design flexibility to respond to changes in market and other factors
5	Maintain program funding throughout the year
6	Clearly articulate program changes to trade allies and customers
7	Develop written process plan
8	Keep participation simple
9	Offer assistance in preparing and submitting program applications
10	Use internet to facilitate participation
11	Provide quick, timely feedback to applicants
12	Maintain accurate contact lists
13	Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks
14	Maintain clear lines of communication
15	Capture and retain "program memory" in-house
16	Offer a single point of contact for customers of audit and non-residential programs
17	Use electronic processing
18	Use well-qualified engineering staff for technical programs
19	Communicate with customers through multiple media
20	Use the program's website to broadly inform the market and attract participation
21	Use Energy Star products and logo for leverage and to instill consumer confidence
22	Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations
23	Promote all benefits of energy efficient measures

24	Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects
25	Conduct cross-program marketing
26	Conduct sample-based post-installation inspections
27	Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)
28	Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions
29	Assess customer satisfaction
30	Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market
31	Implement a contractor QC process, such as training, screening or certification
32	Identify data requirements needed for success metrics and periodic program evaluation (especially pertinent to tracking performance of new or substantially revised programs)
33	Carefully document the tracking system and provide manuals for all users
34	Build in rigorous quality control screens for data entry
35	Use Internet to facilitate data entry and reporting; develop electronic application processes and, as relevant, web-based communications, to the extent the benefits warrant the costs
36	Link databases to dynamically exchange information
37	Integrate all program data, including measure-level data, into a single database
38	Develop accurate algorithms and assumptions on which to base savings estimates
39	Use Internet to facilitate data entry and reporting
40	Include audit recommendations and savings potential in program tracking database
41	Track vendor activity (number of jobs, measure types, savings)
42	Track incentives committed
43	Collect pre-existing wattage data
44	If use proactive marketing, track prospects early and drive program intervention around major equipment-related events
45	Periodically review and update market-level information about measures, including construction practices, EE market share and measure adoption; conduct periodic baseline studies
46	Conduct detailed ex post, impact evaluations -- including measure verification -- routinely, though not necessarily annually; review and update algorithms for calculating project savings; estimate free ridership and spillover
47	Use regular process evaluation activities to provide timely and fresh data providing feedback supporting program rationale and design
48	Create a culture whereby evaluation findings are valued and integrated into program management
49	Support program review & assessment at the most comprehensive level possible
50	Select an evaluator who has a detailed understanding of the market context in which a program operates
51	Clearly explain evaluation roles and responsibilities to participants in advance

31.1. Program Planning , Design, and Management

31.1.1. Service Territory Context

NWE's Montana energy operations serve populations of just under 350,000 electric customers and 200,000 natural gas customers in a unique territory in terms of both physical features and population characteristics. NWE serves about three-quarters of Montana's land area (nearly 110,000 square miles), including 187 communities receiving NWE electricity and 105 communities receiving NWE natural gas. (NorthWestern Energy 2012)

According to the 2010 U.S. Census data, the population of the state of Montana was almost 990,00 individuals living on 145,546 square miles, for a population density of 6.8 people per square mile – one of the lowest density states in the nation. In contrast, Oregon which is the second largest state in the Pacific Northwest with a land area of 95,988 square miles has a population density of almost 40 people per square mile. Montana has a smaller population than other states and the population is spread out more thinly.

The population is also distributed more evenly. Montana is not dominated by one large city, as are its neighbors to the west; instead, there are many smaller communities throughout the state. Billings, the largest city, has a metropolitan area comprising 16% of the state's population, compared with the metropolitan areas of Boise (39% of Idaho's population), Seattle (51% of Washington's population), and Portland (58% of Oregon's population).[16]

Figure 207 and Figure 208 provide maps of NWE's electric and natural gas service territories.

NorthWestern Energy maintains Community Relationship offices in six communities: Billings, Bozeman, Butte, Great Falls, Helena, and Missoula/Kalispell.

[16] U. S. Census 2011 estimates.

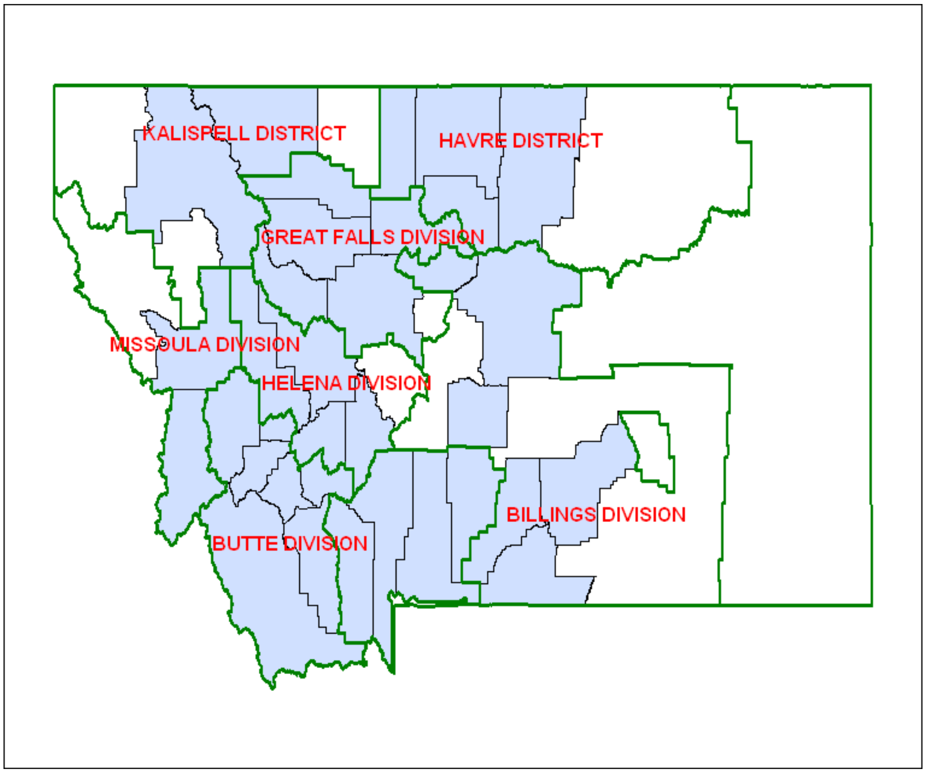

Figure 207: NWE Gas Distribution Service Territory by County

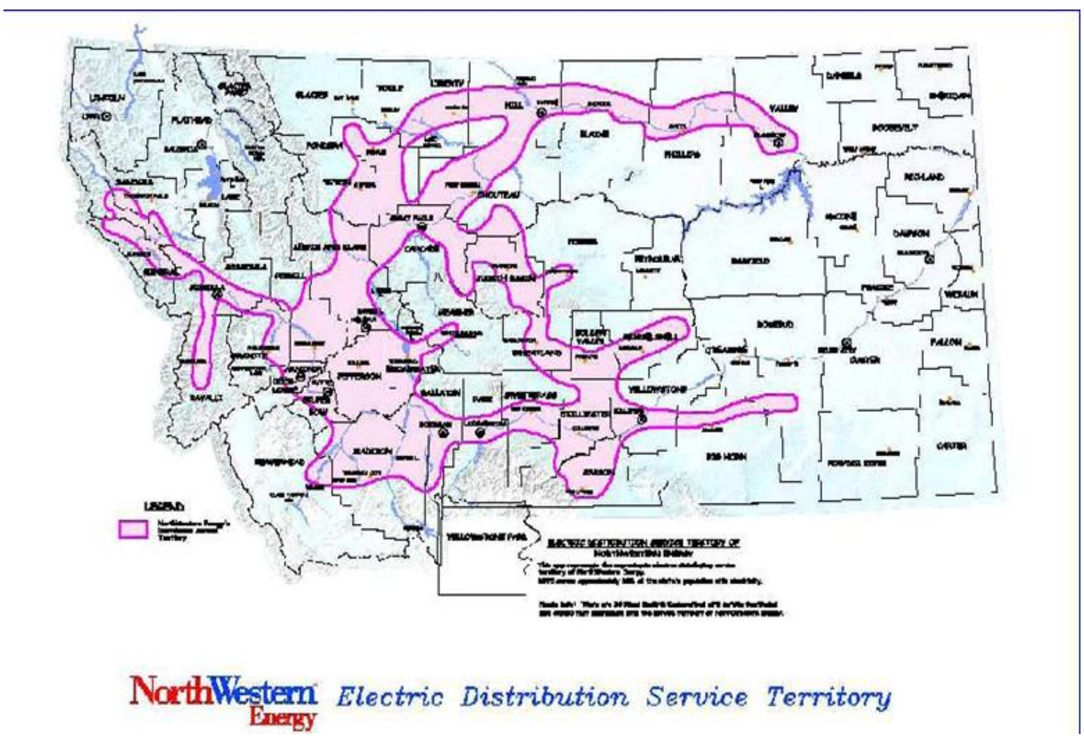

Figure 208: NWE Electric Distribution Service Territory

NWE serves electric-only customers, gas-only customers, and combined customers, as shown in Table 651. (NorthWestern Energy 2011)

Table 651: Total Unique Customers By Sector and Fuel

Sector and Fuel Served	Customers (Percent of Total Unique Customers)	
	Electricity Service	Gas Service
Residential Single-Fuel	138,600	32,000
	37%	8%
Residential Dual-Fuel	137,900	137,900
	37%	37%
Non-residential Single-Fuel	32,000	6,200
	11%	2%
Non-residential Dual-Fuel	21,800	21,800
	6%	6%
Total Customers, by Fuel	338,800	197,900
	90%	52%
Total Unique Customers		377,000
		100%

The residential sector comprises nearly three-quarters of NWE's customers. Space heating typically offers considerable energy efficiency opportunities in the residential sector through weatherization, insulation, and equipment measures. Yet although space heating dominates natural gas usage, less than six percent of NWE's residential electricity sales powers space heating equipment (central heat, room heat, and heat pumps). (Nexant, Cadmus 2010)

Some of the unique characteristics of NWE are evident when we compare Residential Consumption Survey data for the north mountain region (Montana, Idaho, Utah, and Wyoming) to California, a state recognized as a leader in energy efficiency. (Energy Information Administration 2009) In this comparison, the north mountain region:

- Is more rural
- Is a very cold or cold climate while California includes mixed dry/hot dry areas and marine areas
- Is dominated by single-family detached and attached homes, while California has about 33% multifamily homes. And of those single family homes:
    - Nearly 50% have basements, while in California less than 5% have basements
    - More than 50% have added insulation to homes they own, while in California less than 30% have done so

  - More than 80% of owner-occupied homes have double paned windows, while in California less than 45% double paned windows
  - Both regions have about the same (between 50 and 55%) proportion of people who say home is never drafty in winter, so perceived need is about the same.
- Is adopting energy efficient bulbs a bit slower (60% energy efficient bulbs, compared with California 70% energy efficient bulbs)
- Tends to cook about the same number meals at home
  - Uses more electricity than gas for cooking
  - Is more likely to have a stove/oven combination — not separated
  - Is more likely to have microwave, coffee maker, toaster oven
  - Is more likely to have a freezer
- Is more likely to have a clothes washer and clothes dryer in the home

The climate is very different, the households are more self-contained, and as a rural state, there are great distances between households and businesses. Another measure of difference is to look at the adoption of cell phones. This varies greatly across rural and urban states. Montana is among the states with the lowest percent of wireless-only households in the county (less than 20%), while Idaho, another northern mountain state is among the highest states, with more than 30% wireless-only households. In 2010, Montana, Alaska, and South Dakota were among the 13 states that had less than 20% wireless-only households; the remaining ten states are coastal states and more urban (California, Massachusetts, New York, Pennsylvania, New Jersey and five other Northeastern States). (Blumberg, et al. 2011)

Montana enacted legislation in the late 1990s to allow customers to make arrangements for energy supply in competitive markets. To date, the vast majority of the largest electric customers in the service territory have moved to the competitive markets; some most natural gas customers have moved as well. NWE transmits or transports energy to these customers, which are termed “choice” customers. Some customers in the 50 kW to 1MW range have also switched suppliers, becoming NWE choice electric customers; a few customers less than 50 kW have moved to competitive supply. As a consequence of the legislation to open NWE’s service territory to competition, NWE has few large customers. Large consumers offer the potential for large energy efficiency savings; most efficiency program administrators obtain one-third or more of their energy savings from large customers.

NWE has been conducting DSM programs since the 1980s to help customers save energy and improve efficiency. Beginning in 2004, NWE expanded its DSM Programs as part of its effort to secure supply resources for electric and natural gas energy supply customers. DSM Programs are marketed under the Efficiency Plus (E+) name, and include DSM Program offerings for all classes of electric and natural gas customers in the NWE Montana service territory.

In addition to funding DSM programs through its energy supply portfolios, NWE operates certain energy efficiency and renewable energy programs that are funded through a Universal System Benefits (USB) Charge. Established in 1997 as part of the restructuring legislation, USB funds support activities producing public purpose benefits, including low-income customer weatherization and energy assistance, renewable-energy projects and applications, research and development related to energy conservation and renewables, and market transformation efforts designed to encourage competitive markets for public purpose programs. The two funding sources of energy efficiency increase NWE's reach in the market, yet at the cost of more detailed and complex program procedures (eligibility verification, participant tracking) and program and portfolio reporting and analysis.

As part of this evaluation, we sought to identify efficiency best practices for rural utilities. We contacted a leading energy efficiency consultant who specializes in serving community-owned utilities, which are predominantly rural.[17] She reported being unaware of any report summarizing efficiency best practices for utilities serving rural populations. In our best practices assessment in this evaluation, we took into account NWE's unique service territory and customer base.

31.1.2. Program Planning and Design

Following best practices for program administrators, NWE is guided in the development of its efficiency programs and portfolio, as well as integrated resource planning process, by independent assessments of the long-term potential for energy efficiency resources. The most recent of these assessments investigated electric energy efficiency opportunities in the service territory from 2010 to 2029 under alternative economic scenarios. The study estimates economic (that is, cost-effective) potential as well as achievable potential, which reflects market barriers, including consumer technology adoption curves. (Nexant, Cadmus 2010)

NWE designs its programs to acquire the available energy efficiency savings potential. It provides incentives for all cost-effective measures. It offers both prescriptive rebates (specified rebates for specified measures) and custom incentives. Prescriptive incentives are paid per quantity of the measure installed; custom incentives are paid per unit of energy saved. By offering custom incentives, NWE can promote efficiency measures whose energy savings vary considerably according to the context – the application, the operating hours, and so on.

NWE is guided in developing its incentives by the principle of making it as easy as possible for both customers and trade allies to understand the qualifying efficiency measures and the available incentive. To this end, it offers prescriptive rebates for all efficiency measures that can be categorized into groups sufficiently homogeneous that NWE can be confident of the average savings that will result across the various applications customers have for the measure. For example, there are numerous manufactures, designs, and models of commercial reach-in refrigerators; just one of NWE's rebated commercial measures. NWE has determined that it can include this measure in its program with a rebate of $4.50 per cubic foot of refrigerated space and the measure will acquire energy savings cost effectively.

[17] The consultant is Jill K. Cliburn, who has the website Clean and Efficient Energy Program for Public Power (cleanefficientenergy.org).

NWE staff keep abreast of technology development and efficiency research that assesses the reliability of technology savings. Staff continually seek to increase the number of measures for which NWE provides prescriptive rebates. As one source of identifying candidate measures, staff review the custom measures it has accepted, assessing the applications and the associated savings, to determine whether the average savings (either across all units or a subset of applications) are sufficiently reliable to support prescriptive rebates. In the last few years, NWE used this process to add lighting measures and variable frequency drives (VFDs) to its commercial prescriptive rebate programs.

NWE provides rebates and incentive for cost-effective efficiency measures, as determined by its current avoided costs. According to staff, its avoided costs change every nine to fifteen months or so. With the arrival of updated avoided costs, staff recalculates the cost-effectiveness of all measures in its portfolio. With a decrease in avoided costs, staff identify any measures that are no longer cost effective. When avoided costs increase, staff assesses new measures for inclusion in the portfolio, analyzing measures identified in the efficiency potential study.

Every time avoided costs change by any degree, NWE staff revise the list of eligible measures and the associated incentives based on the outcome of the revised measure cost-effectiveness assessment. Following this revision, all program materials need to be updated, including both web-based and print versions. Program materials include descriptions of measures, incentive levels, and application forms. NWE then disseminates these materials through mailings to contractors. It also promotes newly qualifying measures through its advertising and outreach activities.

Reviewing avoided cost practices with several national evaluation and demand side management planning thought leaders,[18] we could not identify any documentation of best practices for frequency in applying avoided cost changes to portfolio and measure cost effectiveness. However, the respondents noted that typically utilities and commissions agree to a fixed avoided cost for a program cycle (such as three years). Practice varies as to whether program administrators use long-term or short-term avoided costs.

In California, a proceeding is currently underway examining the best practice for cost effectiveness; it includes setting avoided cost relative to the portfolio. (Judge's Ruling 2012) The current energy efficiency portfolio uses short-term avoided costs, and the smart grid and demand response portfolios use long-term avoided costs. The energy efficiency portfolio is scheduled to shift to long-term avoided costs in the next program cycle and the commission has launched a discussion as to what the best practice should be.

The Montana commission has not specified a best or preferred practice for revising the avoided cost application to the portfolio. NWE currently adjusts the portfolio whenever the avoided costs changes. This would appear inconsistent with common practice around that country.

[18] Conversations with Jeanne Clinton, former head of planning for the CPUC; Steve Schiller of Schiller Associates, advisor to SEE Action; Snuller Price of E3, advisor to many regulators on cost effectiveness.

As a consequence of avoided cost changes, NWE devotes substantial efficiency staff resources to the tasks of analysis, updating, dissemination, and marketing. In addition, trade allies and customers experience ramifications from changes in qualifying measures.

A key best practice for efficiency programs is that programs need to be as stable as possible. (Peters 2007) Trade allies complain of frequent or dramatic change in programs, which hurts their ability to make commitments to customers. When program changes must occur, trade allies appreciate advance notice. Trade allies need to be aware of the changes and train their staff so as not to misrepresent to their customers the available incentives. Trade allies also make business and marketing decisions based on utility incentives; they need to order equipment; they may need to change their market tactics in response to incentive changes. (On a positive note, related to this complaint is the difficulties for trade allies when programs start-and-stop, such as when funding runs out mid-year. NWE allocates sufficient funding for its programs to operate year-round.)

Prospective participants may be returning to a program they previously participated in, or may be planning over many months to purchase and install a measure; in either case, they may be unpleasantly surprised by changes to the eligible measures and to incentive levels. Reviewing the CPUC Administrative Law Judge ruling, it is apparent that changes in avoided costs may penalize customers as it will result in changes to the qualification of measures.

31.1.3. Best Practices for Planning and Design

Table 652 identifies best practices related to program planning and design and assesses NWE's program activities in comparison with the best practices.

Table 652: Program Planning and Design Best Practices Portfolio Process Evaluation

Practice	NWE Assessment
Develop a sound program plan ▪ State program target and timing ▪ Identify policy objective(s) (resource acquisition, equity, market transformation) ▪ Identify policy and other constraints ▪ Identify program goals and corresponding success metrics ▪ Ensure program strategies and tactics (activities) drive to goals	NWE programs reflect this planning ▪ Opportunity exists to formalize the outcome of its planning efforts with written program plans ▪ Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/ logic
Understand local market conditions ▪ Conduct market research as necessary for understanding	NWE programs reflect strong understanding of local market conditions ▪ Example: NWE conducted a CFL lighting study as part of this evaluation
Define and identify hard-to-reach customers and target programs accordingly (as appropriate given constraints) ▪ Encourage participation of many	NWE seeks out hard-to-reach customers ▪ Example: Programs use multiple distribution methods to reach customers that typically don't participate (especially evident in Audit, Residential Equipment, Residential Lighting, Business Partners,

Practice	NWE Assessment
contractors	and Irrigation) ▪ Example: Programs conduct outreach to all known contractors, ensuring wide market reach (especially evident in Residential Equipment, Non-residential Equipment, and Non-residential Lighting) ▪ Programs encourage trade ally to be on NWE's participating trade ally lists, yet does not limit contractor participation to those listed, ensuring wide market reach
Maintain program design flexibility to respond to changes in market and other factors	NWE practices continuous improvement, adjusting program activities to respond to new opportunities, and reach greater numbers of customers and trade allies
Keep programs stable; revise no more frequently than once a year and ideally for longer periods (e.g., program cycle)	Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
Maintain program funding throughout the year	Programs run year-round
Clearly articulate program changes to trade allies and customers	NWE delivers changes to trade allies annually Opportunity exists to systematically update customers

31.1.4. Program Management and Administration

Much of NWE's program management and administrative activities are reflected in the program and portfolio discussions throughout this document. We provide further discussion of these activities as we assess NWE's conformance with best practices.

NWE designs and implements its DSM and USB program portfolios with staff in the efficiency department, corporate communications department, print shop, and community relations offices. All of these staff also have responsibilities other than the DSM and USB programs. Staff estimate these activities account for six full-time-equivalent (FTE) positions. NWE's efficiency portfolio is also supported by a primary program implementation contractor, E+ Program Contractors, and a few program-specific implementation contractors.

NWE's staffing ratio is approximately 0.40 staff per million dollars of efficiency portfolio, an extremely low ratio compared with 39 efficiency program administrators around the country. (Goldman, et al. 2010) Similarly to NWE, these program administrators also use implementation contractors, so the use of such contractors does not account for differences between NWE and the average administrator. The research collected data on, among other things, administrators' total efficiency budgets; total in-house staff (FTE); proportions of total efficiency budget allocated to incentives, implementation contractors, and marketing; total budget by sector (residential, non-residential); and so on. Table 653 summarizes our findings on staffing ratio, defined as total in-house staff (FTE) divided by total efficiency budget in millions of dollars.

Table 653: Program Administrator Staff (FTE) per Million Dollars of Efficiency Budget

	Staff per Million Dollars of Budget	Description of Program Administrator
Minimum	0.27	A public utilities commission implementing a non-residential portfolio through primary implementation contractor
Maximum	18	A natural gas utility in the same state as the administrator with the minimum ratio
Mean	2.48	All surveyed 39 administrators

31.1.5. Best Practices for Management and Administration

Each of the program sections (3 through 25) discusses NWE management and administrative activities for the program, and assesses them against program best practices. Here, we provide a portfolio-level assessment of NWE's management and administrative practices, as given in Table 654.

Table 654: Program Management and Administrative Best Practices for Portfolio Process Evaluation

Practice	NWE Assessment
Develop written process plan Include program management activities Identify roles and responsibilities	Program roles, responsibilities, and management activities are clear to staff and implementers Opportunity exists to write down process plans
Develop inspection and verification procedures (see Quality Control best practices)	NWE programs have systematic inspections and verifications
Keep participation simple	NWE programs have simple, clear application forms and simple requirements for participants and trade allies.
Offer assistance in preparing and submitting program applications	Program implementation contractor and E+ Program Contractors are available to assist customers and trade allies in the participation process; program application materials clearly identify who to contact
Use internet to facilitate participation	NWE's website clearly presents program information Opportunity exists to support program participation through internet tools
Provide quick, timely feedback to applicants	NWE produces checks within 4-6 weeks of receiving application
Maintain accurate contact lists	The evaluation team found NWE's lists of participating customers and trade allies to be accurate
Ensure all staff have decision-making authority commensurate with their responsibilities and that assignments avoid bottlenecks	NWE reflects this management practice; staff and implementers have clear rules for decision authority
Maintain clear lines of communication	There is frequent, regular communication within and between staff

Practice	NWE Assessment
	and implementers, including scheduled meetings and scheduled reporting timelines
Capture and retain "program memory" in-house	NWE frequently discusses with program implementer activity and experiences; this plus program databases ensure NWE staff has current understanding of programs and markets
Offer a single point of contact for customers of audit and non-residential programs	The implementation contractor, E+ Program Contractor, and lighting trade ally network offer the benefits of a single point of contact, if not literally so; program application materials clearly identify who to contact
Use electronic processing	NWE is developing a new tracking system that will allow greater electronic processing
Use well-qualified engineering staff for technical programs	NWE's program staff include engineers; E+ Program Contractors include engineers to develop projects

31.2. Branding, Marketing, Outreach, and Media Use

Northwestern Energy's Corporate Communications Department participates in all media campaigns and promotional activities across thirty unique communities within its Montana service territory. This department oversees all branding, advertising, marketing, branding, media buys, benchmarking, and public relations in general and for all Northwestern Energy's energy efficiency programs. Corporate Communications provides consultative services, working with departments like Energy Efficiency both to create marketing campaigns and to develop individual marketing pieces. A team of six people comprise the Corporate Communications department.

The Energy Efficiency department is one of the department's two largest internal clients and generates a majority of their marketing work. Energy Efficiency is also the internal print shop's largest client.

It is the philosophy of Energy Efficiency to plan marketing "as early and often as possible." The project managers work directly with Corporate Communications on outreach plans and individual products. NWE staff have found that customers have an inconsistent experience and future outreach plans will be focused on creating "a singular customer experience" throughout the Energy Efficiency programs and interactions.

31.2.1. Branding, Website, and Other Services

NWE's management has set requirements for the use of the NWE label. NWE does not permit the use of its name on bulk direct mail (Valpak, etc.), in phone books, and other mass distribution methods such as door hangers or under windshields. NWE's efficiency program implementation contractor, KEMA, does not advertise or speak with the media.

NWE provides participating contractors with a guideline and template, and limits contractors' co-branding advertising to measures that are covered by the program. NWE asks to review all advertising with the NWE name on it, but in practice trade allies often do not go through this process before co-branding. NWE staff seldom spot a problem with contractor advertising, but occasionally need to take corrective action with a contractor.

The Energy Efficiency web deployment has evolved over time as Corporate Communications used different strategies to meet program needs online. A brief timeline follows:

- 2007 separate energy efficiency site
- 2008 efficiency integrated into NWE site
- 2010 efficiency pages reworked with ad agency

In addition to the core energy efficiency program website, Corporate Communications has also maintained business technology sites and "micro sites" that NWE has targeted to very specific market segments. These are typically sites with simple structures and a limited amount of content for a targeted purpose.

Corporate Communications has not had a dedicated website person for a year, and this has impacted web development, but at the time of our evaluation interviews was seeking to fill this position.

Corporate Communications was also involved in the development and propagation of YouTube videos demonstrating energy efficiency activities, such as installing weather stripping. Other services that Corporate Communications provides are photography, videotaping, and internal communications.

Corporate Communications runs internal metrics to evaluate their effectiveness. Metrics are based on outcomes and are tailored to the marketing project.

NWE uses an external advertising agency only for large media campaigns. Typically, the agency develops and runs advertisements on TV and radio, and in newspapers.

31.2.2. Marketing and Outreach

31.2.2.1 Customers

One of NWE's most popular marketing and outreach activities is the organized efficiency fairs. The fairs have changed over the years, adjusting to meet customer needs and reaching the widespread customer base. The main types of NWE-run events are MegaSaturdays, Customer Appreciation Days, and small town distribution events.

The MegaSaturdays were highly popular events that resembled a county fair in design. Some of the amenities included bucket rides and energy-saving mascots. NWE trucks arrived with marketing wrappers on the sides. Customer Appreciation Days were smaller versions of MegaSaturdays.

At these events, customers could sign up for home energy audits and could receive home weatherization kits. Customer support staff from NWE were available at these fairs and verified customer eligibility for weatherization kits and home energy audits.

The kits included weather stripping, window glaze, and other weatherization materials, along with instructional materials. The kit was packaged in a durable reusable tote. NWE conducted demonstrations of installation of these materials. NWE also distributed CFLs. NWE staff had customers receiving CFLs listen to training on lighting that discussed “the four Ls of CFLs”: location, light (lumens), label (Energy Star), and less energy.

Small town events are also smaller versions of MegaSaturdays. One or two NWE trucks with marketing wrappers drive out to the more remote towns. As with the other events, NWE educates customers and distributes weatherization kits and CFLs to customers for whom it has verified eligibility.

NWE runs weatherization events in the fall. These are free events where weatherization kits are distributed. AmeriCorps received ARRA funding for weatherization and program staff trained them to install weatherization kits and performed installations in the community.

NWE takes part in many events to promote non-residential programs. KEMA staff attend conferences and tradeshows. NWE teams with NEEA, BetterBricks, and Montana DEQ to present program offerings at these and similar events.

NWE increased non-residential customer outreach in recent years. The implementation contractor added more marketing staff and thus is able to reach out to more customers directly, providing face-to-face meetings to promote the program. NWE contracts with E+ Program Contractors to establish relationships with non-residential customers so as to proactively promote energy efficiency and encourage customers making investments in their facilities or equipment to participate in the E+ programs (see sections 5 and 6). E+ Program Contractors conduct one-on-one and group outreach to promote the program. Both the implementation contractor and the E+ Program Contractors visits facilities that have yet to participate in NW’s programs, and initiate several “touches” (aka contacts) with the facilities manager or other appropriate personnel. Implementers and NWE staff report that this increase in direct outreach led to an increase in participation.

NWE offers an online newsletter called Questline. Staff estimate that about 450 to 500 customers receive this newsletter. BOC training attendees are signed up automatically but can unsubscribe (see section 24).

All of the program evaluation sections in this report describe NWE’s marketing activities, as well.

NWE relies on trade allies to marketing efficiency measures and its programs to both residential and non-residential customers. The next section discussed NWE’s outreach to trade allies.

31.2.2.2 Trade Allies

Each time NWE revises its program offerings, it mails to all trade allies on its contact list a complete packet of information for all of the programs in its portfolio. The information includes program descriptions, eligible measures, and application forms. Annually, NWE hosts contractor breakfasts in each of the six largest cities in its service territory.

When NWE initiated residential insulation and equipment programs (for example, 2009 for the current residential equipment program), it conducted extensive efforts to recruit trade allies. It identified trade allies through the yellow pages, internet searches, and other sources. It asked these contractors to become E+ "preferred contractors." To do so, the contractors need to be licensed, insured, and sign a one-page agreement on standards of conduct for program contractors. Since that time, NWE has continued to accept contractors into the "preferred" list. Customers wanting to use contractors that are not on the list often ask the contractor to become preferred, as they receive a higher rebate for some measures when the contractor they use is preferred. And the designation gives the preferred contractors an economic advantage that leverages their sales.

The Lighting Trade Ally Network (LTAN) supports the E+ Commercial Lighting program. A contractor specializing in developing and fostering LTANs to support efficiency programs in the four-state region (as well other states) assists NWE in its LTAN activities. The contractor provides annual training to commercial lighting contractors active in NWE's service territory, provides lighting contractor support on request, and helps NWE to provide *Lighting Network News*, a quarterly newsletter. Each newsletter states the purpose and function of the LTAN: "To help lighting contractors, distributors, and other industry representatives discover ways to dramatically increase the number of completed commercial and industrial energy efficient lighting retrofit projects. The network provides assistance from energy experts in marketing, technology, analysis and lighting and controls energy efficient applications."

NWE provides the LTAN annual trainings at no cost to participants. The trainings cover such topics as new technologies, integrating controls into lighting project proposals, and NWE's portfolio of non-residential E+ programs.

The two-and-one-half page newsletters, designed to quickly get useful information in the hands of lighting contractors:

- Showcases E+ Commercial Lighting projects and participating lighting contractors,
- Offers tips for conducting lighting audits and identifying efficiency opportunities,
- Provides notices of upcoming efficiency conferences and trainings,
- Discusses lighting standards and industry developments,
- And communicates program changes and activity, among other topics.

NWE has established close ties with trade allies through its primary program implementation contractor, as well as with its E+ Program Contractors. Through outreach programs, such as training events and seminars, NWE seeks to keep trade allies engaged in the programs.

The implementation contractor uses IN-SITE to log a Commercial and Industrial interactions which are used to ensure the trade allies follow-up with customers within a fixed time period. Audits generated by both RECAP (residential) and IN-SITE (non-residential) provide indirect leads via the customer to the preferred contractors, which customers select off a list.

31.2.3. Community Relations

NWE's community relations managers, who are NWE employees, provide outreach to multiple communities. Based out of six major cities, community relations managers are already strategically located, an asset the energy efficiency department finds valuable.

The role of community relations managers in the energy efficiency programs has changed over time. More recently, these managers have been asked to shift their focus away from energy efficiency and prioritize other duties. Promoting energy efficiency is one of their many responsibilities. The relationship between community relations managers and the energy efficiency group is further influenced by the experiences of the individual community relations manager. Those that used to work in energy efficiency or related energy services tend to be more engaged with energy efficiency programs and more interested in promoting energy efficiency relative to their other duties as a community relations manager.

Community relations managers support energy efficiency through a wide range of activities. Some are common to all managers, while other forms of support depend on the individual. Typically, community relations managers discuss energy efficiency with customers on a daily basis as they take opportunities that arise to alert customers about the programs. Some community relations managers may go further to educate customers and promote programs when given the opportunity, discussing the benefits of energy efficiency and additional resources available. Managers may offer energy-saving tips that are no-cost ways to save energy. The managers have access to program collateral and can hand out brochures and application forms. The website is a popular source of information and reference point for customers, particularly when discussing through email.

Community relations managers are involved in many types of events, including weatherization fairs, trade shows, and other events that might be located in their service territory. When giving presentations to the public, energy efficiency is covered as part of the speech or in a couple slides. The managers attend NWE-sponsored events as well as make presentations on NWE's programs to agencies, local governments, customer groups, or companies.

Community relations managers may get involved in other activities when presented with opportunities that fit their individual skills. One contact is involved in a local government task force and developed a municipal climate action plan that includes activities that promote NWE's programs. Two managers have also conducted site visits for the program. One occasionally continues to do so for custom projects in irrigation and large facility retrofits.

Managers gain information through the website, emails sent out by the energy efficiency staff, and by contacting energy efficiency staff directly. Managers report receiving frequent emails from members of the energy efficiency team about inspection needs and status of rebate checks. Information on changes to rebates or contracts and pre-notification on surveys are delivered through email. Some managers reported occasions where they were unaware of program changes. When managers run into questions about the programs they can't answer, they can call the energy efficiency staff and learn through this process. Other communications may happen sporadically. The energy efficiency department may ask managers to contact customers who might be interested in training programs. There may also be a meeting about DSM programs every other year.

There are no scheduled meetings, regular newsletters, or reports that are specifically designed for community relationship managers. Thus, managers reported mixed experiences in communication between the energy efficiency department and the community relations departments. Communication may for some be very frequent and effective, but is overall characterized as inconsistent and not comprehensive.

One manager recommends continuing to improve communication between them and the energy efficiency department so that they can efficiently and accurately direct their contacts to the next step. Another manager requested the findings from this evaluation report so that they can better improve their role and understanding of how to effectively promote energy efficiency.

One of the managers raised a concern not about the frequency of communications, but the timing. When events are scheduled, the manger may not hear about it until a couple days before the event. Due to the short notice, their ability to respond and prepare is limited.

Overall, from the perspective of community relations managers, it appears that the programs are effective at meeting the needs of the customers. There is a wide and increasing variety of programs. The rebate programs are run smoothly, and Business Partners has developed good relationships with customers. They are aware that the implementation contractor is actively seeking out various groups of customers and the energy efficiency staff are responsive and helpful.

One major topic of inquiry by customers is the availability of rebates. Funding levels change based on fluctuations to the budget and some measures may change eligibility status. This level of uncertainty introduces a barrier to participation.

One of the managers wanted to know how to increase participation, noting that even with free weatherization materials backed with extensive advertising through multiple media streams, many customers do not take the offer. This topic appears to be of interest to the other managers, inferring from the suggestions they provided.

One manager suggested having more printed collateral available, even if such materials frequently go out of date, and providing it to all employees who interact with customers face to face so that they have something immediate to offer. Another manager suggested that NWE train more employees about the energy efficiency programs, thereby increasing the opportunities to inform customers. A wider variety of programs and opportunities to directly help customers enter those programs were also suggested.

Another suggestion was devoting more time to following up with customers after they have completed audits. The manager observed NWE could have more follow-up touches with customers after they receive their audit reports.

Whether or not managers want to spend more time advocating energy efficiency programs, it is not currently one of their priorities. They have many duties and responsibilities that take priority. While all managers take opportunities to promote energy efficiency and do so every day, they do not have the authority to allocate more time towards energy efficiency. Yet they have connections and relationships with organizations that are different from whom the energy efficiency department interacts with, and customers perceive them as a source of unbiased information about efficiency; thus, they have avenues that should be used as efficiently as possible.

31.2.4. Best Practices for Marketing and Outreach

Table 655 identifies best practices related to marketing and outreach and assesses NWE's program activities in comparison with the best practices.

Table 655: Program Marketing and Outreach Best Practices for Portfolio Process Evaluation

Practice	NWE Assessment
Communicate with customers through multiple media	NWE reflects this practice by advertising through TV, radio, print media, mailings, collateral and leaves-behinds, website, face-to-face, customer events, industry events
Use the program's website to broadly inform the market and attract participation	NWE reflects this practice by maintaining program information on the website
Use Energy Star products and logo for leverage and to instill consumer confidence	NWE includes many Energy Star products among its qualifying equipment
Leverage marketing dollars, including: relationships with trade allies; co-sponsoring or participating in relevant events hosted by other organizations	NWE supports trade allies in marketing the E+ programs and collaborates in relevant events hosted by other organizations
Promote all benefits of energy efficient measures ▪ Tailor messages to audiences	NWE emphasizes energy and cost savings ▪ Opportunities exist to further promote non-energy benefits
Develop and disseminate testimonials (residential) and case studies (non-residential) to showcase program projects	NWE does this
Conduct cross-program marketing	Print and web program materials provide information on all NWE programs ▪ Trade allies are informed of all NWE programs

31.3. Quality Control, Data Tracking, and Evaluation

31.3.1. Best Practices for Quality Control

Each of the program sections (3 through 25) discusses NWE quality assurance and control for the program, and assesses them against program best practices. Here, we provide a portfolio-level assessment of NWE's quality control practices, as given in Table 656.

Table 656: Program Quality Control Best Practices for Portfolio Process Evaluation

Practice	NWE Assessment
Conduct sample-based post-installation inspections ▪ Sample a larger proportion of a vendor's initial projects (including first job submitted by a new vendor), and of new measure types; reduce required inspections based on demonstrated quality of work and observed measure performance ▪ Base ongoing frequency on cost-effectiveness considerations and results from early inspections; obtain good random sample of vendor and measure types ▪ Use inspections as a training opportunity with contractors; ensure inspectors have adequate training in identifying and explaining reasons for failure	NWE follows these inspection practices ▪ Opportunity exists to factor in inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs ▪ Opportunity exists to review inspection samples to assure measures types are represented appropriately based on their contribution to savings
Conduct post-project inspections for all large projects (relative to total program savings) and projects with highly uncertain savings (mindful of administrative costs and cost-effectiveness)	NWE follows this practice, inspecting projects over a specified size
Similarly, conduct pre-project inspections for large or uncertain impacts, perhaps owing to highly uncertain baseline conditions	E+ Program Contractors follow this practice
Assess customer satisfaction	Audit participants receive a "How did we do?" card. NWE assesses satisfaction with all programs during its program cycle evaluation each five years ▪ Opportunity exists to solicit satisfaction feedback for each program on an ongoing basis

Practice	NWE Assessment
Verify accuracy of invoices and incentives; ensure accuracy of reported qualifying installations by target market	NWE follows this practice. The primary program implementation contractor has computer-based and staff-based reviews; multiple program tracking datasets "talk" to each other. E+ Program Contractors review applications and invoices, and NWE staff reviews their work.
Implement a contractor QC process, such as training, screening or certification	NWE's preferred contractors are licensed, insured, and have satisfactorily completed a one-page application. Its lighting contractors participate in a network. NWE meets with contractors annually, communicates periodically through emails, sends newsletters to networked trade allies, and offers and promotes training.

31.3.2. Data Tracking and Reporting

NWE's primary implementation contactor uses thirty databases during the evaluation period to track NWE's program data. These databases are the main method for data tracking for the NWE programs. The implementation contractor considers the databases as comprising five different categories: cross-program, USB (gas and electric), electric DSM, gas DSM, and lighting DSM.

The cross-program databases are particularly important in organizing information between datasets. These databases maintain lists of electric and gas customers, as well as contractors. They also keep track of potential leads for prospective participants. There is one file that tracks all payment requests sent to NWE and another file that controls reporting for all the programs. All of these databases interact with the rest of the program tracking.

The "Gas and Electric USB" databases track information on audits for both residential and commercial. Customer data is entered when scheduling an audit. The databases keep track of who has previously received an audit, as well as automatically compiling information on follow-up phone calls. Digital copies of audit documentation are stored in these databases. Similar databases track information separately for electric, gas, and lighting DSM programs.

All of these databases built to support individual programs are connected to the cross-program databases, so that all programs are checking against a current list of customers for eligibility, payments are tracked together, and consistent reports can be generated for each program.

The main inputs from NWE are periodic updates of electric and gas customers, and information about the status of check requests. The implementation contractor in turn produces monthly reports on the status of the programs and the check requests, as well as any additional reporting that NWE requests.

31.3.2.1. Enhancements to Tracking System

The implementation contractor is currently working on updating and consolidating databases into a single database rather than multiple interconnected ones. It will also allow electronic documents to be stored as part of the database, such as emails, photos, and scanned documents. This new database will allow NWE staff continuous access over the internet to program information. The database will be partitioned in such a way that access can be granted to different types of data so staff will have access to only the data that they need.

NWE staff reported the implementation contractor has been very responsive to their reporting needs. The historical development of databases and the close communication over the new system is further evidence to support this evaluation.

31.3.2.2. Tracking for Evaluability

One of the purposes of database tracking is for the eventual verification of savings. During our evaluation, we discovered three areas where tracking can be improved to ensure efficient and accurate evaluation.

Date Tracking

Dates at which energy savings were considered to have started were not consistently identified among the programs. TRC calculations are influenced by the year in which savings are claimed because the parameters used in those calculations vary from year to year. Designating program-specific project milestones to determine the savings start date would obviate any impacts due to this effect.

For most of the programs we used the tracking field designated as a “Paid Date” to signify the savings start date. This is appropriate for Audit programs, which result in a report of potential energy-conserving measures for implementation rather than installation of specific equipment or implementation of operational procedures. For programs in which evidential measures are implemented as the objective of a project, installation dates (as provided on application forms in the rebate programs), or an inspection date indicating successful implementation would be a better indication of when savings actually start. Technically, it is the actual start of savings that should determine in which year project savings are claimed. Paid dates would always occur after the actual savings start date and could potentially shift savings for some small portion of projects from one year to the next.

Cost Tracking

There are two kinds of costs the evaluation team needed to know on a per-measure basis: the cost of the measure, and participant-perspective costs, which can be either the cost to the participant or the incentives paid. This information was not readily accessible in one location and multiple sources had to be used. Cost tracking was inconsistent between programs overall. In some cases, costs had to be estimated, particularly if measures are being tracked by contract rather than by project.

Unique Identifiers

With some exceptions, documentation was delivered in a manner that allowed the evaluation team to organize the documents quickly and efficiently. Exceptions arose from a lack of standardized file naming conventions or in some cases, a lack of a formal database to contain the information. Specifically, the implementation contractor maintained consistent identifiers. Other data sources lacked similar identifiers.

Suggestions for improving documentation storage, retrieval and use are centered around establishing file naming conventions:

- A possible file- or folder-naming convention might look like:

  ProgramCode_ProgramYear_SiteID_documenttype

  This would make document identification of specific projects easy to store, locate and handle either automatically or manually.
- Maintain a consistent identifying code in document names for all programs surviving from one year to the next. For some programs, names were changed during the five-year evaluation cycle, apparently for marketing reasons. If the program itself survives, it would be easier for the evaluator to group documents if their filenames were encoded with a consistent, program-specific prefix or suffix.
- Incorporate the program year in the file name. In most cases this should not be difficult, although at the time a document is created, the program year may be uncertain. For example when project applications are received close to the end of a program year, it may not be obvious whether processing will be completed before or after the change in program year. Also, custom programs could present difficulties in that their applications must be approved prior to project implementation and the completion date is generally uncertain.
- Similar to the program name, unique project identification codes (which are generally found in the tracking data) included in the document name would assist the evaluator in quickly identifying files associated with specific projects.
- For some programs, many documents are associated with each project. Grouping all project-specific files in a folder incorporating the same naming conventions as specified above would ease file handling. The files within the folder would not then be expected to incorporate the program, year and project codes.

31.3.3. Best Practices for Data Tracking and Reporting

Table 657 identifies best practices related to data tracking and reporting and assesses NWE's program activities in comparison with the best practices.

Table 657: Program Tracking and Reporting Best Practices for Portfolio Process Evaluation

Practice	NWE Assessment
Identify data requirements needed for success	NWE conforms to these practices. NWE receives

Practice	NWE Assessment
metrics and periodic program evaluation (especially pertinent to tracking performance of new or substantially revised programs) ▪ Regularly check tracking reports to assess how the program is working and make program corrections to ensure success ▪ Automate, as much as is practical, routine functions (e.g., monthly program reports); enable program managers to generate standardized reports ▪ Balance the level of tracking planned against program resource availability (that is, don't "over" track)	regular reports from its implementation contractors, and staff are able to generate additional reports
Carefully document the tracking system and provide manuals for all users	Current tracking system is documented. Further, NWE is developing a new tracking system that will be documented and staff and implementers will be trained
Build in rigorous quality control screens for data entry	The tracking system has automated data checks; in addition, staff conduct checks
Develop electronic application processes and, as relevant, web-based communications, to the extent the benefits warrant the costs	Opportunities exist to expand these resources
Link databases to dynamically exchange information ▪ Minimize duplicative data entry ▪ Design databases to fully integrate audit participation results with other efficiency program information systems ▪ Use databases that integrate or link with cross-program energy efficiency program information systems	NWE is developing a new tracking system that will reflect these practices
Integrate all program data, including measure-level data, into a single database	NWE is developing a new tracking system that will reflect these practices
Develop accurate algorithms and assumptions on which to base savings estimates	NWE and its implementation contractor has developed such algorithms; NWE conducts periodic impact evaluations and revises its algorithms as warranted back on evaluation outcomes
Use Internet to facilitate data entry and reporting	
Include audit recommendations and savings potential in program tracking database	NWE is developing a new tracking system that will allow attachment of a wider range of documentation
Track vendor activity (number of jobs, measure	NWE tracks this information

Practice	NWE Assessment
types, savings)	
Track incentives committed	NWE tracks this information
Collect pre-existing wattage data	Application forms collect this information
If use proactive marketing, track prospects early and drive program intervention around major equipment-related events	E+ Program contractors use proactive marketing and do this

31.3.4. Evaluation

In this section, we compare NWE evaluation practices to best practices for evaluation. There are three categories of best practices pertaining to the evaluability of an efficiency program or portfolio. They are best practices for: the level of engagement of the program implementers, the timing of evaluation activities, and the thoroughness of data gathered to inform the evaluation.

The first set of best practices involves the level of engagement of the implementer in the evaluation. The implementer's willingness to participate in the evaluation and benefit from the process is key to the ultimate ability of the evaluator to assess and verify the implementation of findings. Engagement best practices comprise three specific behaviors: engagement of the implementation team in the evaluation process, creation of a culture whereby evaluation findings are valued and integrated into program management, and support for program review and assessment at the most comprehensive level possible.

Our evaluation finds NWE is fully engaged in the evaluation process and meets those best practices. One of the ways NWE demonstrates this engagement is by providing the evaluation contractors with early access to NWE staff and program implementers. For example, NWE's entire energy efficiency staff attended the evaluation kickoff meeting, and were available for in-depth interviews immediately after the meeting. During the kickoff meeting, the energy efficiency staff actively engaged in evaluation discussion, both learning about the proposed process and providing information to develop the evaluation plan. Prior to the kickoff meeting, staff were also available for an in-depth discussion about program logic, answering detailed questions that helped the evaluators develop a sampling plan for the impact evaluation.

Our research finds NWE has a culture in which evaluation findings are valued and integrated into program management consistent with best practices. In addition to a staff that is fully engaged in the evaluation process, NWE requested a review and comparison of its practices with best practices at both the program and portfolio levels to help the utility to improve its offerings. As a further example, NWE has responded to recommendations from past evaluations, such as strengthening the documentation necessary to receive a non-residential lighting rebate and increasing program cross-marketing.

Regarding NWE's support for program review and assessment at the most comprehensive level possible, NWE has been responsive to all requests for information, background, and documentation, often providing more information than is required to allow the evaluation team to be fully informed of utility practices. The level of transparency is commendable, bringing evaluation support to "the most comprehensive level possible." In fact, our evaluation finds NWE goes beyond that standard and establishes a new best practice by anticipating evaluation needs. NWE staff is so thoroughly engaged, and evaluation findings are so valued, that the utility has established systems to assist future evaluations. Databases and document repositories were developed for the express purpose of aiding future evaluations. NWE also collected and maintained marketing materials and other program documents, and provided these materials, by year, to us in binders in advance of the kickoff meetings.

These examples support our overall evaluation of NWE's practices compared to best practices. In all three categories involving engagement levels, we find NWE to meet, or to exceed, established best practices.

The next category of best practices involves the evaluation schedule: Conduct detailed ex post, impact evaluations routinely, though not necessarily annually, use regular process evaluation activities to provide timely and fresh data, and present actionable findings for program staff both in real time and at the end of the study, and stagger the timing of process and ex post impact tasks so process evaluations can be conducted and results communicated on a relatively real-time basis,.

While individually, these are each best practices, there is a direct tradeoff between frequency and depth of evaluation. When evaluation tasks are broken up and spread out across time, recommendations can be accepted and used immediately, and a larger number of smaller changes can be made. When evaluations occur less regularly, there are fewer opportunities for feedback and less flexibility for mid-stream corrections, but it is possible to make more extensive, interconnected evaluations when all the activities are done concurrently or in close succession. Some well-executed evaluations use ongoing feedback activities. Other well-executed evaluations perform an extensive evaluation at longer time intervals. There are no programs that provide regular feedback and also perform extensive evaluation activities that inform each other for a comprehensive, complete picture at a given time.

NWE conducts detailed, ex post impact evaluations and process evaluations concurrently every five years, such as the current evaluation. Programs are reviewed individually, and include statistically significant samples of participants and trade allies for each program. Impact evaluations include document reviews, engineering reviews, site visits with statistically significant samples, and short-duration metering. NWE supported interviews of staff and implementers before fielding end-user surveys, and supported recruitment of site visit candidates from participant surveys, allowing the evaluation team to link results between the participant survey and the site verification. Throughout the course of the evaluation, the evaluation team kept NWE apprised of activities and findings.

Our evaluation finds NWE uses regular process evaluations to provide data at intervals that meet the utility's needs. NWE has opted to spread out evaluation activities by conducting extensive, regularly scheduled evaluations every five years. NWE's programs are mature and do not require as much mid-stream adjustment as new programs. NWE's five-year evaluations occur under a short time frame, allowing NWE to gain at one time a thorough understanding of program performance to aid planning of future program activities. There are some cost savings in this approach, as information obtained by the evaluation team can inform both impact and process work, and information on one set of processes (such as tracking) can inform an understanding of multiple programs. However, the large number of programs in NWE's portfolio, the complication of program year and tracker year, and the five-year evaluation cycle all conspire to make the five-year combined impact and process evaluation a very complex undertaking.

We identified two applicable best practices related to market research: Include periodic estimation of free ridership and spillover, and periodically review and update market level information about construction practices, energy efficiency market share, and measure adoption.

In this category, NWE has shown exceptional dedication to collecting high quality data. Our evaluation finds NWE includes periodic estimation of free ridership and spillover, meeting best practices. This evaluation conducted onsite spillover verification by comparing participants' self-reports with site verification findings. This evaluation also explored leakage when measuring free ridership.

Our evaluation finds NWE periodically reviews and updates market level information, meeting best practices. As a part of the current evaluation, the evaluation team metered CFLs to estimate hours of use in NWE's service territory. NWE periodically conducts a technical and market potential study to identify opportunities for energy efficiency and forecast future scenarios for demand-side management. (Nexant, Cadmus 2010) NWE also periodically conducts a fuel resource assessment to determine the market share of heating fuels in their territory.

31.3.5. Best Practices for Evaluation

Table 658 identifies best practices related to program evaluation and assesses NWE's program activities in comparison with the best practices.

Table 658: Program Evaluation Best Practices for Portfolio Process Evaluation

Practice	NWE Assessment
Periodically review and update market-level information about measures, including construction practices, EE market share and measure adoption; conduct periodic baseline studies	NWE conducts periodic efficiency technical and market potential studies; methods include on-site data collection
Conduct detailed ex post, impact evaluations -- including measure verification -- routinely, though not necessarily annually; review and update algorithms for calculating project savings; estimate free ridership	NWE reflects this practice by having a regular portfolio evaluation cycle to validate program impacts, update algorithms for calculating project savings, and estimate free ridership and spillover; impact evaluation methods include site visits

Practice	NWE Assessment
and spillover ▪ Develop realization rates by end use or measure type & utilize these to improve savings estimates over time ▪ Determine measure life for estimating the lifecycle benefits of a measure	▪ NWE prospectively assess program cost-effectiveness using best available realization rate estimates ▪ Impact evaluators review measure life estimates and estimate program cost-effectiveness
Use regular process evaluation activities to provide timely and fresh data providing feedback supporting program rationale and design	NWE reflects this practice by having a regular portfolio evaluation cycle
Perform market assessments routinely, though not necessarily annually	Opportunities exist to make routine updates to market assessments
Create a culture whereby evaluation findings are valued and integrated into program management ▪ Engage the implementation team in the evaluation process ▪ Allow for plenty of interaction between evaluators and implementation staff ▪ Evaluators present actionable findings to program staff both in real time and at the end of study	NWE reflects this practice by using evaluation findings as a valuable tool in program design and update ▪ Implementation team readily available to evaluators ▪ NWE reflects this practice by requesting, receiving, and acting upon actionable findings from evaluation ▪ Opportunities exist to use actionable findings in real time
Support program review & assessment at the most comprehensive level possible	NWE reflects this practice by coordinating closely with evaluation team ▪ NWE provided the evaluation team with program binders containing comprehensive information and collateral, including application forms, program requirements, marketing pieces, case studies, and other information
Select an evaluator who has a detailed understanding of the market context in which a program operates ▪ View evaluation results in the context of the overall market	NWE reflects this practice by discussing local market context with evaluators ▪ NWE reflects this practice by constantly putting findings into context of the region
Clearly explain evaluation roles and responsibilities to participants in advance	NWE reflects this practice by preparing the program staff and communicating with implementers
Conduct evaluations in a timely manner ▪ Stagger the timing of process and ex post impact tasks so that process	Opportunity exists to conduct more frequent, smaller-scope evaluations, such as separating impact and process evaluations, or evaluating one type of program (example, new construction, or residential portfolio) or one sector of

Practice	NWE Assessment
evaluations can be conducted and results communicated on a relatively real-time basis	program at a time ▪ Smaller evaluation scopes would be more manageable for the evaluation team; however, multiple evaluations would need to cover some of the same information (examples: impact and process evaluations both need to understand program operations; both residential and non-residential programs use similar processes and tools) ▪ Opportunity exists to obtain fast feedback from participants on satisfaction and free ridership within a month or so of their program participation

31.4. Free Ridership, Spillover, and Net-to-Gross Adjustments

This section discusses free ridership, spillover, and their summary representation by the net to gross (NTG) ratio. The section uses the following terms, as defined in section 1.1.

- Free ridership: Energy savings likely to have occurred in the program's absence
- Free ridership estimate: An estimate of the proportion of savings generated by free riders
- Gross savings: Annual energy savings determined either by NWE or this evaluation. Gross savings do not account for free ridership, leakage or spillover, which are included in estimating net savings.
- Leakage: Movement of rebated or directly installed efficiency measures out of NWE Montana's service territory.
- Net savings: Gross savings adjusted for free ridership, leakage, and spillover.
- Net-to-gross ratio: The ratio of net savings to gross savings.
- Spillover: Energy savings induced by, but not subsidized by, the program.
- Spillover estimate: An estimate of spillover savings expressed as a proportion of gross savings.

To assist the reader, we first provide a synopsis of this "Free Ridership, Spillover, and Net-to-Gross Adjustments" section.

We present our estimated values of free ridership and spillover for NWE programs, and find the free ridership estimates to be comparable to those estimated for other program administrators. (Comparison spillover estimates are not readily available.) We find the self-report free ridership estimator, despite its well established use in impact evaluations, to satisfy only the weakest of validity constructs – face validity and internal consistency – and find that numerous empirically demonstrated behavioral phenomena cast doubt on the estimator's face validity and strongly suggest overestimation occurs. We find indicators that spillover is substantially underestimated by current commonly used methods, including our own, and find reasons to believe that the spillover generated by yesterday's programs are likely observed in the free ridership estimate of today's programs.

We thus conclude that our free ridership estimator – while yielding values comparable to those found by other program administrators – overestimates free ridership and our spillover estimator underestimates spillover, creating a problem of asymmetric information about the two effects. Numerous respected evaluators believe spillover effects are likely to be comparable, or possibly exceed, free ridership effects.

We find that methods for estimating portfolio net impacts and the associated net-to-gross (NTG) ratio vary widely across utility regulatory jurisdictions and vary widely at the program level within some jurisdictions. Differences in NTG practices include what elements are included in NTG, how they are included, how they are estimated, and how the NTG ratio is used. A 2012 review of the NTG practices of 31 jurisdictions found that 42% had no NTG requirement, equivalent to an NTG value of 1.0 and a free ridership estimate that is fully offset by program spillover. A number of regulatory commissions are considering revising, or have recently revised their NTG requirements. In tandem with the issue of NTG value to be used, commissions are increasingly embracing the use of prospective NTG values – known to all parties at the outset of the program cycle, rather than retrospective NTG values – determined through evaluation sometime after the program cycle.

We recommend that NWE (1) use a NTG value of 1.0 to estimate program net benefits and cost-effectiveness; (2) monitor product markets and conduct market saturation surveys to determine when market transformation has occurred and exit the market when it has; (3) continue its efforts to keep abreast of state-of-the-art program designs; and (4) conduct short surveys of participants immediately after participation to provide real-time feedback useful for program refinement and evolution, as does the Energy Trust.

The preceding paragraphs provide a synopsis of this section, which is organized as follows:[19]

- Estimated Free Ridership Values by NWE Program
- Challenges in Estimating Free Ridership
- Estimated Spillover Values by NWE Program
- Challenges in Estimating Spillover
- Estimated Leakage by NWE Program
- Net-to-Gross Practices Nationally
- Net-to-Gross Recommendations

[19] Because the three sections of "*Challenges in Estimating Free Ridership*," "*Challenges in Estimating Spillover*," and "*Net-to-Gross Practices*" each have subsections and quickly review a lot of information, we start each one with a summary.

31.4.1. Estimated Free Ridership Values by NWE Program

Table 659 provides our estimated free ridership values by program, estimated using the self-report method as described in section 2. As described, we did not attain our desired sample sizes for the participant surveys for several programs, in spite of repeated attempts at different times of day and the offer of incentives. For survey samples insufficient to provide 90/20 confidence/precision of estimates (or, nearly equivalently, 80/15), we do not report estimates. And in accordance with the evaluation plan, we did not estimate free ridership values for some programs, such as E+ Free Weatherization or the NEEA programs (NEEA reports savings values net of free ridership); the table indicates NA for these programs, for which we assume 0% free ridership.

Table 659: Estimated Free Ridership Values by NWE Program

Program	Estimated Free Ridership	Program	Estimated Free Ridership
E+ Audit	12%	E+ New Homes	46%
E+ Building Blocks Pilot	0%	E+ Residential Existing Electric Rebate	32%
E+ Business Partners	Sample too small	E+ Residential Existing Gas Rebate	14%
E+ Irrigation	Sample too small	E+ Residential Lighting	13%
DEQ Appliance	NA	E+ New Electric Rebate	Sample too small
E+ Commercial Existing Electric Rebate	20%	E+ New Gas Rebate	49%
E+ Commercial Existing Gas Rebate	33%	Low Income Appliance	NA
E+ Commercial Lighting	22%	Vending Miser	0%
E+ Commercial New Electric Rebate	Sample too small	E+ Renewable	14%
E+ Commercial New Gas Rebate	0%	Building Operator Certification	NA
E+ Electric Motor	Sample too small	Motor Management Training	NA
E+ Free Weatherization	NA	NEEA Programs	NA

Figure 209 –Figure 217 provide context for the estimated free ridership rates for NWE programs by comparing them with free ridership rates of other program administrators.[20] As illustrated, the estimate for NWE's:

- Commercial lighting is at the lower end of the range of values,
- Renewables is comparable to the other values
- Audit is at the lower end of the range of values
- Existing residential is at the lower end of the range of values for gas and at the middle of the range for electric
- Residential lighting is at the lower end of the range of values
- New residential is comparable to the other values

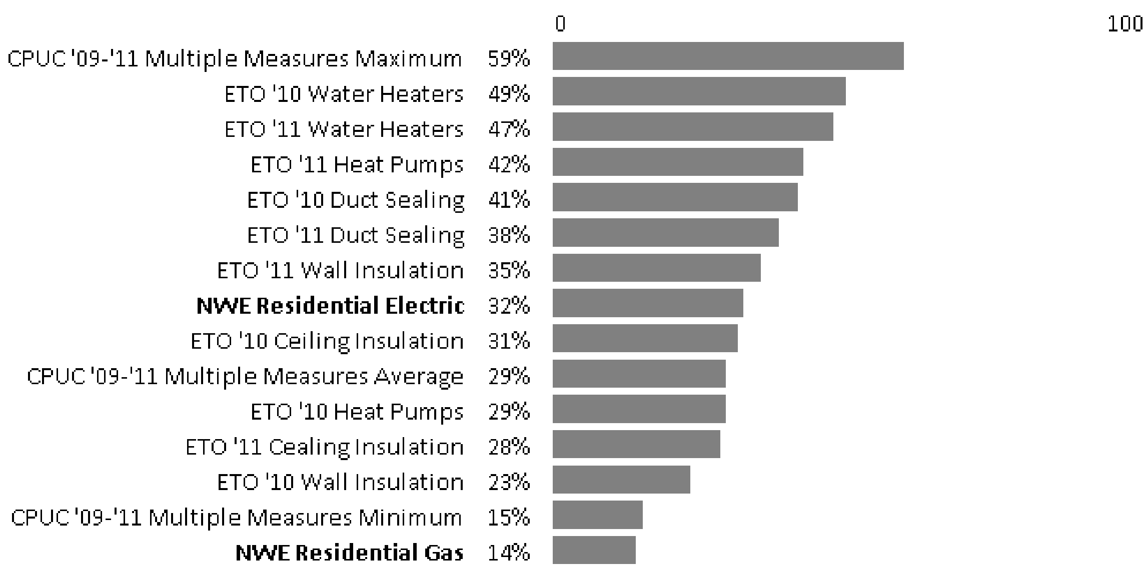

Figure 209: Comparison of Residential Rebate Free Rider Estimates

[20] This comparison draws on two sources: (1) Energy Trust of Oregon studies can be found at http://energytrust.org/about/policy-and-report/Reports.aspx. (2) *Assessment of Energy and Capacity Savings Potential in Iowa*, February 28, 2012. A final report prepared for the Iowa Utility Association by The Cadmus Group, Inc., Energy Services Division, in collaboration with Nexant, Inc. and First Tracks Consulting. Sources cited by the Cadmus study include (a) 2008 Database for Energy-Efficient Resources (http://vvvvw.deeresources.com/deer0911planning/ downloads/DEER2008_NTG_ValuesAndDocumentation_080530.zip); (b) *Final Report: Phase 2 Evaluation of the Efficiency Vermont Residential Programs*, prepared for the Vermont Department of Public Service, Prepared by KEMA. Inc., December 2005; (c) *Process and Impact Evaluation of the Efficiency Main Lighting Program Lighting Program* prepared for Efficiency Main, prepared by Nexus Market Research, lnc., and RLW Analytics, lnc., 2007; (d) *New York's System Benefits Charge Program Evaluation and Status Report—Year Ending December 31, 2010*, prepared by NYSERDA, March, 2011; (e) *Shared Savings Decision-Making Process Evaluation Research Results,* prepared for Wisconsin Power & Light by Summit Blue Consulting, April 11 2006; (f) *Commercial and Industrial Performance Program (CIPP) Market Characterization, Market Assessment and Causality Evaluation, prepared for* New York State Energy Research and Development Authority, prepared by Summit Blue Consulting, LLC, May, 2007.

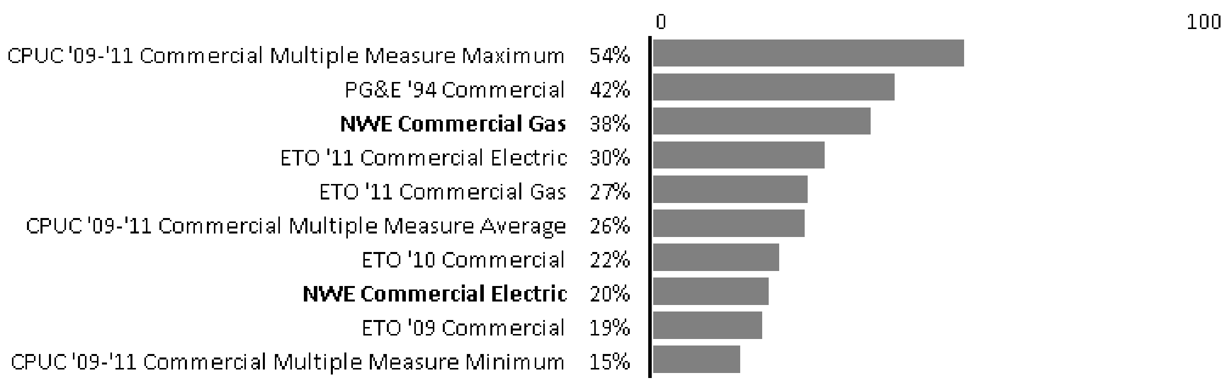

Figure 210: Comparison of Commercial Rebate Free Rider Estimates

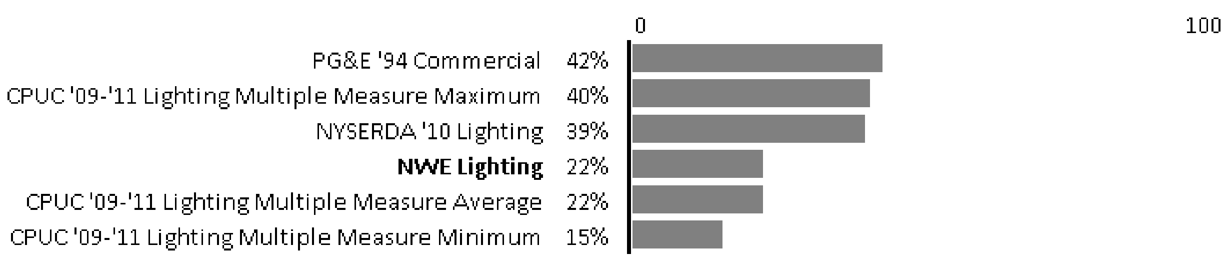

Figure 211: Comparison of Commercial Lighting Free Rider Estimates

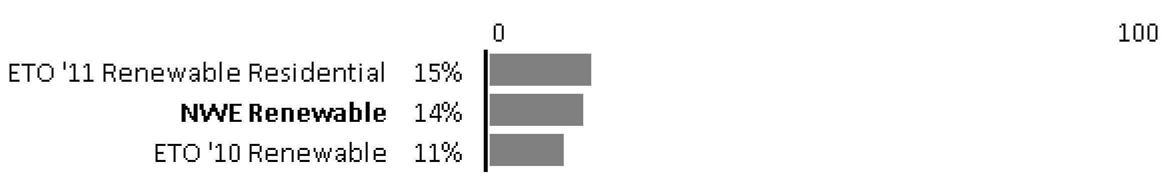

Figure 212: Comparison of Renewable Program Free Rider Estimates

Figure 213: Comparison of Audit Program Free Rider Estimates

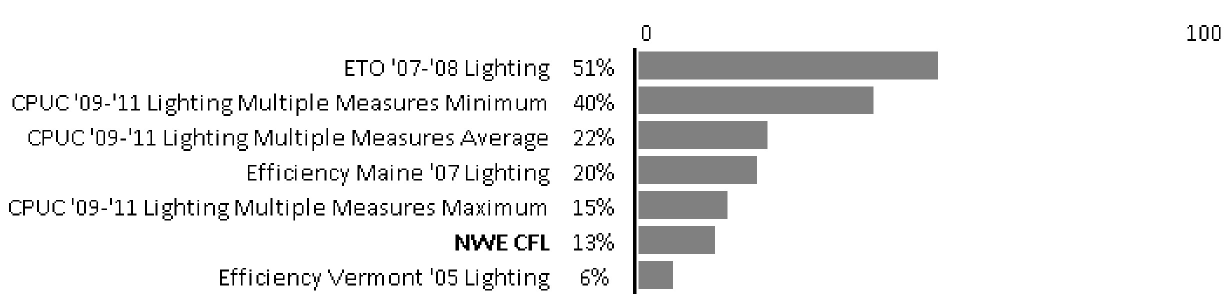

Figure 214: Comparison of Residential Lighting Free Rider Estimates

Figure 215: Comparison of New Residential Free Rider Estimates

Figure 216: Comparison of New Commercial Free Rider Estimates

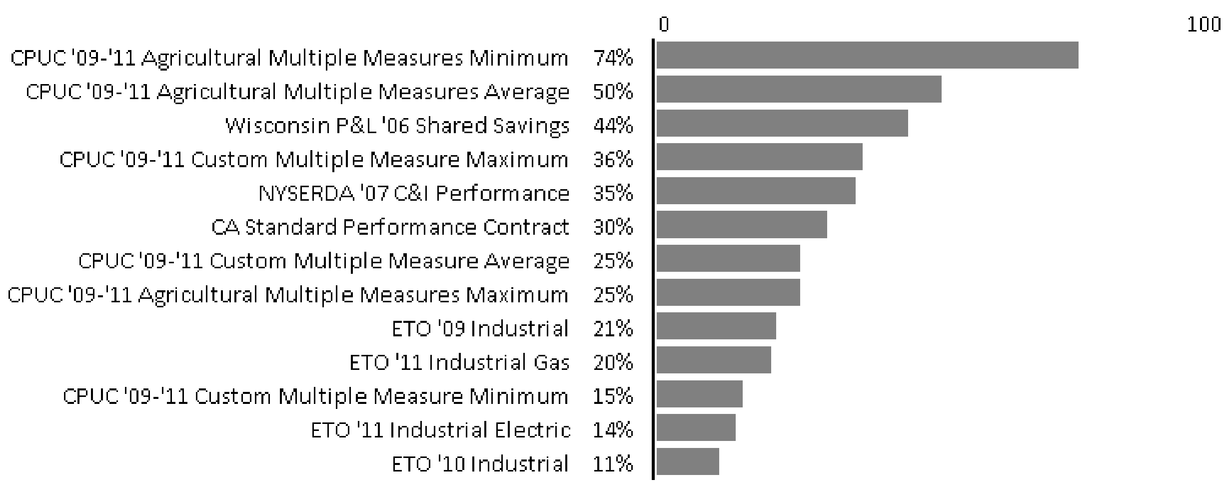

Figure 217: Comparison of Custom C&I Free Rider Estimates

31.4.2. Challenges in Estimating Free Ridership

31.4.2.1. Summary of Challenges in Estimating Free Ridership

To be useful, estimators need to be reliable and valid. The self-reported free ridership estimator appears through comparisons such as shown in Figure 209 –Figure 217, to be generally reliable, so it is measuring a stable concept or fusion of concepts. The difficulty is in knowing what is being measured, that is, it's validity. Statisticians grapple with the assessment of validity and have identified about a dozen possible analytical approaches. Several of the approaches researchers in varying fields use to assess validity are not relevant to the issue of free ridership. Several other approaches typically require significant data and analytical resources, and thus are not used often in the estimation of free ridership (or, more precisely, net savings) for a portfolio of energy efficiency programs; indeed, some very-resource intensive approaches are rarely used. Due to limited resources available for evaluation, most program administrators that estimate free ridership use a self-reported estimator, which seemingly passes the weakest indicators of validity: internal validity and face validity.

However, an understanding of current social and cognitive science research casts strong doubts on the face validity of the self-reported free ridership estimator. Experimental demonstration of loss aversion, attribution theory, cognitive dissonance, and the weak association between intentions and actions, as well as our profession's research showing weak recall of energy efficiency actions and actual actions, cast considerable doubt on the claim to face validity.

Thus, the self-reported free ridership estimate while reliable – and, as we describe subsequently, therefore can be useful – has very little claim to producing valid measurements of the energy savings that would not have resulted had the efficiency program not been offered, that is, measurements of the utility's contribution to energy savings.

As one evaluator noted in the context of summarizing the results of recent programs in California, "the issues of identifying freeriders are complicated and estimating [valid] program-specific freeriders is problematic at best."[21]

The subsequent sections elaborate on, and provide evidence in support of, these summary statements.

31.4.2.2. The Measurement Issues: Reliability and Validity

Statistics is the science of estimation and statisticians have identified two criteria of good estimators: reliability and validity. Reliability describes consistency; an estimator is reliable when it provides a similar estimate each time it is used for the same or similar populations. An estimate is valid if it measures what it claims to measure.

The methods used to estimate free ridership have evolved over thirty years of energy efficiency programs, and they continue to evolve. Currently, common practice estimates free ridership using the self-report method to explore what would have happened in the absence of the program. While researchers have used a variety of survey instruments, most instruments explore participants' opinions both of program influence and what they would have done had they not received the incentive or other program services; our study used this approach and based our instruments on the approach used by Energy Trust of Oregon.

The common self-report method used in this study appears to be generally reliable, as suggested by Figure 209 –Figure 217, which illustrate that the estimates for NWE free ridership by program type are within the ranges obtained by other program administrators. However, there is controversy among energy efficiency evaluation professionals as to whether the estimator is valid.

One can definitively determine (painstakingly, perhaps) the validity of an estimator that is estimating an observable condition, such as an estimate of the rate of home ownership, which could be validated by identifying the deed-holder for the census of dwellings. When the estimator attempts to measure a theoretical, non-observable construct or trait, such as free ridership, one cannot definitively determine validity. As a consequence, statisticians and

[21] TecMarket Works, *California 2002-2003 Portfolio Energy Efficiency Program Effects and Evaluation Summary Report,* prepared for Southern California Edison Co., January 2006.

professionals in measurement and evaluation fields have developed many approaches and methods, corresponding to different definitions of what it means for an estimator to be "valid," because the only definitive test – correspondence with an observable phenomenon – cannot be conducted.

Dawid (2000)[22] describes the problem as follows:

> *By definition, we can never observe such [counterfactual] quantities, nor can we assess empirically the validity of any modeling assumption we may make about them, even though our conclusions may be sensitive to these assumptions.*

Yet even this statement is not without controversy. Pearl (2000)[23] quotes this statement of Dawid's in an article discussing his paper, and immediately follows his quotation with, "This warning isn't entirely accurate," a theme she explores in the remainder of her paper. The issue of researching, and the methods for researching, the counterfactual (what would have happened if what did happen had not happened) are lively debated among philosophers, cognitive scientists, statisticians, and social scientists.

31.4.2.3. Established Approaches to Validity

Lacking an empirical foundation, validity of an estimator of an unobservable phenomenon is ultimately in the eye of the beholder. Table 660 describes the most common validity constructs (definitions, approaches). The table uses FR as an abbreviation of free ridership. Note that several of the items are categories comprising different analytical methods. Counting the subcategories, the table identifies 13 constructs; likely the literature describes a few others. The proliferation of constructs itself suggests the difficulty of establishing the validity of estimators of unobservable phenomena.

Table 660: Constructs for Assessing Validity of Estimators

Validity Construct	Definition	Comments and Applicability to Free Ridership Estimation
Face Validity	Estimator appears valid to the professional and other relevant communities	This is the weakest form of validity. While appearing to be valid does not assure validity by any other construct, an estimator lacking face validity is unlikely to be appropriate. The self-reported FR estimator has face validity
Internal Consistency	Scores on the individual items contributing to the estimate are highly correlated with the estimate	A weak form of validity, as it has no external reference; the individual items themselves could be misdirected. Self-reported FR estimator may satisfy this indicator of validity. For the current study, the "what would have happened" item has

[22] Dawid, A.P., "Causal Inference without Counterfactuals." April 2000. In *Journal of American Statistical Association*, Vol 95, No. 450, 373-406.

[23] Pearl, J., "The Logic of Counterfactuals in Causal Inference." April 2000. In *Journal of American Statistical Association*, Vol 95, No. 450, 428-435.

Validity Construct	Definition	Comments and Applicability to Free Ridership Estimation
		correlation coefficients of 0.85 to 0.98, while the “program influence” item has coefficients of 0.44 to 0.88. The correlations of the two items ranges from 0.05 to 0.79
Experimental Validity	Estimate produced through randomized control trails (RCT). For free ridership, utility customers randomly assigned to two groups – one group offered the program, and one group not offered the program – to measure incidence of energy efficient purchases among customers making purchases	An experimental FR estimator is an alternative to the self-reported FR estimator. Program administrators and regulators value equity and seldom want to offer efficiency resources to one group of customers and not another. Validity of estimator depends on experimental design; evaluators can differ in their assessments of the goodness of an experimental design
Quasi-experimental Validity (more broadly termed Construct Validity: Statistical Methods) ▪ Regression analysis ▪ Factor analysis ▪ Structural equation modeling ▪ Bayesian analysis	Estimates produced through statistical analysis of two groups (for FR: participants and nonparticipants); assignment is not random, so self-selection bias may occur; statistics used to “control” for differences between group. (Methods shown in increasing order of typical complexity)	A quasi-experimental net impacts estimator is an alternative to the self-reported FR estimator. Not well-suited to programs serving large non-residential customers or new construction. Provides combined estimate of program impact, FR, spillover and market transformation effects. Requires several years of energy billing data on large samples of fairly homogeneous participants and nonparticipants; more advanced methods also require nonparticipant data on purchases of target equipment. Researchers have identified advantages and disadvantages to each approach, with some researchers demonstrating biases associated with some common practices. Researchers can differ on the appropriate statistical approach, face validity of the statistical models, presence of bias, and the interpretation of the estimated model coefficients
Content Validity	Applicable to examination of knowledge; experts judge a test to be valid if its content matches course content	Not relevant to the FR estimator
Construct Validity: ▪ Convergent validity ▪ Divergent validity	Validates through correlation (or lack of correlation) with another estimator known to be valid	Not relevant to the FR estimator
Criterion Validity: ▪ Concurrent ▪ Predictive	Applicable to estimators of phenomenon that can be measured with an external criterion (a reference point, so to speak)	Not relevant to the self-reported FR estimator. Criterion validity of an experimental net impacts estimate can be established

The information in Table 660 above thus illustrates the problem for free ridership estimation. Of the seven major constructs by which free ridership estimation validity might be assessed:

- Three (content, construct, and criterion) are not applicable to self-reported free ridership estimators[24]
- Two (experimental and quasi-experimental) are considered quite persuasive yet typically require significant data and analytical resources, are not appropriate for all program types, may be contraindicated by equity considerations, and are themselves not without controversy as methods or without critics of specific studies[25]
- Two (face and internal) are seemingly or partially satisfied, which, while reassuring, provides weak support due to the lack of an external reference

31.4.2.4. Doubts about the Face Validity of Self-Reported Free Ridership

Increasingly, findings in social and cognitive sciences are casting doubt on the face validity of the self-reported free ridership estimator. As described, participants' descriptions of what they imagine they would have done if they had not received a rebate constitute half of the estimated value this study reports (and a similarly large proportion of the values reported by other studies). Yet participants are asked to imagine not having participated in the program after they have lived (at home or work) with the equipment or measure for anywhere from six months to two and a half years.

The social and cognitive sciences suggest that this retrospective assessment is subject to factors that affect the response. The field of behavioral economics has established, under experimental conditions, that people are willing to pay more to avoid a loss than they are willing to attain a gain. Applying this to energy efficiency, in the absence of the program, the customer faces the decision between a standard-efficiency item costing (hypothetically, for expository purposes) $10 and an efficient item costing $13. The customer might reasonably decide she values the increased efficiency at something less than $3 (say, $1) and so selects the standard efficiency item. In an alternative world, the utility offers a $2.50 rebate and the customer decides to purchase the efficient item for $10.50. The customer then lives with that item for a while and the utility's evaluator asks her to think back to life without the item and answer whether she would buy the item for $13, the price without the rebate. The customer considers a scenario that represents a loss – reversion to life before the item, values the loss more highly than she had valued the original gain, and says "Oh, yes, I would have purchased the item at the full price." We do not know the effect, if any, of loss aversion on our free ridership estimator, but

[24] One of these constructs – criterion validity – is applicable if an experimental estimator is used, yet in that case the concept term is equivalent to the experimental validity construct.

[25] A review of methods conducted by The Cadmus Group, Inc. reports on three studies that each derived free ridership estimates using both discrete choice modeling and self report. Two of the studies showed the self-report estimate to be about 50% higher than the discrete choice estimates, while a third study showed the two estimates to be about equal. Source: The Cadmus Group, Inc. *Assessment of Energy and Capacity Savings Potential in Iowa*. Prepared with Nexant, Inc. and First Tracks Consulting for The Iowa Utility Association. February 28, 2012. Page 62.

the proven existence of loss aversion as a normative human characteristic weakens the face validity of the estimator.

Cognitive psychologists have established, under experimental conditions, that people are more likely to attribute their successes or positive outcomes to their individual characteristics (such as their hard work or good sense) and negative outcomes to external factors (such as received bad advice). Common expressions anticipate these empirical findings: "Success has a hundred parents," and "The devil made me do it." Similarly, people are more likely to attribute a positive outcome attained by another to external factors and a negative outcome to the other person's individual characteristics. These tendencies are referred to as the fundamental attribution error.

More generally, attribution theory describes how people attribute as a cause of their actions or outcomes an explanation consistent with feeling good about themselves, perhaps in comparison to others. Attribution studies have demonstrated that the act of making a decision changes people's mental framework, including their preferences; this phenomenon is termed choice-induced preference change. Cognitive scientists have gone further and established under experimental conditions that choice-induced preference change can be long-lasting – several years or more, even when the choices are merely reported to the researcher and do not change what happens to the subjects.

Attribution theory tells us that in the process of taking an energy efficiency action, the person acquires the attribute of being someone who takes such action. As someone who takes such action, when asked to reflect on why they took the action, they say, "I'm just that sort of person." And that "sort of person" would take the action in the absence of the program. According to attribution theory, this phenomenon becomes more pronounced the more positive the program experience. If I were to tell someone I would not have considered installing the energy-efficient lighting system without the program, I would be characterizing myself as being different then than I am now. I would be saying that, without the program, I would be a person with a different mindset, making different decisions that flow from that mindset. Some people are reluctant to say this.

Related to attribution theory is the concept of cognitive dissonance, which is experienced whenever one does something that is inconsistent with stated beliefs or intentions. An experiment in the early 1990s demonstrated how dissonance can be triggered in individuals and gets them to subsequently engage in the more environmentally-friendly behavior of taking shorter showers (Dickerson et al. 1992).[26] It follows from the theory that cognitive dissonance would be triggered when someone needs to explain they took an action that they had not intended. Applied to free ridership, that means cognitive dissonance would be aroused in some participants were they to say, "Yes, I took this action, but no, I didn't intend to and only did so because of the program."

[26] Dickerson, C., R. Thibodeau, E. Aronson, and D. Miller. 1992. "Using Cognitive Dissonance to Encourage Water Conservation." *Journal of Applied Social Psychology* 22: 841-54.

Self-reported free ridership estimation asks participants to *predict retrospectively* what they would have done in the absence of the program. As outlined above, these retrospective assessments are subject to loss aversion, attribution bias, and cognitive dissonance, all of which prompt program participants that value the energy efficiency item they received to overestimate their likelihood of taking the action in the absence of the program.

Further, social scientists have even found people have a limited ability to accurately *predict prospectively* the actions they will be taking. A key area of investigation in psychology is the relationship between attitudes and behavior. In 1969, Wicker[27] reviewed studies conducted during the preceding century on the relationship between attitudes and behaviors and concluded, "It is considerably more likely that attitudes will be unrelated or only slightly related to overt behaviors than [it is likely] that attitudes will be closely related to actions." According to Ajzen and Fishbein (2005),[28] meta-analyses covering diverse behavioral domains have reported mean intention-behavior correlations ranging from 0.44 to 0.62; that is, intentions account for between 18% and 38% of the variance in subsequent behavior. Sheeran (2002)[29] reviewed 422 longitudinal studies and found an overall correlation between intention and behavior of 0.53, or 28% of the variance in subsequent behavior. Ajzen and Fishbein continue, "However, not withstanding these encouraging findings, there is also considerable variability in the magnitude of the observed correlations, and relatively low intention-behavior correlations are sometimes obtained."

Finally, we have found in energy efficiency research that many people cannot accurately report *what they actually did*, as evidenced by the responses of surveyed customers having both Type I (false positive) and Type II (false negative) errors in answers to whether their purchased appliances were efficient and (in separate studies) whether they participated in an energy efficiency program.[30,31]

31.4.3. Estimated Spillover Values by NWE Program

Table 661 provides our estimated spillover ridership values by NWE program, estimated using the self-report method to identify potential instances of spillover and site visits or follow-up

[27] Wicker, A. W. "Attitudes Versus Actions: The Relationship of Verbal and Overt Behavioral Responses to Attitude Objects." 1969. In *Journal of Social Issues*. 25:41-78. Milwaukee, Wisc.: University of Wisconsin.

[28] Ajzen, I., and M. Fishbein. "The Influence of Attitudes on Behavior." 2005. In *The Handbook of Attitudes,* ed. D. Albarracín, B. Johnson, and M. Zanna, 173-221*.* New York, N.Y.: Psychology Press.

[29] Sheeran, P. "Intention-Behavior Relations: A Conceptual and Empirical Review." 2002. In *European Review of Social Psychology*, Vol. 12W, ed. Stroebe and M. Hewstone. New York, N.Y.: John Wiley & Sons, Inc.

[30] Research Into Action, Inc. 2002. *Appliance Sales Tracking: 2001 Residential Survey.* Prepared for Energy Center of Wisconsin.

[31] Research Into Action, Inc. 2009 and 2010. *Oregon Residential Awareness and Perceptions* studies (separate studies). Prepared for Energy Trust of Oregon. Studies available at http://energytrust.org/library/reports/100823_2010_Residential_Awareness.pdf, and http://energytrust.org/library/reports/2009ResidentialAwarenessStudy.pdf. We compared contacts' self-reported participation in Energy Trust's residential programs and their program participation recorded in Energy Trust's tracking databases. In both years, self-reported participation was under-reported significantly – by about 50%. Even more surprising: only 25 to 50% of participants correctly reported their participation status (yes/no). This finding was consistent regardless of how recently they participated in a program, and the types of measures they installed.

phone calls to confirm spillover savings (see section 2). As described in section Estimated Free Ridership Values by NWE Program for free ridership, for some programs we did not attain our desired sample sizes (noted in the table as “sample too small”) and for other programs spillover estimation was not included in the evaluation plan (noted in the table as NA).

Table 661: Estimated Spillover Values by NWE Program

Program	Estimated Spillover
E+ Audit Home or Business	NA
E+ Building Blocks Pilot	NA
E+ Business Partners	Sample too small
E+ Irrigation	Sample too small
DEQ Appliance	NA
E+ Commercial Existing Electric Rebate	0%
E+ Commercial Existing Gas Rebate	1% (dkt)
E+ Commercial Lighting	0.1% (kWh)
E+ Commercial New Electric Rebate	Sample too small
E+ Commercial New Gas Rebate	3.1% (dkt)
E+ Electric Motor/Rewind Rebate	Sample too small
E+ Free Weatherization/Fuel Switch	NA

31.4.4. Challenges in Estimating Spillover

31.4.4.1. Summary of Challenges in Estimating Spillover

Researchers face the challenge of identifying spillover in the absence of reliable market saturation baseline estimates for all of the efficiency measures it promotes.[32] In the absence of saturation baselines, evaluators rely on customer self-reported installations of unincented efficiency measures to narrow the scope of the investigation. Any identified unincented measures comprise spillover only if they can be attributed to the program. Such attribution is subject to the same cognitive factors affecting the reported attribution of incented measures (as discussed for free ridership). Further, evaluators recognize that most market effects are not evident to the participant. Thus, participants are not in a position to assess whether the programs influenced them.

[32] The multiple (potentially numerous) studies needed are individually quite expensive. Any market saturation study establishes a current baseline for estimating spillover going forward. Because spillover effects include both short and long term influences, long-running efficiency portfolios likely are reaping the effects of past program spillover. These past spillover effects cannot be estimated from a current baseline study, unless the study includes areas that both had and lacked the opportunity to participate in efficiency programs.

There are no studies quantifying comprehensive market effects for an energy efficiency portfolio. Indeed, some evaluators express skepticism that such an activity is possible. Nonetheless, a number of researchers believe the energy savings owing to the market effects of well designed and implemented efficiency portfolios are likely quite large – equal to or exceeding free ridership losses.[33]

Spillover and free ridership may be included in the net-to-gross requirements of jurisdictions. Yet, as the discussion in this section suggests and a leader in national energy efficiency evaluation stated, "It is important to understand, though, that calculating net energy and demand savings can be more of an art than a science."[34]

The subsequent sections elaborate on, and provide evidence in support of, these summary statements.

31.4.4.2. The Measurement Issues: Identifying Its Occurrence and Quantifying Its Savings

The estimation of spillover savings is even more difficult than the estimation of free ridership due to a number of factors. The energy efficiency community distinguishes between participant and nonparticipant spillover. Three substantial challenges affect both estimates: difficulty in knowing where unincented efficiency actions have occurred; difficulty in knowing the baseline energy consumption for some measures; and difficulty in knowing whether the action can be attributable to the program (again, the free ridership conundrum). And studies that lack site visits also face the challenge of estimating, or validating estimates of, post-measure consumption.[35] Estimating nonparticipant spillover has the additional challenge of needing accurate information on a random sample (possibly a stratified random sample) sufficiently large as to estimate small effect sizes.[36]

For the current NWE study, we estimated the lower bound of participant spillover savings. We conducted site visits (and, for sites we were unable to visit, follow-up calls) to identify savings from unincented program-qualifying measures among participants that, when surveyed for the process evaluation by phone, (1) reported spillover (unincented qualifying efficiency measures installed); and (2) attributed the action to the program. Our methods do not count participant spillover among participants that, when surveyed, (1) did not report spillover (we did follow-up with a sample of these respondents and did not identify any spillover; however, as referenced above, prior studies have found respondents will mistakenly report their equipment as not

[33] See, for example, The Cadmus Group, Inc. *Assessment of Energy and Capacity Savings Potential in Iowa*. Prepared with Nexant, Inc. and First Tracks Consulting for The Iowa Utility Association. February 28, 2012. Page 67.

[34] *Model Energy Efficiency Program Impact Evaluation Guide,* National Action Plan for Energy Efficiency, November 2007, prepared by S.R. Schiller.

[35] Baseline energy consumption is needed to quantify spillover savings from custom measures and a few prescriptive measures. Yet both custom and prescriptive measures require on-site visits to have confidence the measure is installed and working.

[36] Although researchers believe the average nonparticipant spillover effect is relatively small for a given population (for example, 1%), small average savings applied to the entire nonparticipant population generates a sizeable system-wide savings estimate.

being Energy Star, for example); and (2) report efficiency measures actions but do not, at the time of the site visit or phone follow-up, attribute the measures to the programs (perhaps reflecting loss aversion or attribution bias).[37]

Spillover is closely related to the concept of market effects, with the main distinction being the type of programs generating the savings. Efficiency evaluators coined the term spillover in relation to resource acquisition programs and estimate spillover, if at all, by identifying instances of unincented qualifying units, typically among participants. Evaluators coined the term market effects to describe savings from market transformation programs and as such it includes both unincented qualifying units as well as broader changes in the "structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy efficiency products, services, or practices and is causally related to market interventions."[38]

As described by the 2004 *California Evaluation Framework*, "Market transformation efforts and the market impacts of the statewide IOU [investor owned utility] programs highlight the need for developing new methods for estimating spillover effects into the non-participant population."[39]

According to Eto, Prahl, and Schlegel in their seminal market transformation *Scoping Study:*[40]

> *We consider the following hypotheses of market effects to be the strongest (meaning that the market effects are well-founded in theory, the observed changes in the market are consistent with the market changes that were expected to be caused by the programs, and the market effects are believed to be true by many in the industry, including us and the interviewees):*
>
> - Changes in products and product attributes (including improvements in product quality),
> - Changes in production levels and schedules,
> - Changes in promotional practices among dealers and manufacturers,
> - Changes in stocking practices among dealers and distributors,
> - Increases in product and service availability,
> - Reductions in the incremental costs of energy efficiency products and services,
> - Changes in design and specification practices,

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[37] In order to eliminate the downward estimation bias that results from Type II errors, the researcher needs to visit every site in the sample, such as is done for on-site appliance and equipment saturation surveys. The downward estimation bias that results from loss aversion and other factors affecting customers' attribution responses cannot be corrected for.

[38] Eto, J, R. Prahl, and J. Schlegel. *A Scoping Study on Energy Efficiency Market Transformation by California Utility DSM Programs*. Prepared for The California Demand-Side Measurement Advisory Committee, Project 2091T, July 1996. Page xii.

[39] *The California Evaluation Framework.* Prepared for the California Public Utilities Commission and the Project Advisory Group by TecMarket Works and a ten additional evaluation firms. February 2004. Page 87.

[40] Eto, Prahl, and Schlegel, page 48.

- Changes in awareness and knowledge of energy efficiency among customers, manufacturers, and other businesses in the distribution chain, and
- Changes in decision-making practices among organizations (especially those with multiple sites).

31.4.4.3. Spillover and the Confounding of Free Ridership Estimators

Eto and his colleagues continue, "Some [of these] effects seem to be closely linked to financial incentives, while others appear to be due to other program activities or services."[41] Yet even the effects that seem closely linked to financial incentives – such as increases in product availability – are, with the exception of reductions in measure costs, largely invisible to the participants, who are subsequently asked by evaluators posing free ridership questions whether they installed the measure due to the program. And reductions in measure costs are only clearly evident to participants when they receive a rebate. Participants may not be aware of other types of measure cost reductions, such as from buy-down programs, or from enhancements in suppliers' processes, knowledge, and skills that reduce their fixed costs. [42]

Haeri and Khawaja (2012) address this confounding of free ridership phenomena with spillover/market effects as markets are being transformed with the rhetorical question:

> *Could it be that, in the case of such [transforming] markets, what's being measure in freeridership surveys is in fact the opposite: spillover? …[With free ridership surveys,] what's being measured, it appears, are the effects of the program – not what would be expected in its absence. In areas with long histories of conservation programs and activities, it's no longer possible to parse out who is a freerider from who was influenced by the program.*[43]

Energy efficiency needs to be the compelling action, the action that makes the most sense to most people, from manufacturers to energy users and the professionals that support them. One marker of the success of an energy efficiency program portfolio is the extent it contributes to this market transformation outcome. Yet paradoxically, the more an efficiency portfolio increases the number of people who are always deliberating whether the energy-efficient alternative is the right choice in any given situation, the larger the proportion of people who will report that a given program did not influence their decisions.

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[41] Eto, Prahl, and Schlegel, page 48.

[42] Buy-down programs, such as for CFLs, are among the programs that reduce measure costs. However, the role of the utility in providing the price reduction frequently is not evident to customers. Although survey research, including that which we conducted for NWE, estimates free ridership among customers reporting they purchased discounted bulbs, these reports of purchases (or lack of purchases) of discounted bulbs, are subject to Type I and Type II errors, as true for all self-reports and as true for research cited elsewhere in this section,.

[43] Haeri, H. and M.S. Khawaja. The Trouble with Freeriders. *Public Utilities Fortnightly*, March 2012, page 39.

Echoing the sentiments of other evaluators, Haeri and Khawaja believe,

> *Disentangling what might have occurred in the absence of a program from the program's spillover effects is practically impossible in most cases. The longer a program operates, the more biased the estimates of freeridership are likely to be.* [44]

31.4.4.4. Relative Magnitudes of Spillover and Free Ridership Effects

Doubtless no established energy efficiency evaluation professional denies the existence of free riders; the issue for net-to-gross estimation is the relative magnitudes of free rider and spillover savings. An understanding of market effects suggests that free ridership estimates include a "true" free ridership component as well as a market effects component (not to mention a component reflecting cognitive processes associated with loss aversion and all attributions, as discussed above). Nonparticipant spillover savings owing to the entire portfolio is rarely if ever quantified and such quantification as is done is subject to the challenges described here.

Eto, Prahl, and Schlegel report that they were unable to identify any studies quantifying the savings from these market effects, other than estimates of spillover, about which they conclude, "the *existence* of spillover appears to be irrefutable."[45] They recognize that the persistence of market effects varies by effect (and, no doubt, program design), with some effects not lasting long after utility programs are discontinued and other effects likely to persist. They conclude that even if "a minority of the *number* of effects summarized in this report [persist], they would result in a large *amount* of savings and benefits for customers and society.[46]

Eto and his colleagues are writing about market transformation programs, but these effects also accompany well designed and implemented resource acquisition programs. Persistence of market effects is critically important to the assessment of whether a market has been transformed. Yet prior to the attainment of market transformation, both short- and long-term market effects among participants will likely inflate free ridership estimates, and similar effects among nonparticipants result in uncounted benefits accruing to the portfolio.[47]

Spillover savings thus include savings from both current and past program activities that are invisible to customers (such as increased availability of qualifying units, or conviction of the salesperson that the qualifying unit provides the best value). Evaluators are challenged to quantify these savings. Free ridership estimates reflect, but can't distinguish between, "true" free ridership savings, "true" spillover savings for which the customer is unaware of the program influence, and savings customers attribute to their own initiative rather than the utility

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[44] Haeri and Khawaja, page 39. They cite Rafael Friedman's "Maximizing Societal Uptake of Energy Efficiency in the New Millennium: Time for Net-to-Gross to Get Out of the Way?" Proceedings, *International Energy Efficiency Program Evaluation Conference,* Chicago, August 2007.

[45] Eto, Prahl, and Schlegel, page 48.

[46] Eto, Prahl, and Schlegel, page 49.

[47] Note that a market may not be transformed, yet it may be in the process of transforming, which can be years or decades, depending both on the technology and on the efforts to promote its adoption.

program owing to such internal processes as loss aversion and attribution error.[48] In the calculation of NTG, spillover savings are added (a positive value) and free ridership savings are subtracted (a negative value). Yet spillover appears in both the positive and negative terms, plus response biases internal to the individual puts their thumb on the scale, so to speak, and further tips the balance to the negative. Yet a number of evaluators believe that the total savings owing to spillover are equal to, and perhaps in excess of, free ridership savings.

31.4.5. Estimated Leakage by NWE Program

We did not find any leakage of measures out of NWE's Montana territory for any program.

31.4.6. Net-to-Gross Practices Nationally

31.4.6.1. Summary of Net-to-Gross Practices Nationally

Methods for estimating net impacts and the associated net-to-gross (NTG) ratio vary widely across jurisdictions and, when considered at the level on an evaluation of a single program, vary widely within some jurisdictions. Indicative of the degree of nonstandardization, in some jurisdiction it is difficult for researchers to identify documents that clearly state the NTG practices, nor does the seminal document on cost-effectiveness calculations – *California Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs* – clearly describe how to apply the NTG should be applied to the cost side of the Total Resource Cost cost-effectiveness test. Differences in NTG practices include what elements are included in NTG, how they are included, how they are estimated, and how the NTG ratio is used.

A 2012 review of the NTG practices of 31 jurisdictions found that 42% had no NTG requirement, equivalent to an NTG value of 1.0 and a free ridership estimate that is fully offset by program spillover. A number of regulatory commissions are considering revising, or have recently revised, their NTG requirements. In tandem with the issue of NTG value to be used, commissions are increasingly embracing the use of prospective NTG values – known to all parties at the outset of the program cycle, rather than retrospective NTG values – determined through evaluation sometime after the program cycle. Commissions making these decisions recognize that retrospectives NTG values put the program administrator at risk and are concerned that the administrators might respond by charting a conservative course for efficiency savings acquisition.

[48] Self-reported free ridership values have these three components of "true" free ridership, "true" spillover, and bias due to the self-reporting. Billing analyses and other quasi-experimental/statistical estimates of free ridership are not subject to the self-reporting biases, but nonetheless include a "true" spillover component. These approaches attribute savings evidenced over time by the control group to "naturally occurring conservation" because they lack the ability to distinguish savings from program market effects.

31.4.6.2. Current NTG Practices

Several researchers have conducted reviews of current state and program-administrator practices relating to NTG practices.

Recent research conducted by the Northeast Energy Efficiency Partnerships' (NEEP) Evaluation, Measurement and Verification (EM&V) Forum focused on current practices to estimating gross and net savings. The studies address primarily, but not exclusively, the northeast – a region with one of the longest histories of energy conservation. The first of two studies concludes that "the definition and measurement of net energy savings remains a controversial issue."[49] Included among the differences are the decisions whether to include free ridership and, if included, accepted methods of estimating free ridership. The study also notes that the *use* of net energy savings estimates also varies widely, a theme on which the second study elaborates.[50] The second study reported substantial differences among and between state energy efficiency policies and regional transmission policies with respect to how gross and net savings are used in measuring progress toward policy goals.

Haeri and Khawaja summarize current free ridership practices of 30 states and the District of Columbia.[51] Twenty five of these jurisdictions have energy efficiency resource standards in place, setting minimum performance targets; all have active energy efficiency programs. They found that practices vary widely, with 13 of the jurisdictions (42%) having no NTG requirement, thus implicitly assuming an NTG value of 1.0 and a free ridership estimate that is fully offset by program spillover.

An LBNL review of EM&V approaches in use found a lower proportion of jurisdictions did not estimate NTG components (about 30% did not routinely estimate free ridership, and about 64% did not estimate spillover) in their 2010 report based on interviews with over 50 knowledgeable informants working in the 14 states that accounted for about 80-85% of then-current spending on ratepayer-funded energy efficiency. [52] However, the LBNL study is focused on methods for the evaluation, measurement and verification of program savings, not the role NTG estimates play in the stated portfolio accomplishments regulators use to determine compliance, lost revenue recovery, and so on. Haeri and Khawaja found that the majority of jurisdictions requiring NTG use it for planning and program design, not to assess past performance.[53]

[49] NMR Group, Inc. 2010. *Net Savings Scoping Paper*. Prepared with Research Into Action, Inc. for the Northeast Energy Efficiency Partnerships: Evaluation, Measurement, and Verification Forum. November 13, 2010. Page XV.

[50] NMR Group, Inc. 2012. *Draft Exploratory Policy Research and Recommendations*. Prepared with Research Into Action, Inc. for the Northeast Energy Efficiency Partnerships: Evaluation, Measurement, and Verification Forum. September 19, 2012; draft (final anticipated in 2012).

[51] Haeri and Khawaja, pages 39-41.

[52] *Review of Evaluation, Measurement and Verification Approaches Used to Estimate the Load Impacts and Effectiveness of Energy Efficiency Programs.* Prepared by the Ernest Orlando Lawrence Berkeley National Laboratory (authors: M. Messenger, R. Bharvirkar, B. Golemboski, C.A. Goldman, and S.R.Schiller) for the U.S. Department of Energy, Environmental Energy Technologies Division. April 2010. The study also drew on findings from interviews with over 30 national evaluation experts.

[53] Haeri and Khawaja, page 39.

Further, the regulatory arena is changing rapidly, and the LBNL study contacts were describing largely pre-2010 practices. For example, the California PUC is currently considering, and some observers think appears to be leaning toward, a decision that would remove NTG from the determination of shareholder incentives.[54] In 2012, the Massachusetts DPU revised its NTG procedures, moving from a retrospective estimate of NTG to a prospective one.[55] The DPU accepted the argument that judging portfolio cycle performance by using an NTG ratio estimated after the cycle has ended creates uncertainty and puts program administrators at risk insofar as they invest in a program with an assumed NTG level that can later be revised downward. The 2012 DPU order also recognized that many current energy efficiency programs are multi-faceted, multi-year programs intended to change the equipment and building markets and noted that these programs may result in spillover and market effects that may not be captured by current evaluation approaches, which focus on participants in specific programs in specific years. As a result, it convened a working group "to explore if and how a market-based approach could be developed and implemented in a way that produces net savings results that improve upon the status quo."[56]

The LBNL study identified the same issues with respect to net savings as identified by the NEEP EM&V Forum studies and by Haeri and Khawaja:[57]

> *EM&V methods are well documented and relatively standardized for determining gross (direct) energy savings for energy efficiency programs or projects. In contrast, there is much less agreement on the value and methods that should be used to estimate net savings. Key areas where differences exist on issues relating to net savings include: (1) how, if at all, to address program attribution; (2) how to define and set standards for rigor and accuracy for net savings given different policy objectives, and (3) how to assess broader "net" market effects of energy efficiency programs on future spillover savings in the market and the demand for energy services.*

Further underscoring the variety of approaches among the jurisdictions, both the authors of the NEEP studies and Haeri and Khawaja expressed surprise at the difficulties they had in simply finding, for several jurisdictions, the relevant regulatory documents and piecing together the NTG calculating and reporting requirements. Perhaps such difficulty contributed to the methodological approach taken by the LBNL study, which relied solely on interviews and did not augment these with document reviews.

Critics that argue against energy efficiency programs by referring to high free ridership rates as supporting evidence often conclude that incentives are too high. Yet this conclusion conveys a misunderstanding of the free ridership concept: true free riders would install the measure with

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[54] Pierre Landry, personal communication, November 18, 2012.

[55] Retrospective net savings estimates are obtained by estimating free ridership and other NTG factors after the program period has ended. The NTG ratio NWE uses in program planning is a prospective estimate. Any revisions to the NTG that would be used in reporting on net program impacts would be a retrospective estimate.

[56] Massachusetts Department of Public Utilities, DPU 11-120-A, "Order on Program Net Savings and Environmental Compliance Costs," August 10, 2012. http://www.env.state.ma.us/dpu/docs/electric/11-120/81012dpuord.pdf.

[57] Messenger, et. al., page xi.

no incentives. When a program reduces an incentive offering, we predict that the number of free riders will remain the same (because they are not motivated by the incentive), while the number of target participants persuaded to take the action is likely to decrease, which would result in a higher free ridership ratio.

31.4.6.3. Emerging NTG Practices

While it would be inaccurate – certainly premature – to characterize the current discussion of NTG among the energy efficiency community as heading toward a consensus, there is a very active NTG discussion underway and regulatory practices are changing.

As discussed previously, researchers of current practices have found inconsistency simply in the terminology used to describe program savings (and even in the accessibility of documentation defining these terms). Adopting a uniform set of terms, however, is not as straight-forward as it might seem, as the terms used cannot be separated from the savings adjustment methodology used. After all, the savings tracked by the program administrator are modified by various *terms* of adjustment (such as realization rate and NTG) to produce evaluated savings. Perhaps this situation explains why one-third of the experts interviewed for the LBNL study were *not* in favor of having a national glossary of program savings terms, in spite of the obvious advantage that common terminology facilitates information sharing.[58] The NEEP study also seeks to contribute to the establishment of common terminology throughout the region, yet the group undertaking the research is advisory only, and the researchers noted resistance to change among most informants. Haeri and Khawaja describe the situation:

> *Despite years of research, …[NTG's] very definition isn't firmly settled. …There's also the question of what to do with the NTG ratio once it's measured and how to factor it into performance metrics, such as cost-effectiveness tests. …Even today there's little consensus on how to account for NTG in the calculation of TRC [the Total Resource Cost test].*[59]

Significantly more complex than the issues of terminology and the methods they imply are the engineering- and social-science-based methods used to estimate values of the various adjustment terms (such as realization rate and NTG). In this section, we have discussed challenges confounding the social-science methods for estimating free ridership and spillover values. Although the groups that commissioned the NEEP and LBNL studies[60] are exploring the feasibility of standardizing efficiency program evaluation methods, it appears this goal will not be realized any time soon. Indeed, less than half of the LBNL informants supported the development of a national EM&V protocol.[61]

[58] Messenger, et. al., page x.

[59] Haeri and Khawaja, pages 36, 40, and 41.

[60] The NEEP EM&V Form commissioned the NEEP study conducted by the NMR team. The LBNL study conducted by Messenger and his colleagues was commissioned by SEE Action (short for State & Local Energy Efficiency Action Network, an initiative formerly known as the National Action Plan for Energy Efficiency). SEE Action is a state- and local-led effort facilitated by the U.S. Department of Energy and the U.S. Environmental Protection Agency to take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.

[61] Messenger, et. al., page x.

As Haeri and Khawaja predict, "Freeridership likely will continue playing a prominent part in the regulatory and policy discourse about ratepayer-funded conservation."[62] And as the discourse continues, some regulators are staying the course – whatever course they have been on – while others are revising their positions.

For example, the Iowa Utilities Board recently adopted an NTG of 1.0, influenced in part by the work of The Cadmus Group, Inc., which is Iowa's independent evaluation firm. In a savings potential study Cadmus conducted for the Iowa Utility Association, it recommended that "gross savings be used as the basis for reporting and target compliance."[63] Cadmus based the recommendations on many of the conclusions we have presented in this section, namely: methods for measuring NTG elements, particularly spillover, are imprecise; NTG estimates would have a small impact on the societal benefit test; many states have assumed a NTG ratio of 1.0; and assuming a NTG ratio of 1.0 may be conservative in certain cases, given spillover.

Minnesota's Department of Commerce set the NTG value at 1.0 for the portfolio, having concluded that free ridership is offset by spillover and market effects. Similarly, the Arizona Public Service Commission has adopted an NTG of 1.0. The New York Department of Public Service instructs utilities and evaluation contractors to use 0.9 as the NTG factor. The Michigan Public Service Commission approved an NTG value of 0.9 for plan years 2011-2012 for most of its energy optimization programs, with an NTG value of 1.0 for the pilot, low income, and educational programs. The Michigan PSC is currently deliberating, and appears to observers to be favorably disposed toward, a decision to apply those values for program years 2013-2015.[64] The jurisdictions in the Northeast all use a prospective NTG (that is, an NTG value known at the outset of the program cycle). Some Northeast jurisdictions use an implied or explicit NTG of 1.0, others use a stipulated value less than that, and still others require the use of program-specific NTGs determined from evaluations of the prior program cycle. In the Northwest, the Bonneville Power Administration and its customer utilities use an implied NTG value of 1.0.

Stipulated (or deemed) NTG values are prospective NTG values, applied to verified savings; for example, a portfolio with a set NTG of 0.9 and a savings goal of, for example, 1,000,000 kWh would be judged as meeting its goal if its verified savings are in excess of 1,111,111 kWh. When programs operate under an NTG value less than 1.0, all program costs – including incentives, outreach, and training – must therefore be scaled to total less than the remaining proportion (e.g., 90%) of installed program savings in order to assure cost effectiveness. Thus, an assumed NTG value less than 1.0 exerts a downward influence on the level of incentives that can be offered and, perhaps more importantly, the amount of promotion or infrastructure development (e.g., website design) that can be undertaken.

[62] Haeri and Khawaja, page 35.

[63] The Cadmus Group, Inc. *Assessment of Energy and Capacity Savings Potential in Iowa*. Prepared with Nexant, Inc. and First Tracks Consulting for The Iowa Utility Association. February 28, 2012. Page 67.

[64] Nick P. Hall, personal communication, November 20, 2012.

31.5. Net-to-Gross Recommendations

We recommend that NWE (1) use a NTG value of 1.0 to estimate program net benefits and cost-effectiveness; (2) monitor product markets and conduct market saturation surveys to determine when market transformation has occurred and exit the market when it has; (3) continue its efforts to keep abreast of state-of-the-art program designs; and (4) conduct short surveys of participants immediately after participation to provide real-time feedback useful for program refinement and evolution, as does Energy Trust.

Frequent short surveys such as Energy Trust deploys provide real-time feedback on any problems that may be occurring and measure-specific free ridership estimates. Although we recommend against using estimated free ridership in the determination of program net benefits and cost-effectiveness, we noted that the self-reported free ridership estimate is rather reliable. When self-reported free ridership is estimated at the measure level from data generated monthly or quarterly, one can compare free ridership estimates across measures, programs, time, and other program administrators. High or steadily increasing measure and program free ridership rates (even with their estimation faults as enumerated here) can be a signal to take an action such as the following: (1) conduct product stocking studies to estimate the current market share of efficient units; (2) assess whether some submarkets are underserved and, if so, make the program more available to those submarkets through enhance outreach or modified program design; (3) experiment with not offering incentives for the measure, initiating and concluding the experiment with a product stocking study; (4) discontinue incentives for which the incentive is *low* relative to the cost of the measure, or increase the incentive; (5) investigate market transactions to assess whether program requirements can be made more stringent; and (6) changing the measure mix offered by a program.

As Haeri and Khawaja conclude:

> *Certainly, program administrators should avoid programs where freeridership is known to be high and discontinue offering programs when high freeridership is suspected. But insisting on measuring freeridership with tools of questionable [validity] isn't the answer…Well-conceived and effectively executive programs will likely generate enough spillover savings to offset freeridership. What few freeriders remain can be regarded, as one evaluation expert puts it, simply "a cost of doing business."*[65]

31.6. Nonparticipant Findings

We conducted phone surveys with NWE residential and commercial customers with no record of participating in E+ efficiency programs. Results for small, large, and irrigation commercial customers are presented separately.

[65] Haeri and Khawaja, page 41.

Interpreting Response Frequencies

For questions pertaining only to a small subset of respondents, we encourage the reader to recognize that for these small samples, a change in a single respondent's view might change the reported frequencies dramatically (by ±20% for a sample of five respondents, for example). Thus, we caution the reader to interpret these responses as suggestive, but not definitive for the population of all NWE customers.

Finally, many survey questions allowed the respondent to give more than one response; in these cases percentages will not add to 100%. These multiple response questions are indicated by the text "Allowed Multiple" in table headers.

31.6.1. Residential Nonparticipants

We conducted 67 phone surveys with residential nonparticipants to assess their current energy efficiency actions and their familiarity with and opinions on NWE's energy efficiency programs.

Residential nonparticipants provided general feedback on their familiarity with and use of NWE's website, their awareness of NWE's energy efficiency programs, and how they heard about those programs.

Few respondents (21%) had visited the utility website. Overall, this proportion is lower than for participant samples. Most nonparticipants cited lack of internet access or not liking to use the internet much; one-fifth indicated they had no need or reason to visit the utility website (Table 662).

Table 662: Reasons Website Not Used, among Residential Nonparticipants

	Percent (n=67)
Don't have access	37%
Don't like to use it much	31%
No need or no reason	20%
Other	4%
Have access but connection is slow	2%
Just haven't	2%
Too busy	2%
Didn't know website existed	2%

Nonparticipants who used the website reported two primary motivations: half looked for utility contact information and half paid their utility bill (Table 663).

Table 663: Website Use, among Residential Nonparticipants

(Allowed Multiple)	Percent
Utility contact information (n=14)	50%
Pay utility bill (n=14)	50%
Learn about rebates or audits (n=14)	36%
Money saving tips (n=14)	14%
Other use of website (n=14)	7%
How-to videos (n=14)	0%
Energy saving educational opportunities (n=14)	0%

Most (65%) of the 14 nonparticipants who used the website thought information on NWE's website was easy to find and helpful (Figure 218).

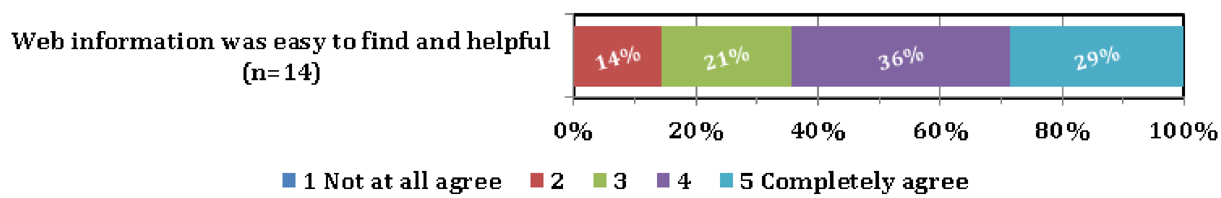


Figure 218: Website Effectiveness, among Residential Nonparticipants

We asked nonparticipants if they were aware of three NWE efficiency program areas. Almost two-thirds (64%) were aware of NWE rebates for efficient measures or equipment. About half (51%) were aware of NWE energy audits or the web energy use calculator. A minority (39%) were aware of incentives for renewable energy projects (Table 664).

Table 664: Awareness of Utility Programs, among Residential Nonparticipants

(Allowed Multiple)	Percent
Rebates for efficient measures or equipment (n=64)	64%
Home energy audits or web energy use calculator (n=65)	51%
Incentives for renewable energy projects (n=67)	39%

Just under half (46%) of those aware of NWE efficiency programs had considered participation. Among those, few (17%) reported having initial questions or concerns about participating.

Among nonparticipants aware of NWE efficiency activities, the majority (83%) learned about them through utility publications or advertisements. Minorities of respondents also reported hearing about efficiency programs via word of mouth (28%), or by other means (Table 665).

Table 665: Means of Awareness, among Residential Nonparticipants

(Allowed Multiple)	Percent
Utility publication or advertisement (n=52)	83%
Word of mouth (n=50)	28%
Directly contacted utility (n=51)	18%
Utility representative appearance (n=52)	15%
Building professional, vendor, or contractor (n=52)	15%
Newspaper (n=52)	10%
Other (n=51)	8%
Television (n=52)	8%
Internet (n=52)	2%
Radio (n=52)	0%

To gauge general market awareness, we asked nonparticipants if they had heard of the Energy Star logo, as well as several high efficiency measures. The majority (70%) of respondents were aware of the logo, and almost all (97%) had heard of compact fluorescent light bulbs (CFLs). Majorities also knew about benefits of adding insulation (65%) and/or high efficiency HVAC options (Table 666).

Table 666: Awareness of Efficiency Measures, among Residential Nonparticipants

(Allowed Multiple)	Percent
High-efficiency equipment and insulation (n=66)	41%
Programmable thermostats (n=67)	31%
High efficiency refrigerators (n=66)	30%
Consumer electronics (n=67)	9%
New home rebates (n=66)	8%

Nearly half (45%) of respondents reported they were “likely” or “very likely” to participate in a NWE energy efficiency program in the future (Figure 219).

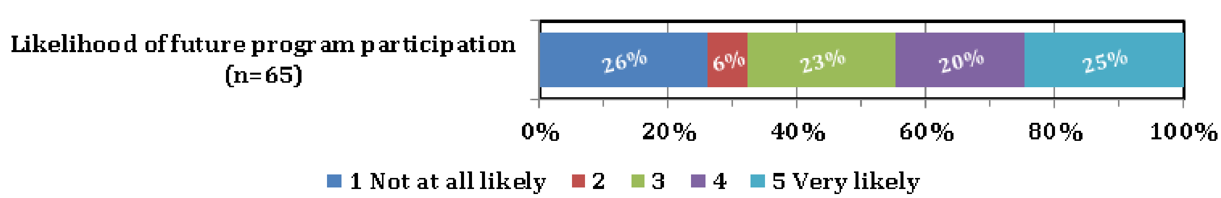


Figure 219: Likelihood of Future Participation, among Residential Nonparticipants

Nineteen respondents explained why they were unlikely to participate in the future. The most frequent response, given by just over a third of respondents (37%), was that they were "not interested." Notably, one-fifth (21%) reported that their house is new and efficient already (Table 667).

Table 667: Reasons Why Unlikely To Participate, among Residential Nonparticipants

	Percent (n=19)
Not interested	37%
House is new/efficient	21%
Too old or retired	11%
Rent home/building	11%
Other	11%
Building is too old	5%
Don't use much energy	5%

31.6.2. Small Commercial NonParticipants

We conducted 67 phone surveys with a random sample of small commercial organizations initially identified by their NWE rate schedule and who had no record of participating in an E+ energy efficiency program. We surveyed them to assess their current energy efficiency actions and their familiarity with and opinions on NWE's energy efficiency programs.

Small commercial nonparticipants provided general feedback on their familiarity with and use of NWE's website, as well as their awareness of NWE's energy efficiency programs, and how they heard about those programs.

Very few respondents (13%) had visited the utility website. Overall, this proportion is lower than for our participant samples. Over half of these commercial nonparticipants cited not liking to use the Internet much; one-fifth indicated they had no need or reason to visit the utility website (Table 668).

Table 668: Reasons Website Not Used, among Small Commercial Nonparticipants

	Percent (n=55)
Don't like to use it much	56%
No need or no reason	20%
Don't have access	11%
Just haven't	4%
Too busy	4%
Never thought to	2%

Over three-quarters (78%) of these nonparticipants who used the website did so to pay their utility bill (Table 669).

Table 669: Website Use, among Small Commercial Nonparticipants

(Allowed Multiple)	Percent
Pay utility bill (n=9)	78%
Learn about rebates or audits (n=9)	33%
Utility contact information (n=9)	33%
How-to videos (n=9)	22%
Money saving tips (n=9)	11%

Many (44%) of the 14 nonparticipants who used the website thought information on NWE's website was easy to find and helpful; however, the majority gave it a middle rating of "3" on the five-point scale (Figure 220).

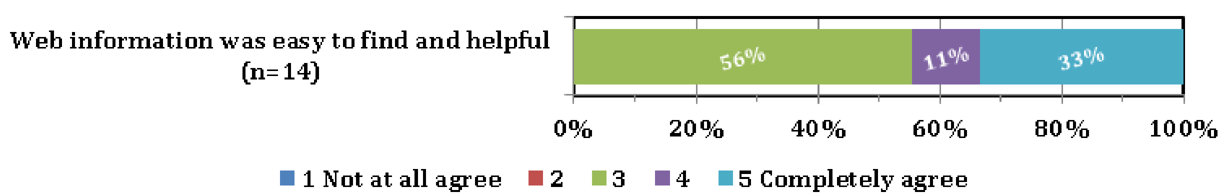


Figure 220: Website Effectiveness, among Small Commercial Nonparticipants

We asked nonparticipants if they were aware of three NWE efficiency program areas. Two-thirds (66%) of respondents were aware of NWE rebates for efficiency measures or equipment. Less than half were aware of incentives for renewable energy projects (44%) or small business energy audits (39%; Table 670).

Table 670: Awareness of Utility Programs, among Small Commercial Nonparticipants

(Allowed Multiple)	Percent
Rebates for efficiency measures (n=65)	66%
Incentives for renewable energy projects (n=66)	44%
Small business energy audits (n=57)	39%

Over one-third (38%) of those aware of NWE efficiency programs had considered participating. Among those, a few (22%) reported having initial questions or concerns about participation.

Among our sample of nonparticipants who were aware of NWE efficiency activities, the majority (86%) learned about them through utility publications or advertisements. Smaller percentages of respondents also reported hearing about efficiency programs via word of mouth (34%) or by other means (Table 671).

Table 671: Means of Program Awareness, among Small Commercial Nonparticipants

(Allowed Multiple)	Percent
Utility publication or advertisement (n=50)	86%
Word of mouth (n=50)	34%
Building professional, vendor, or contractor (n=49)	20%
Directly contacted utility (n=49)	16%
Television (n=50)	10%
Utility representative appearance (n=49)	4%
Newspaper (n=50)	2%
Internet (n=50)	2%

To gauge general market awareness, we asked these small commercial nonparticipants if they had heard of the Energy Star logo, as well as several high efficiency measures. Majorities were aware of the logo (77%), knew about the benefits of adding insulation (75%), or had heard of high-efficiency boilers, chillers, or HVAC systems (53%; Table 672).

Table 672: Awareness of Efficient Measures, among Small Commercial Nonparticipants

(Allowed Multiple)	Percent
Benefits of adding insulation to facility (n=67)	75%
Small wind turbines (n=67)	67%
High efficiency boiler, chiller, or HVAC (n=66)	53%
Heating and cooling building automation controls (n=65)	32%
Photovoltaic systems (n=65)	28%
Variable frequency drives (n=65)	12%

We asked non-participating commercial respondents about their use and purchases of electric motors. Half of the respondents reported using *no* electric motors, while about one-third (35%) used between one and five motors. Few of these respondents used motors over 15 horsepower (Figure 221).

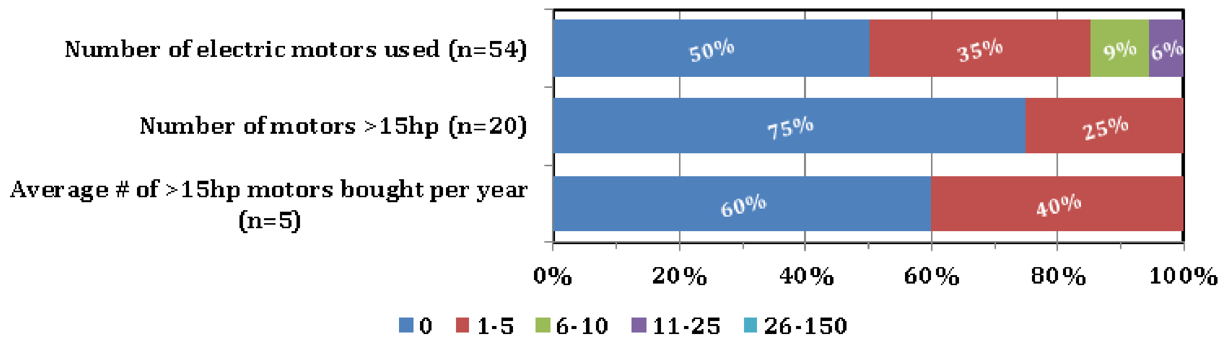


Figure 221: Motor Use and Purchases, among Small Commercial Nonparticipants

Two of the five respondents who used any of the larger motors were aware of motor rewinding for efficiency, or of motor rewind shops. Two respondents who attempted to purchase a NEMA Premium motor thought it "took a long time to get."

Half (51%) of these nonparticipants reported they were "likely" or "very likely" to participate in a NWE energy efficiency program in the future (Figure 222).

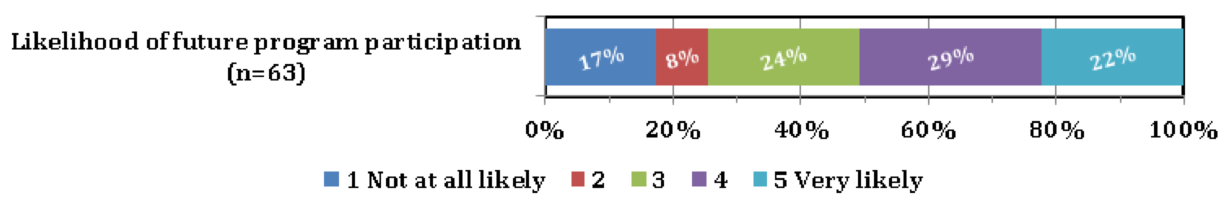


Figure 222: Likelihood of Future Participation, among Small Commercial Nonparticipants

Fifteen respondents explained why they were unlikely to participate in the future. The most frequent reason, given by just over a quarter of respondents (27%), was lack of interest (Table 673).

Table 673: Reasons Why Unlikely To Participate, among Small Commercial Nonparticipants

	Percent (n=15)
Not interested	27%
Too old or retired	13%
Too busy	13%
NWE not main power provider	13%
Building is too old	7%
Don't use much energy	7%
Unspecified or unclear	20%

31.6.3. Large Commercial Nonparticipants

We conducted 67 phone surveys with a random sample of large commercial organizations identified by their rate schedule and having no history of E+ program participation. We surveyed nonparticipants to assess their current energy efficiency actions and their familiarity with and opinions on NWE's energy efficiency programs.

Large commercial nonparticipants provided general feedback on their familiarity with and use of NWE's website, as well as their awareness of NWE's energy efficiency programs, and how they heard about those programs.

Few respondents (22%) had visited the utility website. Overall, this proportion is lower than for participant samples. About one-half (49%) of these non-visitors indicated they had no need or reason to visit the utility website; one-quarter cited not liking to use the Internet much (Table 674).

Table 674: Reasons Website Not Used, among Large Commercial Nonparticipants

(Allowed Multiple)	Percent (n=53)
No need or no reason	49%
Don't like to use it much	25%
Don't have access	8%
Just haven't	8%
Too busy	6%
Didn't know website existed	2%
Other	4%

Nonparticipants who did use the website reported two primary reasons: over three-quarters (79%) needed NWE contact information, and two-thirds (64%) paid their utility bill online (Table 675).

Table 675: Website Use, among Large Commercial Nonparticipants

(Allowed Multiple)	Percent
Utility contact information (n=14)	79%
Pay utility bill (n=14)	64%
Money saving tips (n=14)	36%
Learn about rebates or audits (n=14)	29%
Energy saving educational opportunities (n=14)	14%
Other use of website (n=14)	7%

Nearly all (92%) of the 14 nonparticipants who used the website thought information on NWE's website was easy to find and helpful (Figure 223).

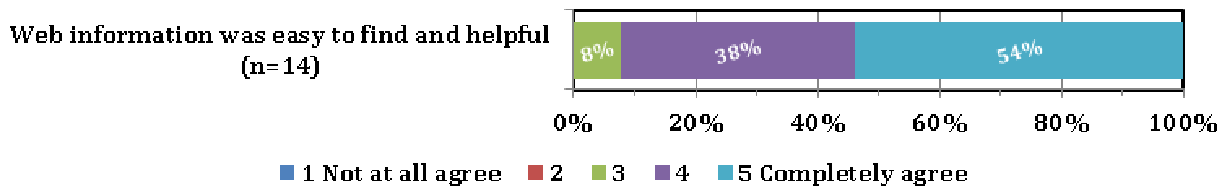


Figure 223: Website Effectiveness, among Large Commercial Nonparticipants

We asked commercial nonparticipants if they were aware of three NWE efficiency program areas. Three-quarters (74%) of respondents were aware of NWE rebates for efficiency measures or equipment. Less than half were aware of incentives for renewable energy projects (45%) or small business energy audits (38%; Table 676).

Table 676: Awareness of Utility Programs, among Large Commercial Nonparticipants

(Allowed Multiple)	Percent
Rebates for efficiency measures (n=66)	74%
Incentives for renewable energy projects (n=66)	45%
Small business energy audits (n=53)	38%

Almost half (48%) of those aware of NWE efficiency programs had considered participating. Among those, few (12%) reported having initial questions or concerns about participation.

Among nonparticipants aware of NWE efficiency activities, the majority (82%) learned about them through utility publications or advertisements. Smaller percentages of respondents also reported hearing about efficiency programs via word of mouth (25%), or through building professionals, vendors, or contractors (23%; Table 677).

Table 677: Means of Program Awareness, among Large Commercial Nonparticipants

(Allowed Multiple)	Percent
Utility publication or advertisement (n=55)	82%
Word of mouth (n=56)	25%
Building professional, vendor, or contractor (n=56)	23%
Directly contacted utility (n=55)	13%
Television (n=56)	11%
Utility representative appearance (n=56)	9%
Radio (n=56)	9%
Newspaper (n=56)	7%

(Allowed Multiple)	Percent
Internet (n=56)	2%
Other (n=55)	4%

To gauge general market awareness, we asked nonparticipants if they had heard of the Energy Star logo, as well as several high efficiency measures for commercial buildings. Majorities of respondents were aware of the logo (83%) or knew about the benefits of adding insulation (72%). More than half had heard of high-efficiency boilers, chillers, or HVAC systems (53%) or heard of small wind turbines (52%; Table 678).

Table 678: Awareness of Efficiency Measures, among Large Commercial Nonparticipants

(Allowed Multiple)	Percent
Benefits of adding insulation to facility (n=65)	72%
High efficiency boiler, chiller, or HVAC (n=66)	53%
Small wind turbines (n=67)	52%
Heating and cooling building automation controls (n=66)	41%
Photovoltaic systems (n=67)	28%
Variable frequency drives (n=64)	14%

We asked non-participating commercial respondents about their use and purchases of electric motors. While most of the respondents reported using *no* electric motors, a notable fraction (43%) of these organizations reported using motors. At the time of our survey, one-quarter (24%) of these motor users operated between six and 150 motors (Figure 224).

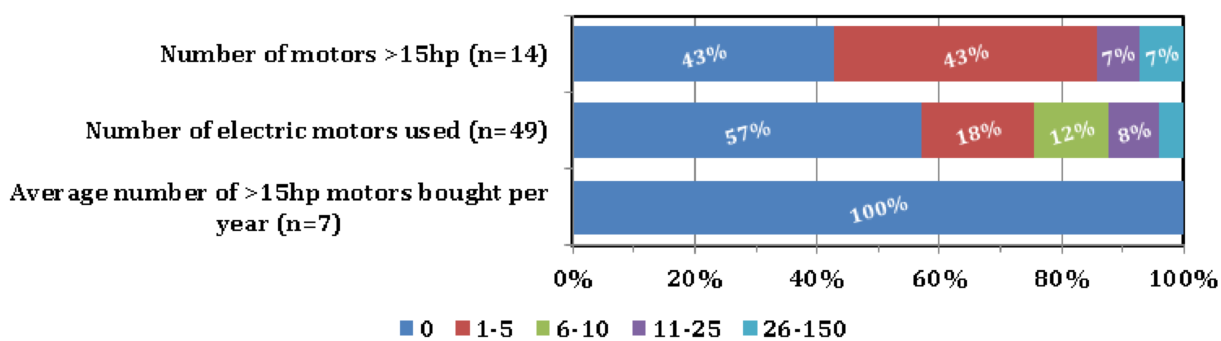


Figure 224: Motor Use and Purchases, among Large Commercial Nonparticipants

Under half (43%) of these commercial nonparticipants reported they were “likely” or “very likely” to participate in a NWE energy efficiency program in the future (Figure 225).

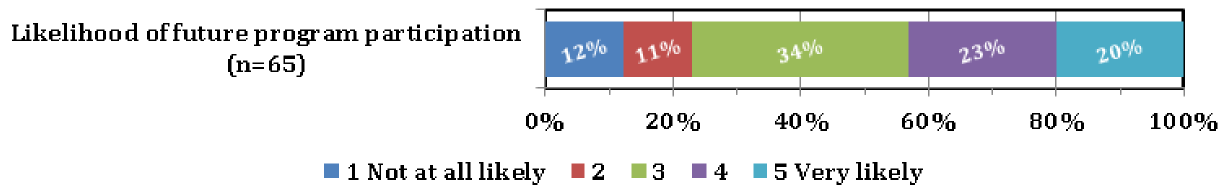


Figure 225: Likelihood of Future Participation, among Large Commercial Nonparticipants

Fifteen respondents explained why they were unlikely to participate in the future. The most frequent reason, given by about twenty percent of respondents, was lack of interest (Table 679).

Table 679: Reasons Why Unlikely To Participate, among Large Commercial Nonparticipants

Reason	Percent (n=15)
Not interested	20%
House is new/efficient	13%
Rent home/building	7%
Too busy	7%
NWE not main power provider	7%
Unclear or unspecified	47%

31.6.4. Irrigation Nonparticipants

We conducted phone surveys with a random sample of 30 NWE commercial electricity irrigation customers initially identified by their rate schedules and with no record of participating in an E+ energy efficiency program. We surveyed them to assess their current energy efficiency actions and their familiarity with and opinions on NWE's energy efficiency programs.

Commercial irrigation nonparticipants provided general feedback on their familiarity with and use of NWE's website, as well as their awareness of NWE's energy efficiency programs, and how they heard about those programs.

Very few respondents (20%) had visited the utility website. Over one-quarter (29%) of these respondents did not have access to the Internet. In addition, 29% of these commercial nonparticipants cited not liking to use the Internet much (Table 680).

Table 680: Reasons Website Not Used, among Commercial Irrigation Nonparticipants

	Percent (n=24)
Don't have access	29%
Don't like to use it much	29%

	Percent (n=24)
No need or no reason	21%
Just haven't	8%
Have access but connection is slow	4%
Never thought to	4%

We asked the six nonparticipants who *did* use the website their reasons for using NWE's website. Along with other reasons, this group most often mentioned paying their utility bill (Table 681).

Table 681: Website Use, among Commercial Irrigation Nonparticipants

(Allowed Multiple)	Percent
Pay utility bill (n=6)	67%
Learn about rebates or audits (n=6)	50%
Utility contact information (n=6)	50%
Other use of website (n=6)	50%
Money saving tips (n=6)	33%

Four of the six nonparticipants who used the site thought the web-based information they were looking for was easy to find and helpful.

We asked nonparticipants if they were aware of three NWE efficiency program areas. Half of these respondents were aware of NWE rebates for efficiency measures or equipment (Table 682).

Table 682: Awareness of Utility Programs, among Commercial Irrigation Nonparticipants

Program type	Percent Aware
Rebates for efficiency measures (n=30)	50%
Incentives for renewable energy projects (n=30)	40%
Small business energy audits (n=30)	23%

Half of those aware of NWE efficiency programs had considered participating. Among those nine irrigation nonparticipants, one-third (33%) reported having initial questions or concerns about participation.

Among nonparticipants aware of NWE efficiency activities, the majority (72%) learned about them through utility publications or advertisements. Smaller percentages of respondents also reported hearing about efficiency programs via word of mouth (39%), and by other means such as through contractors or by contacting NWE directly (Table 683).

Table 683: Means of Program Awareness, among Commercial Irrigation Nonparticipants

(Allowed Multiple)	Percent
Utility publication or advertisement (n=18)	72%
Word of mouth (n=18)	39%
Directly contacted utility (n=17)	29%
Building professional, vendor, or contractor (n=18)	28%
Utility representative appearance (n=18)	6%
Newspaper (n=18)	6%

To gauge general market awareness, we asked nonparticipants if they had heard of the Energy Star logo, as well as several high efficiency measures. A large majority (86%) of respondents were aware of the logo, and majorities had heard of several high efficiency measures for commercial customers. Most respondents were aware of small wind turbines (70%) and/or knew about the benefits of adding insulation to facilities (69%). Half were aware of photovoltaic solar energy systems (Table 684).

Table 684: Awareness of Efficiency Measures, among Commercial Irrigation Nonparticipants

(Allowed Multiple)	Percent
Small wind turbines (n=30)	70%
Benefits of adding insulation to facility (n=29)	69%
Photovoltaic systems (n=30)	50%
High efficiency boiler, chiller, or HVAC (n=30)	40%
Heating and cooling building automation controls (n=30)	27%
Variable frequency drives (n=29)	21%

We asked non-participating commercial irrigators about their use and purchases of electric motors. Most used electric motors; however, a notable minority (38%) reported using no electric motors. Among those using motors, the quantity in use at the time of our survey varied widely, 37% used between six and 150 motors and 25% used five or fewer motors. Furthermore, among those using any motors larger than 15 horsepower, the majority (87%) used between one and ten motors over 15 horsepower.

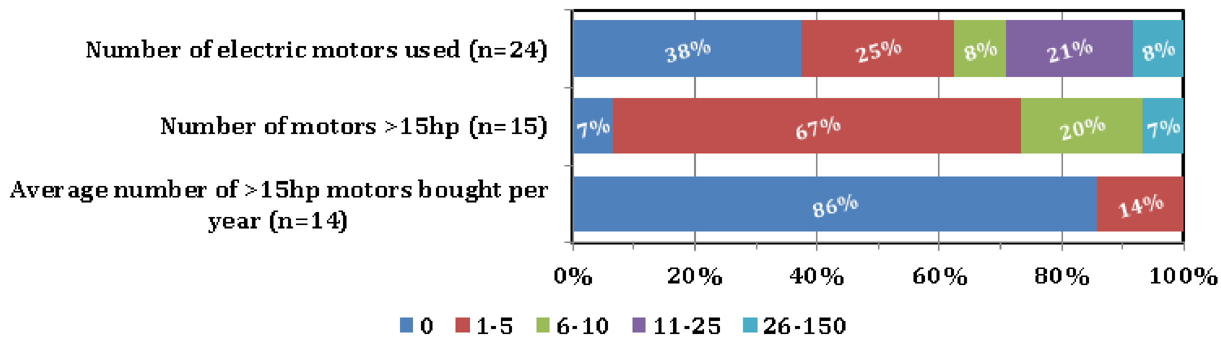


Figure 226: Motor Use and Purchases, among Commercial Irrigation Nonparticipants

Just over half (57%) of motor users among these non-participants were aware of motor rewinding for efficiency and 43% knew of a motor rewind shop (Table 685).

Table 685: Awareness and Motor Policies, among Commercial Irrigation Nonparticipants

(Allowed Multiple)	Percent Aware
Awareness of motor rewinding (n=14)	57%
Purchasing policy for only NEMA premiums (n=2)	50%
Awareness of rewind shops (n=14)	43%
NEMA premium motor attempted (n=12)	17%
Keep a spare stock of >15hp motors (n=14)	7%

About a third (35%) of these irrigation nonparticipants reported they were “likely” or “very likely” to participate in a NWE energy efficiency program in the future (Figure 227).

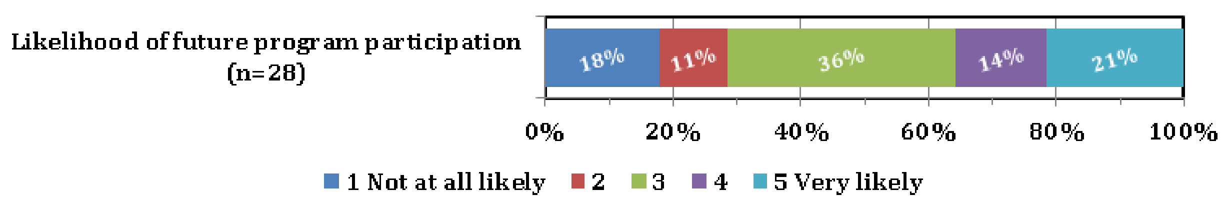


Figure 227: Likelihood of Future Participation, among Commercial Irrigation Nonparticipants

Eight respondents explained why they were unlikely to participate in the future. The most frequent reason (for 38%) was lack of interest (Table 686).

Table 686: Reasons Why Unlikely To Participate, among Commercial Irrigation Nonparticipants

Reason	Percent (n=8)
Not interested	38%
Too old or retired	25%
Building is too old	13%
Unspecified or unclear	25%

32. Portfolio Recommendations

32.1. Impact Evaluation

Based on the impact evaluation findings, we offer the following recommendations for improving the portfolio.

- **Increased marketing:** Consider increasing marketing efforts to increase awareness of the efficiency opportunities that NWE offers. During the site inspections, many customers inquired about getting incentives for efficiency improvements that they were considering. Often they were not aware that they could go to the NWE website to get information regarding the efficiency programs.
- **Customer e-mail addresses:** Future program evaluations would benefit from having customer e-mail information in addition to telephone numbers. In many cases, customer communication is easier and more efficient through the e-mail system. Consider compiling both customer telephone numbers and e-mail addresses in the tracking database during program implementation for future program years.
- **Consistent program names:** For some programs, the program name changes from year to year to assist program marketing efforts. However, these changes complicate program evaluations that cover multiple years. The program tracking database and supporting tables (e.g., tracker year reports, calendar year reports, savings, cost reporting, rebate tables) should maintain a consistent name for each program across an evaluation cycle (in addition to the actual program name). Alternatively, consider providing evaluators with a means for easily mapping program names.
- **Updated UES values:** For prescriptive programs that rely on unit energy savings values to determine overall savings, consider updating the UES values for the measures included in these programs to the evaluation values, which incorporate the findings from recent research. UES values should be updated regularly so they best reflect the latest industry assessments and consensus. Also consider applying the UESs by building type (when applicable) during program implementation.

32.2. Process Evaluation

NWE offers a large portfolio of residential and non-residential programs, including audits, prescriptive rebates, custom incentives, and education and training. It offers this portfolio with an extremely low staff to budget ratio, as compared with program administrators around the country (Goldman, et al. 2010).

NWE's efforts are firmly grounded in efficiency program best practices. It follows best practices in program planning and design, including sound program planning based on local market conditions, attention to attracting hard-to-reach customers, responding to market conditions, and maintaining program funding throughout the year. If follows best practices for program management and administration, including keeping participation simple, offering participation assistance, and having clear lines of authority and communication, among other things. NWE follows best practices in program marketing and outreach by using multiple communications media and distribution channels, rebating Energy Star products, supporting and working through trade allies, disseminating case studies, and conducting cross-program marketing. It follows best practices for quality control, including conducting project inspections, verifying accuracy of invoices and incentives, and educating contractors. NWE follows best practices for program tracking and reporting, including identifying data requirements needed for success metrics, producing and reviewing regular status reports, incorporating rigorous quality control screens for data entry, and using accurate algorithms and assumptions (and revising per evaluation results). Finally, NWE follows evaluation best practices, including conducting baseline studies of technical potential, and conducting regular detailed impact and process evaluations supported by site inspections and customer surveys.

NWE has opportunities to build on its successes by considering additional best practices and adopting those that appear to have value for them and their customers. We emphasize that responding to opportunities requires additional work for NWE and may not be cost-effective. No program administer is in full conformance with all best practices. NWE should adopt those practices whose benefits seem likely to outweigh their implementation costs.

NWE should consider the following opportunities for its **planning and design** activities:

- Opportunity exists to formalize the outcome of its planning efforts with written program plans
  - Consistency of objectives/ goals and strategies/ tactics can be confirmed through a description of program theory/logic. Formal logic models can be useful, but informal descriptions can suffice
  - NWE might construct plans using as a starting point the program descriptions provided in this report
- Opportunity exists for NWE to reduce the frequency with which it updates its cost-effectiveness analyses and qualifying measures
  - Qualifying measures should change no more than once a year and ideally at the longer increment of a program cycle (two to five years)
  - Reducing the frequency of updates will provide program stability to trade allies and customers, reduce time program staff and corporate communications spend on updates, and reduce potential for communication errors
- Opportunity exists to systematically update customers about program changes
  - NWE already uses multiple channels to communicate with customers. NWE might examine which channel or channels are most appropriate to convey information on program changes and consider how it might use these channels to regularly update customers.

NWE should consider the following opportunities for its program **management and administrative** activities:

- Opportunity exists to write down process plans (that is, detailed implementation activities, including roles and responsibilities)
  - Process plans facilitate new staff (NWE or program implementation staff) getting up to speed and contribute to institutional memory, whereby the organization knows what individuals know.
  - Process plans can be useful in identifying the source of problems that may emerge
- Include in trade ally program communications a means to provide program feedback to NWE, as contractors can be a good source of market intelligence and suggestions for program improvement
  - NWE should take care in the phrasing of such notification to create the expectation that while NWE reads contractor comments, it is not obligated to respond to or address comments received
- Opportunity exists to increase the use of internet tools in facilitating program applications
  - NWE is developing a new tracking system and, as part of that activity, should explore opportunities to increase participant access to internet tools

NWE should consider the following opportunities for its **marketing and outreach** activities:

- Consider ways to provide participants with more information about efficiency opportunities through mail
  - Consider mail messages to increase awareness of the available weekly efficiency tip emails, as many participants do not appear to be aware of this resource. Although many respondents reported they would like additional efficiency information, we caution that we live in an age of information overload. Thus, NWE's challenge is to be strategically selective
  - Possible examples are an anniversary post-card mailing to participants annually after receiving a rebate, with a we miss you message; post-card notices of workshops or seminars; a post-card message of see you at the home show; or periodic time-limited sweeteners for a succession of measures. While the specific measure sweetened might not be relevant to the customer, such a campaign would provide another opportunity to attract customer and trade ally attention to the topic of efficiency
- Consider notifying participating trade allies by email of all Montana-based efficiency related workshops, seminars, and training opportunities – the information NWE currently provides the members of its Lighting Trade Ally Network
- Consider recruiting additional trade allies as preferred contractors from among the contractors serving self-installed participants

  - NWE benefits from designating contractors as preferred because of the program communications it is able to maintain with preferred contractors and for basing project inspection rates on contractors volume of jobs and past performance
  - Surveyed trade allies typically reported serving both commercial and residential customers, so this activity could benefit both the residential and non-residential programs
- Consider incorporating additional non-energy benefits and marketing messages, such as waste reduction and community benefit

NWE should consider the following opportunity for its **quality control** activities:

- Consider project inspection costs when setting ongoing inspection rates, as NWE may be over-inspecting in some programs
  - Ensure measure types are represented appropriately based on their contributions to savings

NWE should consider the following opportunities for its **evaluation** activities:

- Consider adopting a fast-feedback evaluation approach, which surveys customers within a month or so of participation to obtain customer satisfaction and free ridership information
  - Survey would provide immediate feedback on trends in satisfaction and free ridership, providing NWE with the information to support adaptive management
  - Addressing these issues through fast-feedback survey enables process evaluation surveys to explore other program issues without excessive length
  - Energy Trust of Oregon has developed and its call center now implements a fast-feedback survey; the organization views the approach as successful and valuable
- Monitor product markets and conduct market saturation studies to assess the extent of market transformation; exit transformed markets
- Consider conducting more frequent, smaller-scope evaluations
  - The current evaluation bordered on the unwieldy, with the large number of programs, multiple program delivery methods (and thus samples), and multiple time frames (program year and tracker year) over a five-year cycle

33. Technical Appendices

33.1. Impact and Economic Analysis Workbooks

Two Excel workbooks accompany this report that provides detailed tables of portfolio and program impact evaluation and economic analysis results. One of these workbooks (Impact and Economic Results Calendar Year.xlsm) contains tables organized by calendar year, and is the source of all the portfolio and program impact and economic analysis tables that appear throughout this report. The other workbook (Impact and Economic Results Tracker Year.xlsm) contains tables organized by tracker year (July 1 thru June 30).

33.2. Recommendations Workbook

An Excel workbook accompanies this report (Impact and Process Recommendations.xlsx) that contains all of the recommendations that we made, both for the impact and the process portions of the evaluation. These 59 recommendations are categorized in the matrix by evaluation aspect (impact/process), area (e.g., audits, UES, communication), and topic (e.g., report improvements, duplicate entries, additional trade allies). The topics provided are brief phrases meant to capture the gist of the full recommendations, which are also provided. To the right of the recommendations is a grid with columns corresponding to the chapters in the report. For example, the column named "4 - E+ Audit Home or Business" refers to section 4 of the report, which concerns that particular program. There are also columns for more general classifications, such as NEEA initiatives or savings persistence. The matrix contains a dot whenever a particular recommendation pertains to a particular program or subject. Some recommendations only apply to a single program, while others may pertain to most of them. The matrix is set up with a standard data filter to facilitate isolating relevant information for particular programs and/or recommendations.

33.3. CFL Operating Hours

33.3.1. Procedures for Field Surveyors

Below are the procedures that evaluation field surveyors followed when performing this study.

Overview

The objective of this study is to determine the average annual operating "on" hours for a typical CFL in a NWE program participant residence. Note that this may include program CFLs as well as any other CFLs installed in the residence.

At each sampled and recruited residence, the field surveyor will assess interior and exterior lighting in non-commercial structures, and determine which lighting fixtures and lamps contain CFLs. It is critical to understand that each field visit consists of two tasks:

1. inspect to identify the program CFLs to establish installation rates, and

2. meter a sample of all CFLs to determine typical CFL operating hours.

While the two tasks are interrelated, they have fundamentally different aims. This document focuses on the latter metering task, as the inspection task is dealt with in the general inspection procedures that span many types of measures.

For the metering, the surveyor will prepare a simple sketch showing floor layouts, indicating rooms containing fixtures and lamps with CFLs. The surveyor will then apply a predetermined sampling scheme to select up to three CFLs to monitor. The sampling scheme will consist of a randomly-generated start number and a sampling interval proportional to the number of lamps, so that each residence will have no more than five metered CFLs (with an average, we hope, of three). We will use a combination of two methods to meter the lamps, depending on the type of fixture—either lighting on/off time-of-use loggers, with fiber optics extension tubes as needed, or current switches and state loggers, which can be installed between a plug-in lamp and the power receptacle.

Once the metering period has elapsed, a surveyor will go back to the residence to retrieve the loggers and download the data. These data will be aggregated, annualized, and analyzed to determine average annual operating hours for the population.

We expect to inspect about 130 residential sites with CFL measures, and of these, 77 will be metered, too. (70 is required, seven sites are contingency). The current budget allots about 10.5 analyst hours per metering site, which includes two visits. For the initial visit, this time would include prep, scheduling, travel, onsite work, and entering data. For the follow-up visit, the time would also include travel, onsite work, and downloading meter data.

For background, the six NWE programs that provide CFLs to residential customers are listed below.

Table 687: NWE Programs that Provide CFLs to Residential Customers

Program	Key facts from program description
CFL Mail-out	One 13W CFL provided with audit report.
CFL Mail-in Rebate	5 to15 screw-in or hard-wired CFLs rebated.
CFL In-store Coupon	Up to twice a year, customers get a coupon for up to 10 CFLs, valid at qualified retailers.
Trade Show Give-away	Participants can receive up to four 13-14W CFLs. Customer gets a mail-in brochure if they want to get more.
Residential Direct Install	For fixtures used more than 3 hours/day, an installer provides 13-26W CFLs. Customer gets mail-in brochure if they want to get more.
In Store CFL Buy Down	NWE provides funding to retailers to make CFLs more affordable for retail customers. They have focused on less common / emerging CFL types recently to “push” the market.

Work Plan

1. Initial recruitment

Research Into Action is performing the telephone survey and initial recruitment. They are recruiting customers for the inspection, but not for the additional metering. The field surveyor will be responsible for the latter.

Information available after the RIA recruitment includes the following:

- Respondent name, phone number, address
- Best time to call contact
- Total quantity of CFLs provided by program(s) (note: customer may have gotten CFLs from more than one program.)

Using these lists, group the recruits according to geography and availability to determine where to focus metering recruitment follow-up calls.

2. Follow-up recruitment for metering

For initially recruited sites, call to explain that they have been selected for metering in addition to the inspection, and that while it will take more time, they can receive $50 in gift cards. See the recruitment guide in for details. Follow up by arranging with Wynette Miller in the SBW office (wmiller@sbwconsulting.com, 425-827-0330, generally works Tues-Fri) to send the confirmation letter in section 4 to the respondent you spoke with, either via email (preferred) or by postal service. If a customer declines to be metered, then coordinate with Marc Schuldt (mschuldt@sbwconsulting.com, 425-827-0330) in the SBW office to obtain a replacement site. In some cases, such as multi-family dwellings, you may have a multi-step recruitment process, where you first talk to the landlord, then to the tenant.

3. Onsite visit

- Tools and supplies you will need, in addition to the loggers and related equipment, include the following:
- 5-foot stepladder
- Pliers for undoing fixture screws
- Small inspection mirror for viewing behind/inside fixtures
- Flashlight
- Rag for wiping bulbs and fixtures
- Logger mounting supplies (wire, zip ties, putty, tape, Velcro, etc.)
- Camera
- Sunglasses (for viewing light bulbs when on)
- NWE contractor badge

Upon arrival, introduce yourself, show your NWE contractor badge (which you should where at all times when at a customer site), and give them your business card. Briefly explain what you will be doing again, and answer any questions. If necessary, reassure them that the loggers are not dangerous, and that the logging and the whole evaluation process will not compromise their privacy.

As much as is permissible, survey the entire residence to look for CFLs in use, in both interior and exterior spaces (avoid any clearly commercial areas, though). Be methodical and sketch each floor's layouts, and indicate which fixtures have CFLs. Refer to the example sketch in section 5. Details of metering are discussed in the next section.

You should prioritize your work taking into account the customer's attitude, time constraints, patience, etc. Getting the loggers in place and operational is the highest priority. Finding program CFLs is a secondary priority, and can be done during the follow-up logger retrieval visit if necessary. Generally speaking, it may make sense to walk the house, sketch out where the CFLs are, and then talk to them about where the program bulbs might be.

Regarding the inspection portion of the visit, using the information provided in the evaluation site workbook and the program files as a guide, ask generally about where the CFLs that came from NWE programs. You will have a database listing (and receipts in the case of the mail-in program) of the expected fixtures for your reference. Use this to prompt the customer, if necessary. Assume that there could be many non-program CFLs, so we want to get the most reliable sense of which CFLs are associated with the programs. If they know, find out where the program CFLs are (including in storage), but be prepared for them not to know. If possible, inspect some or all of the possible program CFLs to confirm that they match the records. For example, if a customer points to a CFL she says she got at a trade show, but you see it is 26W (and the shows only distributed 13–14W CFLs), then quietly note that fact.

4. Metering

Depending on the number of operating CFLs in the residence, *select three CFLs to meter*. The random number generator in the site workbook will produce a custom matrix for each site that specifies which CFLs to meter (note that in instances when a fixture has multiple CFLs, each CFL should be considered a sampling point).

A partial example is shown below.

CFLs in sample frame	CFLs selected to meter (in lamp counting order)				
N	1st pick	2nd pick	3rd pick	4th pick	5th pick
1	1	na	na		
2	1	2	na		
3	1	2	3		
4	1	2	3		
5	1	2	3		
6	1	3	5		
7	2	4	6		
8	2	4	6		
9	1	4	7		
10	2	5	8		
11	3	6	9		
12	3	7	11		
13	2	5	8	11	
14	2	5	8	11	
15	1	4	7	10	
16	3	7	11	15	
17	2	6	10	14	
18	1	5	9	13	
19	4	8	12	16	
20	1	6	11	16	
21	1	5	9	13	17

Figure 228: Example CFLs Selected to Meter

If, for example, you found 11 CFLs in the residence, you would number them using a standard scheme (say, clockwise around the floor starting at the north, going from the first floor on up). You would then meter the 3rd, 6th, and 9th CFL per your numbering scheme. If a selected lamp cannot be metered (for instance, if it is in an unsafe location), then go the next highest number on the scheme. In the previous example, if the 6th lamp is inaccessible, then try the 7th lamp instead.

Please note that the sampling matrix is set up to select four or five CFLs to meter if there are more than 12 CFLs in the residence. This was established in case we ran across sites that had only one or two CFLs. This probably will occur only rarely, but if it does, we will need to install loggers on four or more CFLs in some of the other homes to maintain an average of three. The figure in the procedures document was designed to help select additional CFLs to meter if this occurs. SBW managers will advise you if you will need to select more than three CFLs. If you have a site with more than 12 CFLs, and you are only metering three of them, then “randomly” pick three of four, or three of five, of selection numbers in the matrix (for example, if the residence had 21 CFLs and you only needed to meter three, then you could arbitrarily pick three of the five numbers shown, such as 1, 9, and 13).

You will install metering on selected CFLs, using one of two techniques. The first is Dent lighting on/off time-of-use loggers, each of which should be affixed securely to the fixture or lamp it is monitoring, in a way that is unobtrusive and does not mar customer property. If necessary, install a fiber optics extension tube to ensure that stray ambient light does not result in erroneous logger readings. The second is a combination of Veris current switches and HOBO state loggers, which can be installed between a plug-in lamp and the power receptacle to log when the fixture is on.

Before leaving the metering location, check to ensure that the logger is secure and, as much as is practical, appears to be functioning properly. Then take a picture of each metered CFL, fixture, and logger.

At the conclusion of the visit, thank the customer for their time, and give them a $25 gift card. Explain roughly when our team will be returning to retrieve the loggers (July-August), and if possible, find out any relevant logistical details for that visit.

Ask the customer to avoid disturbing loggers, but otherwise use their lights as they normally would. If you installed current switches/state loggers, ask them to move the logger along with the fixture (in the case of, say, a desk lamp) if they move the latter.

Before you leave the site, confirm you have recorded all critical information, and soon afterwards, complete your field notes and site workbook.

5. **Follow-up visit**

   Using contact information previously obtained, recontact the customer and set up a time for the follow-up visit to retrieve the logger(s) and collect any remaining data needed. Remove the loggers, and note any unusual circumstances (such as the fixture being moved).

   As you conclude the visit, thank the customer for their participation in the study, and give them the second $25 gift card. Before you leave the site, confirm you have recorded all critical information, and soon afterwards, complete your field notes and site workbook.

   Be sure to download data from the loggers before you ship them back, in case the loggers are lost in transit. Upload metering data, plus photos and scanned sketches, to the SBW ShareFile file-sharer, being sure to label all materials with the SBW-provided *SamplingID* number.

CFL Metering Sheet in Site Workbook

Each site workbook will have a Res CFL metering worksheet/tab, but this tab will only be filled in for initially recruited, potential metering sites. The worksheet will contain:

1. Pre-assigned random numbers + sampling matrix.
2. Matrix for entering info on metered CFLs (location in house, type of lamp, logger number and type, date logger installed/removed, conditioned (heated/cooled/both) space, notes, etc.).
3. Space for entering total # of CFLs.
4. Notes on file names for scans or photos of field maps showing site floor layout and locations of meters (to aid in metering pickup at later date).

Info for(2) and (3) will be in named ranges so it can be easily extracted and uploaded into a DB.

The worksheet may also have checklists and question prompts so that the surveyor can it print out and have everything necessary for the site visit in summarized hard copy form.

Recruitment script outline

- Hi, I'm ___ and I'm following up on a call you got __ weeks ago from ___. My firm ___ is part of the team that is evaluating NWE's conservation programs.
- Thank you for agreeing to an inspection.
- In addition to the inspection, we were hoping to "sweeten the pot." You've been randomly selected for on-site metering as well, so we can better understand how CFLs operate in the State of Montana. You will be one of only 77 such homes throughout the state, so the info you provide will be very important.
  - We realize this is an inconvenience, so we will provide you with $50 in gift cards if you participate ($25 after the initial visit, $25 after the follow-up visit).
  - Our initial visit should take no longer than 30 minutes, depending on how your home is set up. We will be leaving several small battery-powered loggers on selected lights in your home for a couple of months. These loggers are safe and unobtrusive, and they do *not* transmit data. We will come back to remove the loggers.
  - If they say yes, thank them again. If they decline, thank them for considering this, and tell them that someone will be in touch with them later to schedule the inspection without any metering.
- Just to be sure, I wanted to confirm that you still have CFLs installed in your residence. I'm talking about *any* CFL, not just the ones you got from NorthWestern Energy. Is this the case? If so, how many, and do you know where in the house they are?
- We are hoping to visit the week/day of ___. Are you available then?
- If they agree, get best phone #, if different (such as a cell phone), to make it easier to confirm actual appointment. Also get their email / mailing address so we can send a confirmation letter documenting what we told them.
- As appropriate, obtain additional information about best times for the visit, how to contact them, how to find their residence. Feel free to provide your name, and an appropriate phone number so they can reach you if anything comes up.

- If they have questions about our work and want to talk to an NWE representative, they should contact:

  NorthWestern Energy Customer Contact Center

  (888) 467-2669

  Open Monday-Friday 7 a.m. – 6 p.m. MDT.

  The staff at the contact center will be aware of our study and can confirm that you are legitimate.

Confirmation Letter Text

NorthWestern Energy

NorthWestern Corporation
d/b/a NorthWestern Energy
40 East Broadway Street
Butte, MT 59701
Telephone: (406) 497-2491
Facsimile: (406) 497-2084
www.northwesternenergy.com

<Month Date>, 2012

Dear <First name Last name>:

Thank you for agreeing to participate in a compact fluorescent lamp (CFL) metering study, as part of an evaluation of NorthWestern Energy's efficiency programs. These efforts will help us improve our programs and better serve our customers.

SBW Consulting, Inc. (SBW) of Bellevue, Washington, in conjunction with New Horizons Technologies of Butte, Montana, is conducting the evaluation. As was mentioned during the recent phone call with you, one of their trained field surveyors will be scheduling a short visit to your residence to (1) inspect the CFLs you received through a NorthWestern energy efficiency program, and (2) install several small, temporary meters on selected lighting fixtures in your home. These meters should not interfere with your normal household activities during the several months when they are in place. At the end of this period, a surveyor will return to remove them at your convenience. All information collected as part of this effort will be kept confidential.

In appreciation of your participation, the surveyor will give you **$50 in Visa® gift cards**–$25 after the initial visit, and another $25 after the follow-up visit. These cards are redeemable anywhere Visa® is accepted.

Should you have any questions or concerns, please contact the SBW study manager, Marc Schuldt, at (425) 827-0330 or mschuldt@sbwconsulting.com, or the NorthWestern Energy Customer Contact Center at (888) 467-2669, M-F.
7 a.m.-6 p.m.

David Bausch

Dave Bausch

Senior DSM Engineer

NorthWestern Energy

Figure 229: Confirmation Letter Text

Example Site Sketches

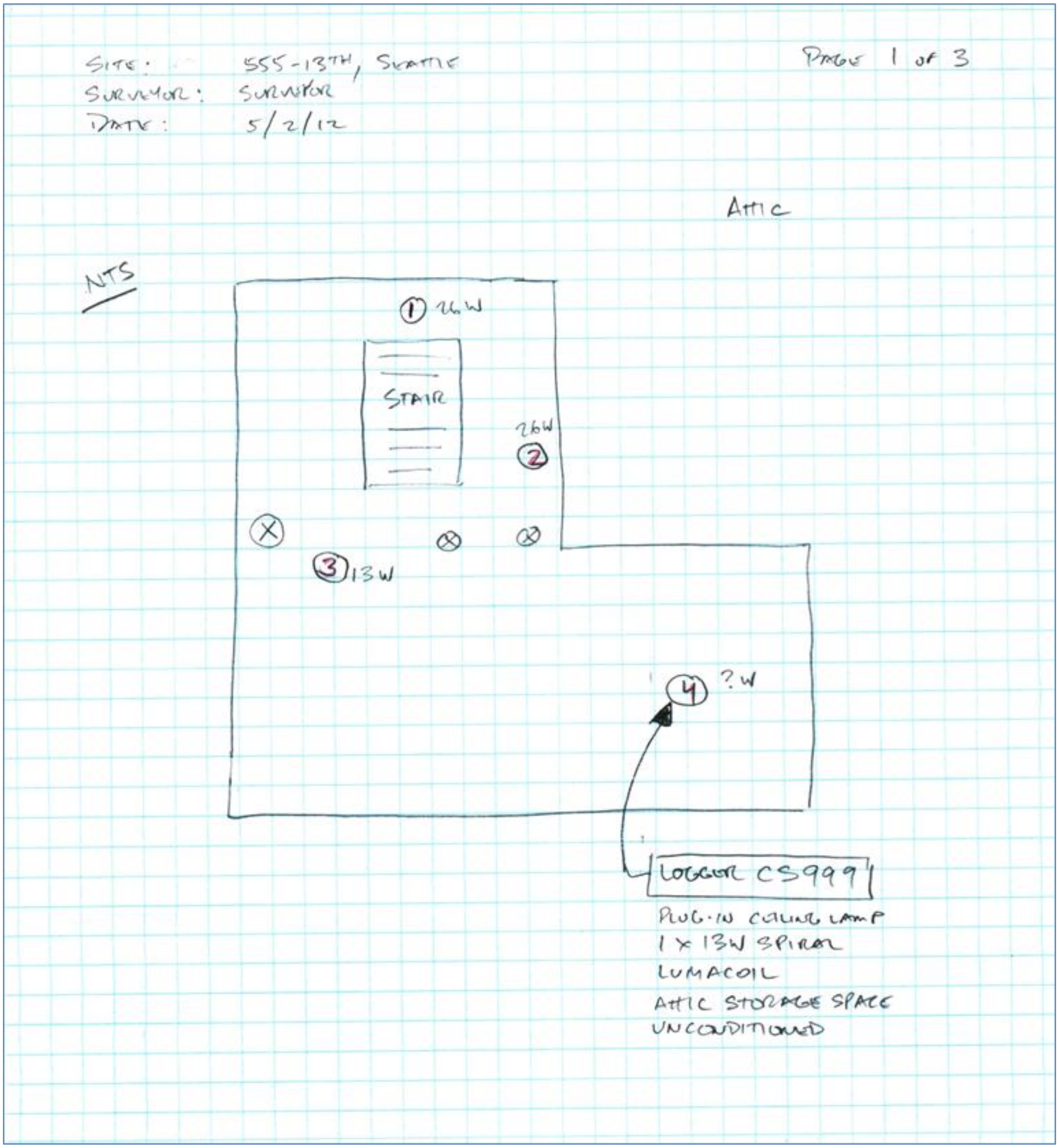


Figure 230: Example Site Sketch 1

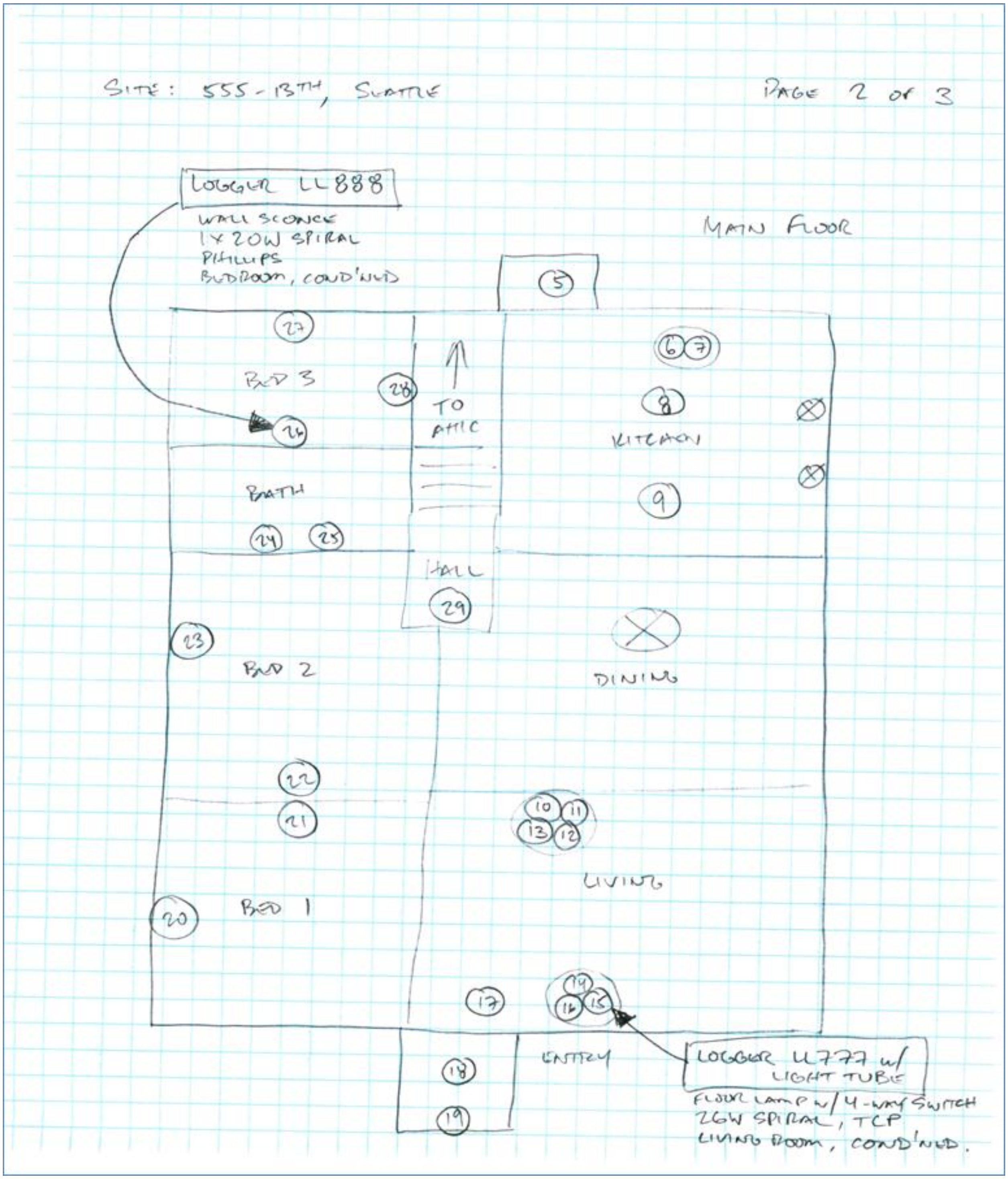


Figure 231: Example Site Sketch 2

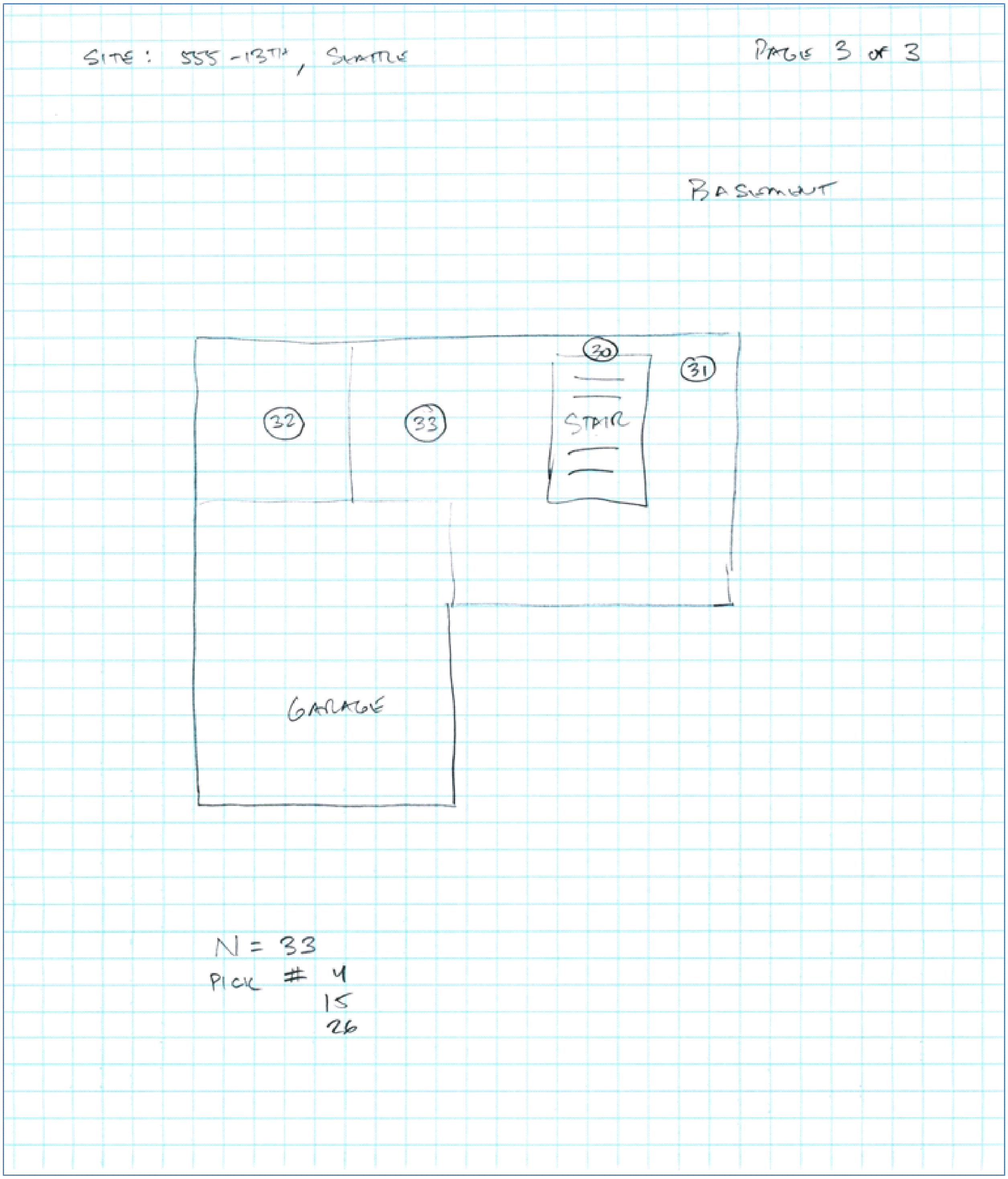


Figure 232: Example Site Sketch 3

33.3.2. Recruitment Script

- Hi, I'm ___ and I'm following up on a call you got __ weeks ago from ___. My firm ___ is part of the team that is evaluating NWE's conservation programs.

- Thank you for agreeing to an inspection.
- In addition to the inspection, we were hoping to “sweeten the pot.” You’ve been randomly selected for on-site metering as well, so we can better understand how CFLs operate in the State of Montana. You will be one of only 77 such homes throughout the state, so the info you provide will be very important.
    - We realize this is an inconvenience, so we will provide you with $50 in gift cards if you participate ($25 after the initial visit, $25 after the follow-up visit).
    - Our initial visit should take no longer than 30 minutes, depending on how your home is set up. We will be leaving several small battery-powered loggers on selected lights in your home for a couple of months. These loggers are safe and unobtrusive, and they do *not* transmit data. We will come back to remove the loggers.
    - If they say yes, thank them again. If they decline, thank them for considering this, and tell them that someone will be in touch with them later to schedule the inspection without any metering.
- Just to be sure, I wanted to confirm that you still have CFLs installed in your residence. I’m talking about *any* CFL, not just the ones you got from NorthWestern Energy. Is this the case? If so, how many, and do you know where in the house they are?
- We are hoping to visit the week/day of ___. Are you available then?
- If they agree, get best phone #, if different (such as a cell phone), to make it easier to confirm actual appointment. Also get their email / mailing address so we can send a confirmation letter documenting what we told them.
- As appropriate, obtain additional information about best times for the visit, how to contact them, how to find their residence. Feel free to provide your name, and an appropriate phone number so they can reach you if anything comes up.
- If they have questions about our work and want to talk to an NWE representative, they should contact:

    NorthWestern Energy Customer Contact Center
    (888) 467-2669
    Open Monday-Friday 7 a.m. – 6 p.m. MDT.

  The staff at the contact center will be aware of our study and can confirm that you are legitimate.

33.3.3. CFL Map Examples

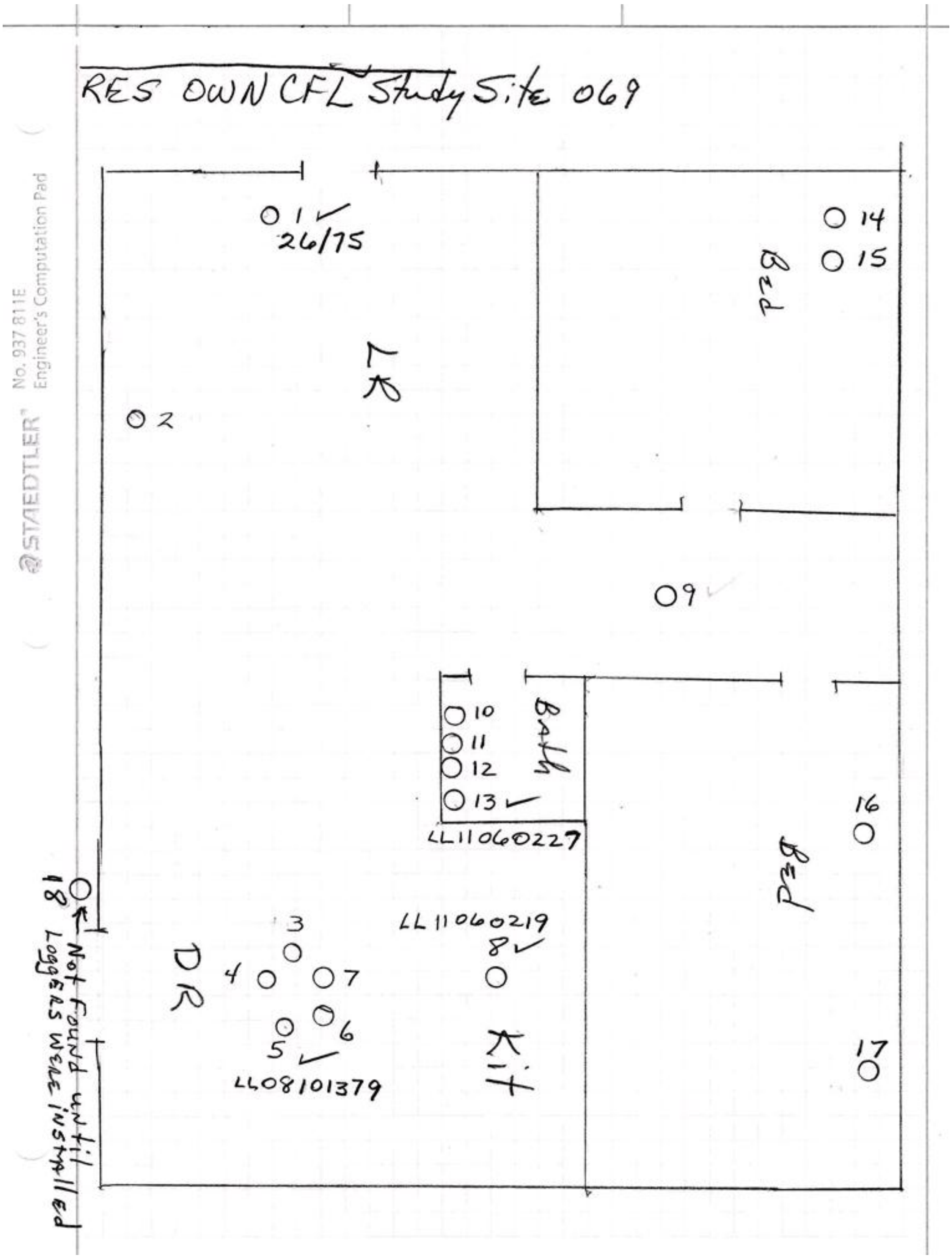


Figure 233: CFL Map #1

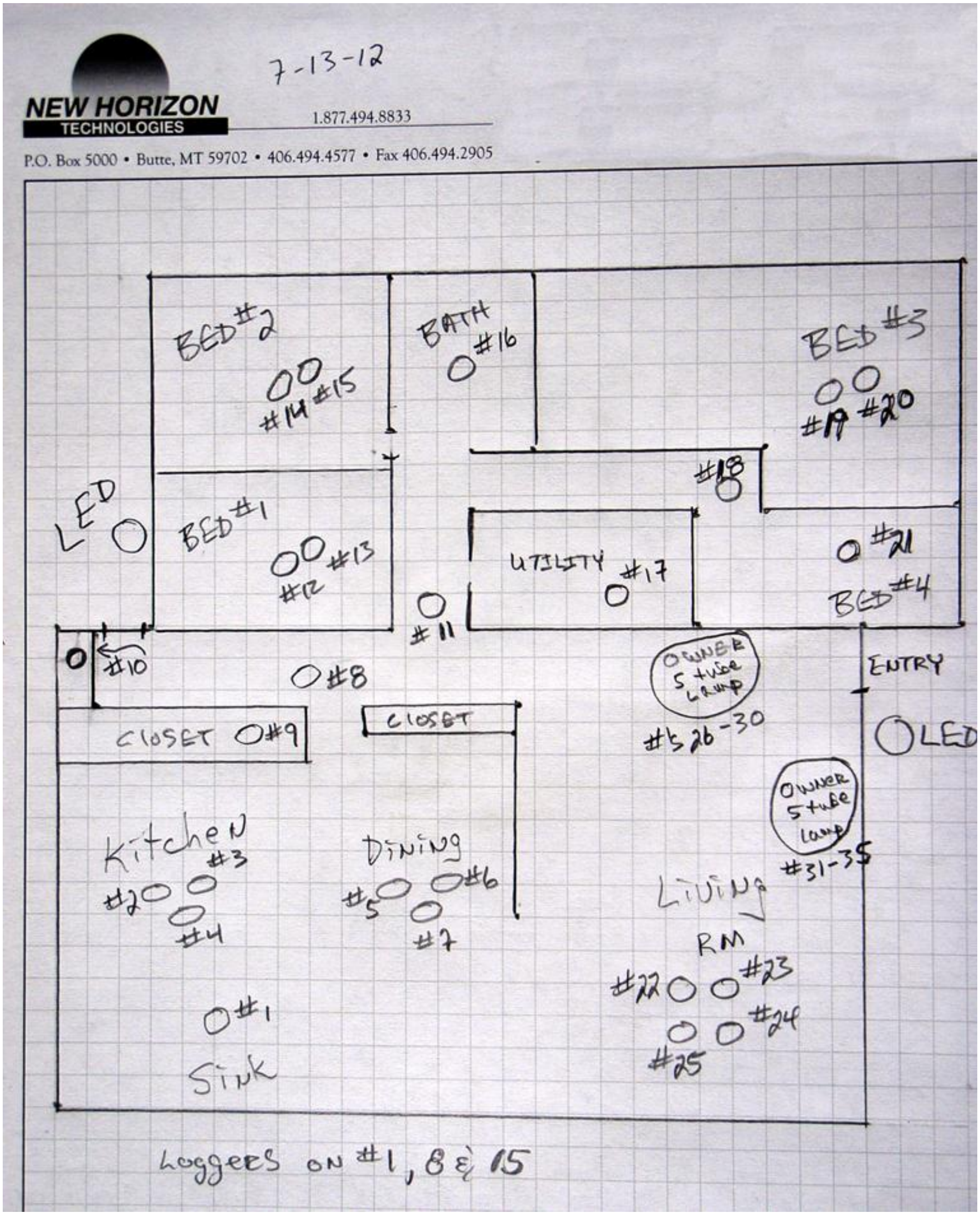


Figure 234: CFL Map #2

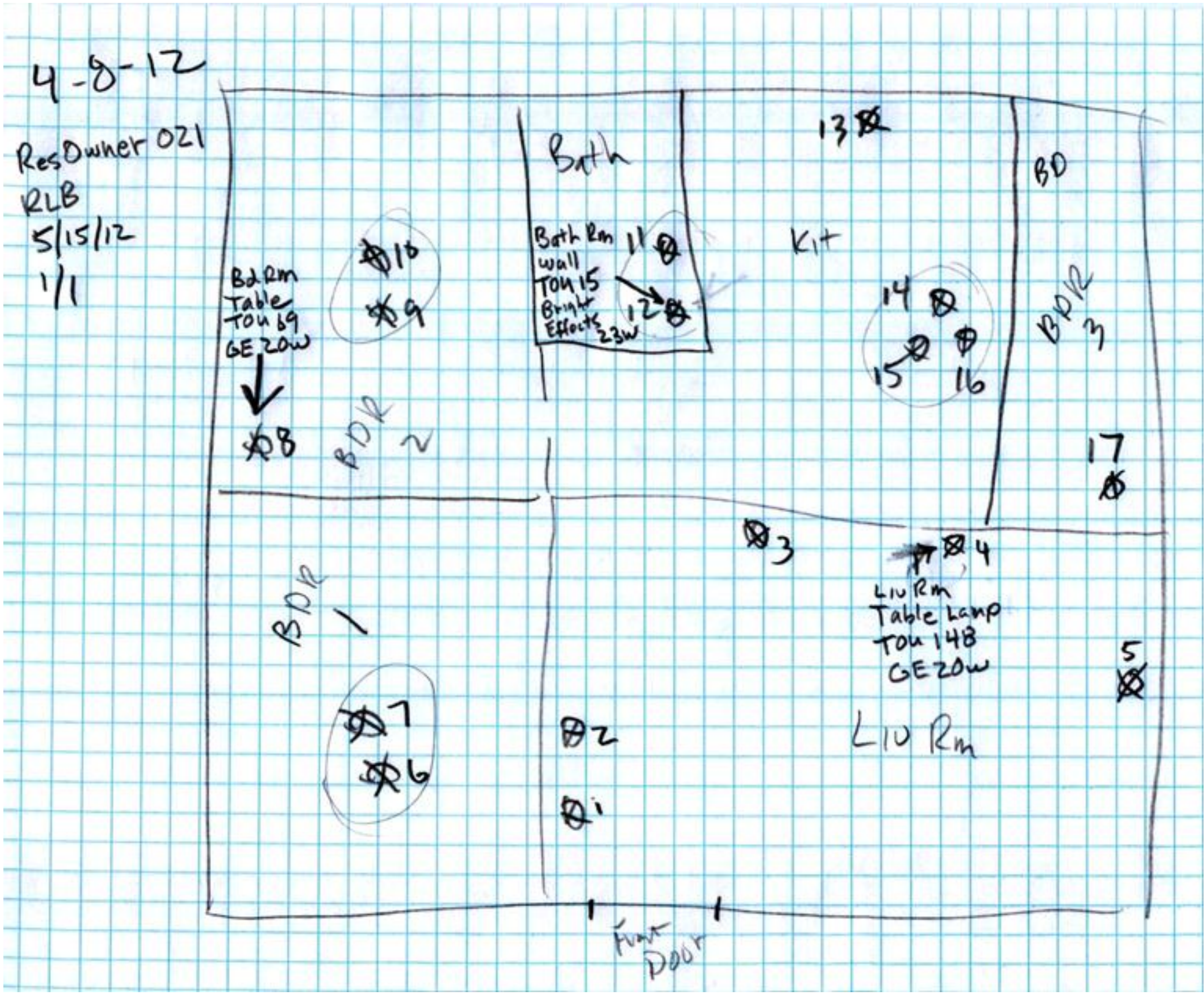


Figure 235: CFL Map #3

33.3.4. CFL Metering Installation Examples

Figure 236: CFL Metering Installation #1

Figure 237: CFL Metering Installation #2

Figure 238: CFL Metering Installation #3

33.3.5. CFL Metered Data Examples

Res_DI_CFL_2010_11_006_DL24_123

Daily hours of operation, (1) by day and, (2) average by day of week

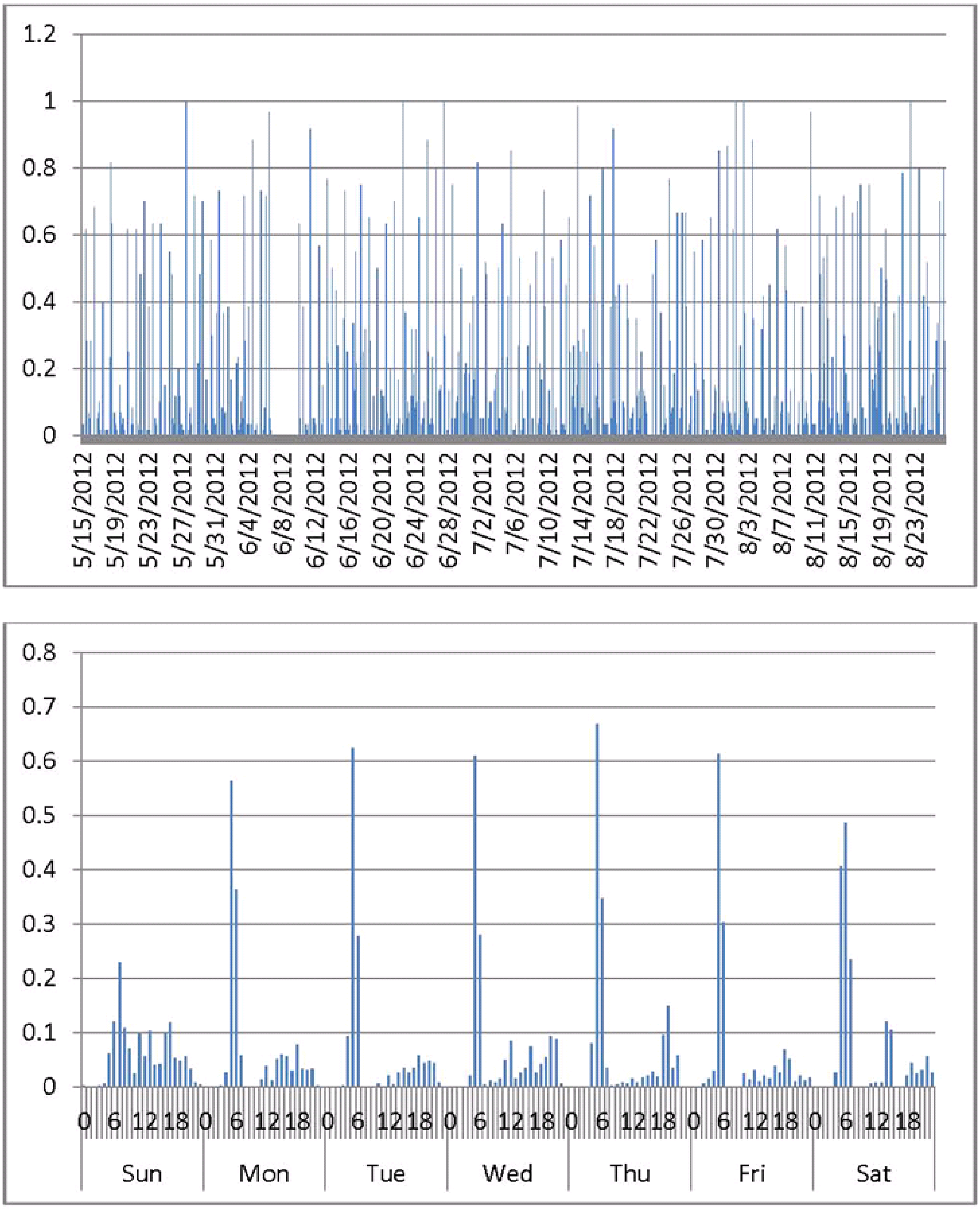
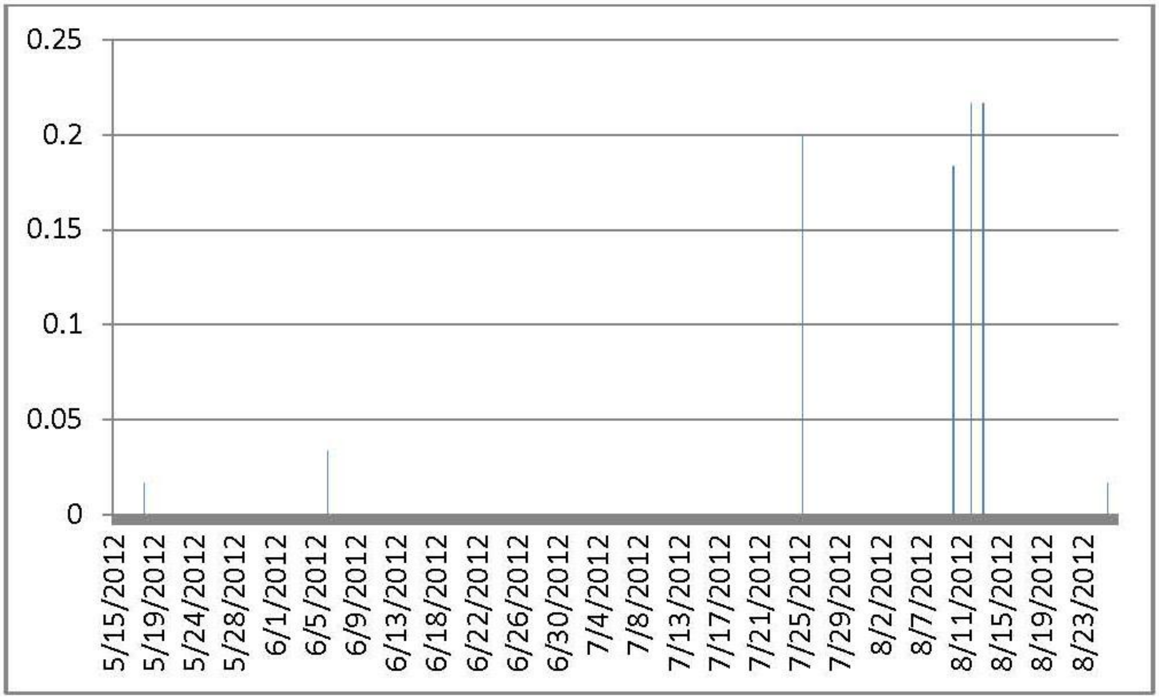


Figure 239: CFL Metered Data #1

Res_DI_CFL_2010_11_006_DL24_134

Daily hours of operation, (1) by day and, (2) average by day of week



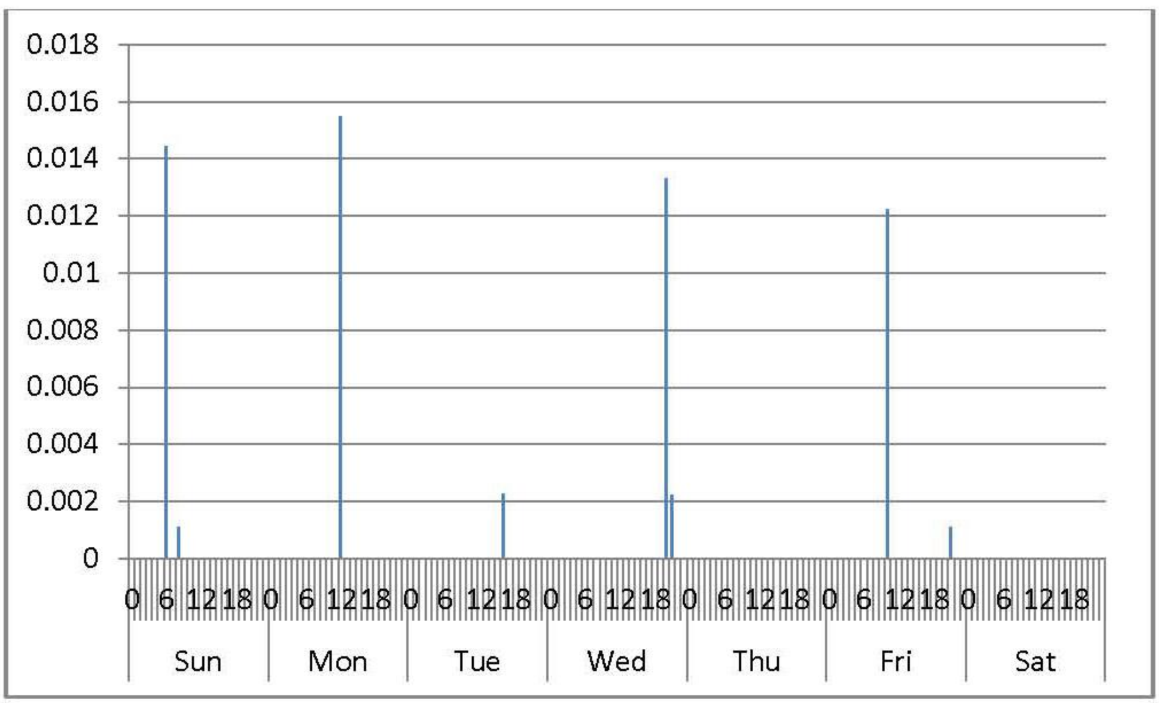
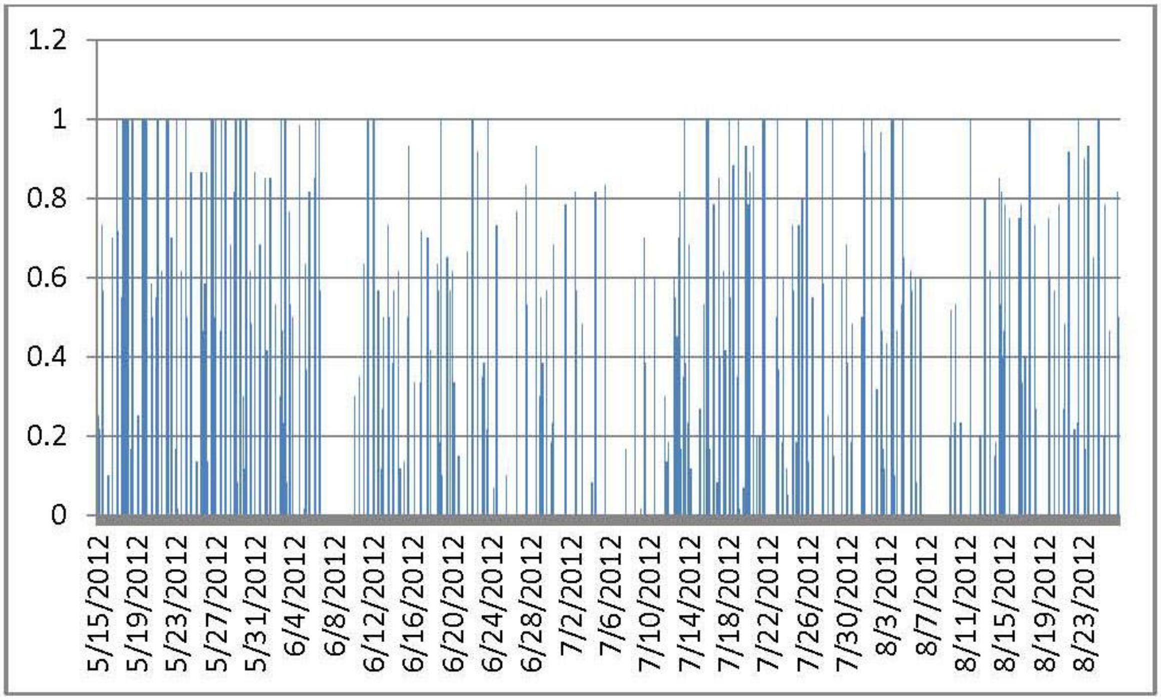


Figure 240: CFL Metered Data #2

Res_DI_CFL_2010_11_006_DL24_89

Daily hours of operation, (1) by day and, (2) average by day of week



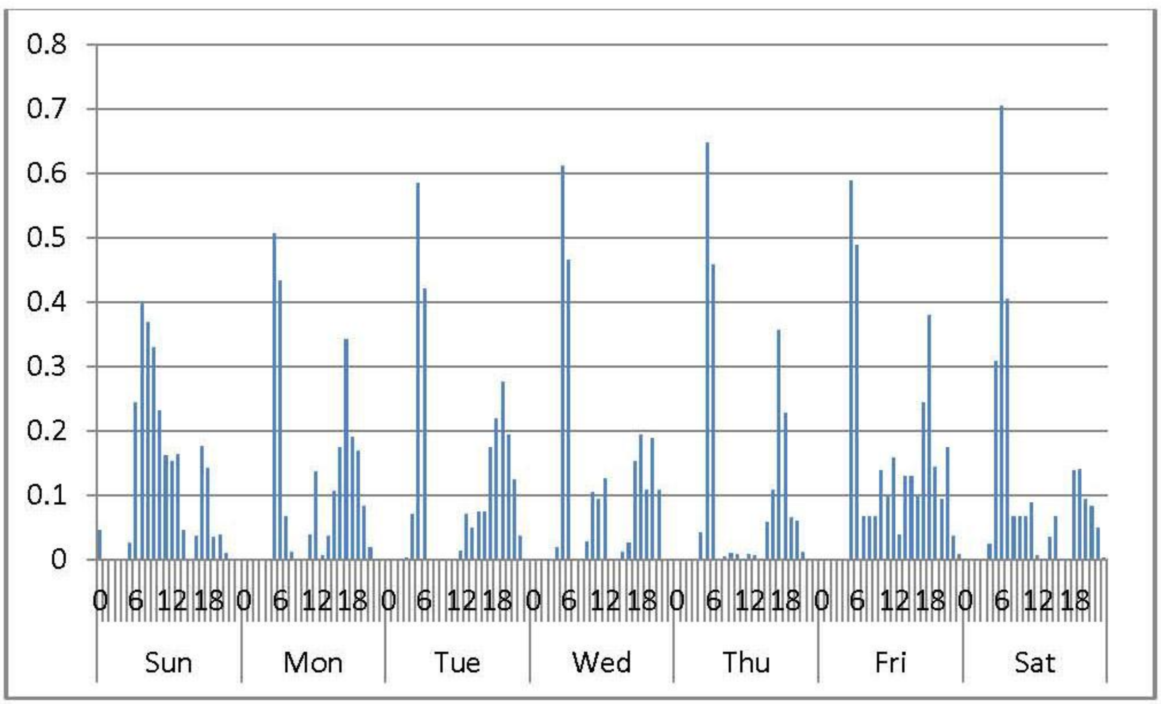


Figure 241: CFL Metered Data #3

33.3.6. CFL Meter-level Data Set

Table 688: CFL Meter-level Data Set

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
DI	1	Res DI CFL_2010-11_005_meter	Res_DI_CFL_2010_11_005_DL24_209	5	DL24_209	0.51	1.17	0.59	11	1
DI	2	Res DI CFL_2010-11_005_meter	Res_DI_CFL_2010_11_005_DL24_82	5	DL24_82	0.60	1.17	0.70	11	1
DI	3	Res DI CFL_2010-11_006_meter	Res_DI_CFL_2010_11_006_DL24_123	6	DL24_123	1.47	1.17	1.71	19	1
DI	4	Res DI CFL_2010-11_006_meter	Res_DI_CFL_2010_11_006_DL24_134	6	DL24_134	0.01	1.17	0.01	19	1
DI	5	Res DI CFL_2010-11_006_meter	Res_DI_CFL_2010_11_006_DL24_177	6	DL24_177	0.07	1.17	0.08	19	1
DI	6	Res DI CFL_2010-11_006_meter	Res_DI_CFL_2010_11_006_DL24_89	6	DL24_89	2.45	1.17	2.85	19	1
DI	7	Res DI CFL_2010-11_007_meter	Res_DI_CFL_2010_11_007_DL24_149	7	DL24_149	0.12	1.17	0.14	22	1
DI	8	Res DI CFL_2010-11_007_meter	Res_DI_CFL_2010_11_007_DL24_227	7	DL24_227	3.68	1.17	4.29	22	1
DI	9	Res DI CFL_2010-11_007_meter	Res_DI_CFL_2010_11_007_DL32_46	7	DL32_46	1.07	1.17	1.25	22	1
DI	10	Res DI CFL_2010-11_008_meter	Res_DI_CFL_2010_11_008_DL24_138	8	DL24_138	0.82	1.17	0.95	22	1
DI	11	Res DI CFL_2010-11_008_meter	Res_DI_CFL_2010_11_008_DL24_172	8	DL24_172	0.08	1.17	0.09	22	1
DI	12	Res DI CFL_2010-	Res_DI_CFL_2010_11_008_DL24_218	8	DL24_218		1.17		22	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		11_008_meter				0.16		0.19		
DI	13	Res DI CFL_2010-11_008_meter	Res_DI_CFL_2010_11_008_DL24_237	8	DL24_237	2.58	1.17	3.00	22	1
DI	14	Res DI CFL_2010-11_008_meter	Res_DI_CFL_2010_11_008_DL24_56	8	DL24_56	0.31	1.17	0.37	22	1
DI	15	Res DI CFL_2010-11_009_meter	Res_DI_CFL_2010_11_009_DL24_224	9	DL24_224	8.45	1.17	9.84	10	1
DI	16	Res DI CFL_2010-11_009_meter	Res_DI_CFL_2010_11_009_DL24_51	9	DL24_51	0.60	1.17	0.70	10	1
DI	17	Res DI CFL_2010-11_010_meter	Res_DI_CFL_2010_11_010_DL24_112	10	DL24_112	1.11	1.17	1.30	19	2
DI	18	Res DI CFL_2010-11_010_meter	Res_DI_CFL_2010_11_010_DL24_150	10	DL24_150	0.17	1.17	0.20	19	2
DI	19	Res DI CFL_2010-11_010_meter	Res_DI_CFL_2010_11_010_DL24_170	10	DL24_170	2.03	1.17	2.36	19	2
DI	20	Res DI CFL_2010-11_010_meter	Res_DI_CFL_2010_11_010_DL24_21	10	DL24_21	2.36	1.17	2.75	19	2
DI	21	Res DI CFL_2010-11_012_meter	Res_DI_CFL_2010_11_012_DL24_152	12	DL24_152	0.24	1.17	0.28	8	2
DI	22	Res DI CFL_2010-11_012_meter	Res_DI_CFL_2010_11_012_DL24_217	12	DL24_217	0.01	1.17	0.02	8	2
DI	23	Res DI CFL_2010-11_013_meter	Res_DI_CFL_2010_11_013_DL24_126	13	DL24_126	0.44	1.17	0.51	11	2
DI	24	Res DI CFL_2010-11_013_meter	Res_DI_CFL_2010_11_013_DL26_42	13	DL26_42	0.64	1.17	0.75	11	2
DI	25	Res DI CFL_2010-11_015_meter	Res_DI_CFL_2010_11_015_DL24_130	15	DL24_130	1.06	1.17	1.24	27	1
DI	26	Res DI CFL_2010-	Res_DI_CFL_2010_11_015_DL24_86	15	DL24_86		1.17		27	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		11_015_meter				0.25		0.29		
DI	27	Res DI CFL_2010-11_016_meter	Res_DI_CFL_2010_11_016_DL24_213	16	DL24_213	7.55	1.17	8.80	9	1
DI	28	Res DI CFL_2010-11_016_meter	Res_DI_CFL_2010_11_016_DL24_214	16	DL24_214	0.70	1.17	0.81	9	1
DI	29	Res DI CFL_2010-11_016_meter	Res_DI_CFL_2010_11_016_DL24_236	16	DL24_236	6.40	1.17	7.46	9	1
DI	30	Res DI CFL_2010-11_019_meter	Res_DI_CFL_2010_11_019_DL24_84	19	DL24_84	2.36	1.17	2.75	24	1
DI	31	Res DI CFL_2010-11_020_meter	Res_DI_CFL_2010_11_020_DL24_180	20	DL24_180	0.73	1.17	0.85	24	2
DI	32	Res DI CFL_2010-11_020_meter	Res_DI_CFL_2010_11_020_DL24_26	20	DL24_26	1.77	1.17	2.06	24	2
DI	33	Res DI CFL_2010-11_020_meter	Res_DI_CFL_2010_11_020_DL26_45	20	DL26_45	1.32	1.17	1.54	24	2
DI	34	Res DI CFL_2010-11_025_meter	Res_DI_CFL_2010_11_025_DL24_231	25	DL24_231	1.96	1.17	2.28	10	1
DI	35	Res DI CFL_2010-11_025_meter	Res_DI_CFL_2010_11_025_DL26_80	25	DL26_80	1.62	1.17	1.88	10	1
DI	36	Res DI CFL_2010-11_028_meter	Res_DI_CFL_2010_11_028_DL24_239	28	DL24_239	0.16	1.17	0.19	24	3
DI	37	Res DI CFL_2010-11_028_meter	Res_DI_CFL_2010_11_028_DL24_37	28	DL24_37	0.26	1.17	0.31	24	3
DI	38	Res DI CFL_2010-11_028_meter	Res_DI_CFL_2010_11_028_DL24_74	28	DL24_74	4.20	1.17	4.90	24	3
DI	39	Res DI CFL_2010-11_034_meter	Res_DI_CFL_2010_11_034_DL24_207	34	DL24_207	1.47	1.17	1.71	10	1
DI	40	Res DI CFL_2010-	Res_DI_CFL_2010_11_034_DL24_220	34	DL24_220		1.17		10	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		11_034_meter				1.88		2.19		
DI	41	Res DI CFL_2010-11_036_meter	Res_DI_CFL_2010_11_036_DL24_192	36	DL24_192	0.69	1.17	0.80	4	1
DI	42	Res DI CFL_2010-11_036_meter	Res_DI_CFL_2010_11_036_DL24_58	36	DL24_58	4.68	1.17	5.46	4	1
DI	43	Res DI CFL_2010-11_038_meter	Res_DI_CFL_2010_11_038_DL24_215	38	DL24_215	0.02	1.17	0.02	26	1
DI	44	Res DI CFL_2010-11_038_meter	Res_DI_CFL_2010_11_038_DL32_38	38	DL32_38	0.35	1.17	0.41	26	1
DI	45	Res DI CFL_2010-11_039_meter	Res_DI_CFL_2010_11_039_DL24_122	39	DL24_122	1.48	1.17	1.72	7	1
DI	46	Res DI CFL_2010-11_039_meter	Res_DI_CFL_2010_11_039_DL24_153	39	DL24_153	1.02	1.17	1.19	7	1
DI	47	Res DI CFL_2010-11_039_meter	Res_DI_CFL_2010_11_039_DL26_5	39	DL26_5	7.30	1.17	8.50	7	1
DI	48	Res DI CFL_2010-11_040_meter	Res_DI_CFL_2010_11_040_DL24_161	40	DL24_161	0.93	1.17	1.09	50	1
DI	49	Res DI CFL_2010-11_040_meter	Res_DI_CFL_2010_11_040_DL24_169	40	DL24_169	0.92	1.17	1.07	50	1
DI	50	Res DI CFL_2010-11_040_meter	Res_DI_CFL_2010_11_040_DL24_221	40	DL24_221	0.13	1.17	0.15	50	1
DI	51	Res DI CFL_2010-11_041_meter	Res_DI_CFL_2010_11_041_DL24_162	41	DL24_162	-	1.17	-	10	1
DI	52	Res DI CFL_2010-11_041_meter	Res_DI_CFL_2010_11_041_DL24_203	41	DL24_203	1.06	1.17	1.24	10	1
DI	53	Res DI CFL_2010-11_041_meter	Res_DI_CFL_2010_11_041_DL32_52	41	DL32_52	1.20	1.17	1.39	10	1
DI	54	Res DI CFL_2010-	Res_DI_CFL_2010_11_042_DL24_204	42	DL24_204		1.17		64	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		11_042_meter				0.02		0.02		
DI	55	Res DI CFL_2010-11_042_meter	Res_DI_CFL_2010_11_042_DL24_234	42	DL24_234	0.86	1.17	1.00	64	1
DI	56	Res DI CFL_2010-11_042_meter	Res_DI_CFL_2010_11_042_DL24_60	42	DL24_60	1.00	1.17	1.16	64	1
DI	57	Res DI CFL_2010-11_042_meter	Res_DI_CFL_2010_11_042_DL32_18	42	DL32_18	0.18	1.17	0.21	64	1
DI	58	Res DI CFL_2010-11_043_meter	Res_DI_CFL_2010_11_043_DL24_216	43	DL24_216	1.31	1.17	1.53	6	1
DI	59	Res DI CFL_2010-11_043_meter	Res_DI_CFL_2010_11_043_DL24_235	43	DL24_235	0.08	1.17	0.09	6	1
DI	60	Res DI CFL_2010-11_043_meter	Res_DI_CFL_2010_11_043_DL24_7	43	DL24_7	0.67	1.17	0.78	6	1
DI	61	Res DI CFL_2010-11_049_meter	Res_DI_CFL_2010_11_049_DL24_33	49	DL24_33	2.86	1.17	3.34	19	9
DI	62	Res DI CFL_2010-11_049_meter	Res_DI_CFL_2010_11_049_DL24_39	49	DL24_39	4.03	1.17	4.69	19	9
DI	63	Res DI CFL_2010-11_049_meter	Res_DI_CFL_2010_11_049_DL24_92	49	DL24_92	0.55	1.17	0.64	19	9
Owner	1	Res Owner CFL_2010-11_000_meter	Res_Ow_CFL_2010_11_000_DL24_12	0	DL24_12	1.24	1.17	1.44	24	1
Owner	2	Res Owner CFL_2010-11_000_meter	Res_Ow_CFL_2010_11_000_DL24_129	0	DL24_129	0.04	1.17	0.05	24	1
Owner	3	Res Owner CFL_2010-11_000_meter	Res_Ow_CFL_2010_11_000_DL24_17	0	DL24_17	4.72	1.17	5.50	24	1
Owner	4	Res Owner	Res_Ow_CFL_2010_11_001_DL24_222	1	DL24_222		1.17		8	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_001_meter				0.04		0.04		
Owner	5	Res Owner CFL_2010-11_001_meter	Res_Ow_CFL_2010_11_001_DL24_238	1	DL24_238	1.30	1.17	1.52	8	1
Owner	6	Res Owner CFL_2010-11_001_meter	Res_Ow_CFL_2010_11_001_DL24_24	1	DL24_24	0.62	1.17	0.73	8	1
Owner	7	Res Owner CFL_2010-11_003_meter	Res_Ow_CFL_2010_11_003_DL24_168	3	DL24_168	11.73	1.17	13.67	15	1
Owner	8	Res Owner CFL_2010-11_003_meter	Res_Ow_CFL_2010_11_003_DL24_48	3	DL24_48	1.41	1.17	1.64	15	1
Owner	9	Res Owner CFL_2010-11_003_meter	Res_Ow_CFL_2010_11_003_DL24_9	3	DL24_9	0.58	1.17	0.67	15	1
Owner	10	Res Owner CFL_2010-11_004_meter	Res_Ow_CFL_2010_11_004_DL24_160	4	DL24_160	4.24	1.17	4.94	9	2
Owner	11	Res Owner CFL_2010-11_004_meter	Res_Ow_CFL_2010_11_004_DL24_178	4	DL24_178	2.10	1.17	2.44	9	2
Owner	12	Res Owner CFL_2010-11_004_meter	Res_Ow_CFL_2010_11_004_DL24_80	4	DL24_80	1.54	1.17	1.79	9	2
Owner	13	Res Owner CFL_2010-11_006_meter	Res_Ow_CFL_2010_11_006_DL24_173	6	DL24_173	9.00	1.17	10.49	11	2
Owner	14	Res Owner	Res_Ow_CFL_2010_11_006_DL24_18	6	DL24_18		1.17		11	2

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_006_meter				3.75		4.37		
Owner	15	Res Owner CFL_2010-11_006_meter	Res_Ow_CFL_2010_11_006_DL24_5	6	DL24_5	0.11	1.17	0.13	11	2
Owner	16	Res Owner CFL_2010-11_012_meter	Res_Ow_CFL_2010_11_012_DL24_159	12	DL24_159	0.06	1.17	0.07	10	3
Owner	17	Res Owner CFL_2010-11_012_meter	Res_Ow_CFL_2010_11_012_DL24_182	12	DL24_182	0.20	1.17	0.23	10	3
Owner	18	Res Owner CFL_2010-11_012_meter	Res_Ow_CFL_2010_11_012_DL24_94	12	DL24_94	2.18	1.17	2.54	10	3
Owner	19	Res Owner CFL_2010-11_013_meter	Res_Ow_CFL_2010_11_013_DL24_107	13	DL24_107	0.20	1.17	0.24	10	1
Owner	20	Res Owner CFL_2010-11_013_meter	Res_Ow_CFL_2010_11_013_DL24_193	13	DL24_193	4.12	1.17	4.80	10	1
Owner	21	Res Owner CFL_2010-11_013_meter	Res_Ow_CFL_2010_11_013_DL24_223	13	DL24_223	0.35	1.17	0.41	10	1
Owner	22	Res Owner CFL_2010-11_014_meter	Res_Ow_CFL_2010_11_014_DL24_133	14	DL24_133	0.57	1.17	0.66	22	1
Owner	23	Res Owner CFL_2010-11_014_meter	Res_Ow_CFL_2010_11_014_DL24_43	14	DL24_43	3.83	1.17	4.46	22	1
Owner	24	Res Owner	Res_Ow_CFL_2010_11_014_DL24_76	14	DL24_76		1.17		22	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_014_meter				0.00		0.00		
Owner	25	Res Owner CFL_2010-11_018_meter	Res_Ow_CFL_2010_11_018_DL24_16	18	DL24_16	0.89	1.17	1.04	10	1
Owner	26	Res Owner CFL_2010-11_018_meter	Res_Ow_CFL_2010_11_018_DL24_191	18	DL24_191	16.93	1.17	19.73	10	1
Owner	27	Res Owner CFL_2010-11_018_meter	Res_Ow_CFL_2010_11_018_DL24_75	18	DL24_75	1.64	1.17	1.91	10	1
Owner	28	Res Owner CFL_2010-11_020_meter	Res_Ow_CFL_2010_11_020_DL24_167	20	DL24_167	0.81	1.17	0.95	16	2
Owner	29	Res Owner CFL_2010-11_020_meter	Res_Ow_CFL_2010_11_020_DL24_181	20	DL24_181	0.04	1.17	0.05	16	2
Owner	30	Res Owner CFL_2010-11_020_meter	Res_Ow_CFL_2010_11_020_DL24_35	20	DL24_35	2.52	1.17	2.94	16	2
Owner	31	Res Owner CFL_2010-11_020_meter	Res_Ow_CFL_2010_11_020_DL24_79	20	DL24_79	3.96	1.17	4.61	16	2
Owner	32	Res Owner CFL_2010-11_021_meter	Res_Ow_CFL_2010_11_021_DL24_148	21	DL24_148	0.36	1.17	0.42	17	1
Owner	33	Res Owner CFL_2010-11_021_meter	Res_Ow_CFL_2010_11_021_DL24_15	21	DL24_15	2.10	1.17	2.45	17	1
Owner	34	Res Owner	Res_Ow_CFL_2010_11_021_DL24_69	21	DL24_69		1.17		17	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_021_meter				1.58		1.84		
Owner	35	Res Owner CFL_2010-11_022_meter	Res_Ow_CFL_2010_11_022_DL24_131	22	DL24_131	0.57	1.17	0.66	22	1
Owner	36	Res Owner CFL_2010-11_022_meter	Res_Ow_CFL_2010_11_022_DL24_144	22	DL24_144	0.36	1.17	0.42	22	1
Owner	37	Res Owner CFL_2010-11_022_meter	Res_Ow_CFL_2010_11_022_DL24_85	22	DL24_85	0.65	1.17	0.75	22	1
Owner	38	Res Owner CFL_2010-11_023_meter	Res_Ow_CFL_2010_11_023_DL24_164	23	DL24_164	1.77	1.17	2.06	29	1
Owner	39	Res Owner CFL_2010-11_023_meter	Res_Ow_CFL_2010_11_023_DL24_31	23	DL24_31	0.03	1.17	0.04	29	1
Owner	40	Res Owner CFL_2010-11_023_meter	Res_Ow_CFL_2010_11_023_DL24_59	23	DL24_59	4.38	1.17	5.11	29	1
Owner	41	Res Owner CFL_2010-11_025_meter	Res_Ow_CFL_2010_11_025_DL24_111	25	DL24_111	0.24	1.17	0.28	6	1
Owner	42	Res Owner CFL_2010-11_025_meter	Res_Ow_CFL_2010_11_025_DL24_38	25	DL24_38	0.51	1.17	0.59	6	1
Owner	43	Res Owner CFL_2010-11_025_meter	Res_Ow_CFL_2010_11_025_DL24_99	25	DL24_99	0.03	1.17	0.04	6	1
Owner	44	Res Owner	Res_Ow_CFL_2010_11_026_DL24_115	26	DL24_115		1.17		8	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_026_meter				0.74		0.87		
Owner	45	Res Owner CFL_2010-11_026_meter	Res_Ow_CFL_2010_11_026_DL24_135	26	DL24_135	5.22	1.17	6.08	8	1
Owner	46	Res Owner CFL_2010-11_026_meter	Res_Ow_CFL_2010_11_026_DL32_5	26	DL32_5	0.53	1.17	0.62	8	1
Owner	47	Res Owner CFL_2010-11_027_meter	Res_Ow_CFL_2010_11_027_DL24_166	27	DL24_166	0.40	1.17	0.46	37	1
Owner	48	Res Owner CFL_2010-11_027_meter	Res_Ow_CFL_2010_11_027_DL24_189	27	DL24_189	0.32	1.17	0.37	37	1
Owner	49	Res Owner CFL_2010-11_027_meter	Res_Ow_CFL_2010_11_027_DL24_64	27	DL24_64	0.01	1.17	0.01	37	1
Owner	50	Res Owner CFL_2010-11_027_meter	Res_Ow_CFL_2010_11_027_DL24_70	27	DL24_70	1.95	1.17	2.28	37	1
Owner	51	Res Owner CFL_2010-11_028_meter	Res_Ow_CFL_2010_11_028_DL24_118	28	DL24_118	0.56	1.17	0.65	10	1
Owner	52	Res Owner CFL_2010-11_028_meter	Res_Ow_CFL_2010_11_028_DL24_155	28	DL24_155	0.23	1.17	0.26	10	1
Owner	53	Res Owner CFL_2010-11_028_meter	Res_Ow_CFL_2010_11_028_DL32_14	28	DL32_14	3.56	1.17	4.14	10	1
Owner	54	Res Owner	Res_Ow_CFL_2010_11_031_DL24_137	31	DL24_137		1.17		15	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_031_meter				1.35		1.57		
Owner	55	Res Owner CFL_2010-11_031_meter	Res_Ow_CFL_2010_11_031_DL24_49	31	DL24_49	0.92	1.17	1.07	15	1
Owner	56	Res Owner CFL_2010-11_031_meter	Res_Ow_CFL_2010_11_031_DL32_17	31	DL32_17	0.01	1.17	0.01	15	1
Owner	57	Res Owner CFL_2010-11_033_meter	Res_Ow_CFL_2010_11_033_DL24_179	33	DL24_179	1.90	1.17	2.21	16	2
Owner	58	Res Owner CFL_2010-11_033_meter	Res_Ow_CFL_2010_11_033_DL24_46	33	DL24_46	0.32	1.17	0.37	16	2
Owner	59	Res Owner CFL_2010-11_033_meter	Res_Ow_CFL_2010_11_033_DL24_47	33	DL24_47	1.10	1.17	1.28	16	2
Owner	60	Res Owner CFL_2010-11_034_meter	Res_Ow_CFL_2010_11_034_DL24_117	34	DL24_117	3.02	1.17	3.52	6	1
Owner	61	Res Owner CFL_2010-11_034_meter	Res_Ow_CFL_2010_11_034_DL24_97	34	DL24_97	1.86	1.17	2.17	6	1
Owner	62	Res Owner CFL_2010-11_035_meter	Res_Ow_CFL_2010_11_035_DL24_125	35	DL24_125	0.18	1.17	0.20	4	1
Owner	63	Res Owner CFL_2010-11_035_meter	Res_Ow_CFL_2010_11_035_DL24_40	35	DL24_40	0.00	1.17	0.00	4	1
Owner	64	Res Owner	Res_Ow_CFL_2010_11_035_DL24_71	35	DL24_71		1.17		4	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_035_meter				0.19		0.22		
Owner	65	Res Owner CFL_2010-11_037_meter	Res_Ow_CFL_2010_11_037_DL24_165	37	DL24_165	0.05	1.17	0.06	17	1
Owner	66	Res Owner CFL_2010-11_037_meter	Res_Ow_CFL_2010_11_037_DL24_2	37	DL24_2	0.40	1.17	0.47	17	1
Owner	67	Res Owner CFL_2010-11_037_meter	Res_Ow_CFL_2010_11_037_DL26_54	37	DL26_54	0.37	1.17	0.44	17	1
Owner	68	Res Owner CFL_2010-11_039_meter	Res_Ow_CFL_2010_11_039_DL24_219	39	DL24_219	0.07	1.17	0.08	12	2
Owner	69	Res Owner CFL_2010-11_039_meter	Res_Ow_CFL_2010_11_039_DL26_74	39	DL26_74	15.01	1.17	17.49	12	2
Owner	70	Res Owner CFL_2010-11_039_meter	Res_Ow_CFL_2010_11_039_DL32_9	39	DL32_9	-	1.17	-	12	2
Owner	71	Res Owner CFL_2010-11_041_meter	Res_Ow_CFL_2010_11_041_DL24_114	41	DL24_114	3.14	1.17	3.66	7	1
Owner	72	Res Owner CFL_2010-11_041_meter	Res_Ow_CFL_2010_11_041_DL24_174	41	DL24_174	0.46	1.17	0.54	7	1
Owner	73	Res Owner CFL_2010-11_041_meter	Res_Ow_CFL_2010_11_041_DL24_230	41	DL24_230	0.25	1.17	0.29	7	1
Owner	74	Res Owner	Res_Ow_CFL_2010_11_042_DL24_194	42	DL24_194		1.17		27	2

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_042_meter				1.94		2.26		
Owner	75	Res Owner CFL_2010-11_042_meter	Res_Ow_CFL_2010_11_042_DL24_198	42	DL24_198	1.52	1.17	1.77	27	2
Owner	76	Res Owner CFL_2010-11_043_meter	Res_Ow_CFL_2010_11_043_DL24_142	43	DL24_142	0.13	1.17	0.15	7	1
Owner	77	Res Owner CFL_2010-11_043_meter	Res_Ow_CFL_2010_11_043_DL24_197	43	DL24_197	1.73	1.17	2.02	7	1
Owner	78	Res Owner CFL_2010-11_043_meter	Res_Ow_CFL_2010_11_043_DL26_60	43	DL26_60	0.06	1.17	0.07	7	1
Owner	79	Res Owner CFL_2010-11_050_meter	Res_Ow_CFL_2010_11_050_DL24_145	50	DL24_145	0.91	1.17	1.06	17	1
Owner	80	Res Owner CFL_2010-11_050_meter	Res_Ow_CFL_2010_11_050_DL24_157	50	DL24_157	0.01	1.17	0.01	17	1
Owner	81	Res Owner CFL_2010-11_050_meter	Res_Ow_CFL_2010_11_050_DL24_208	50	DL24_208	0.65	1.17	0.75	17	1
Owner	82	Res Owner CFL_2010-11_054_meter	Res_Ow_CFL_2010_11_054_DL24_151	54	DL24_151	0.89	1.17	1.04	15	1
Owner	83	Res Owner CFL_2010-11_054_meter	Res_Ow_CFL_2010_11_054_DL24_190	54	DL24_190	5.11	1.17	5.95	15	1
Owner	84	Res Owner	Res_Ow_CFL_2010_11_054_DL26_24	54	DL26_24		1.17		15	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_054_meter				1.31		1.53		
Owner	85	Res Owner CFL_2010-11_057_meter	Res_Ow_CFL_2010_11_057_DL24_210	57	DL24_210	0.04	1.17	0.05	10	4
Owner	86	Res Owner CFL_2010-11_057_meter	Res_Ow_CFL_2010_11_057_DL24_211	57	DL24_211	0.56	1.17	0.65	10	4
Owner	87	Res Owner CFL_2010-11_057_meter	Res_Ow_CFL_2010_11_057_DL24_212	57	DL24_212	0.38	1.17	0.44	10	4
Owner	88	Res Owner CFL_2010-11_059_meter	Res_Ow_CFL_2010_11_059_DL24_101	59	DL24_101	0.10	1.17	0.12	11	1
Owner	89	Res Owner CFL_2010-11_059_meter	Res_Ow_CFL_2010_11_059_DL24_120	59	DL24_120	0.99	1.17	1.15	11	1
Owner	90	Res Owner CFL_2010-11_059_meter	Res_Ow_CFL_2010_11_059_DL32_28	59	DL32_28	1.61	1.17	1.87	11	1
Owner	91	Res Owner CFL_2010-11_060_meter	Res_Ow_CFL_2010_11_060_DL24_140	60	DL24_140	0.62	1.17	0.72	5	1
Owner	92	Res Owner CFL_2010-11_060_meter	Res_Ow_CFL_2010_11_060_DL26_44	60	DL26_44	5.00	1.17	5.82	5	1
Owner	93	Res Owner CFL_2010-11_064_meter	Res_Ow_CFL_2010_11_064_DL24_205	64	DL24_205	0.78	1.17	0.91	19	1
Owner	94	Res Owner	Res_Ow_CFL_2010_11_064_DL24_229	64	DL24_229		1.17		19	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_064_meter				0.81		0.94		
Owner	95	Res Owner CFL_2010-11_064_meter	Res_Ow_CFL_2010_11_064_DL24_34	64	DL24_34	0.65	1.17	0.76	19	1
Owner	96	Res Owner CFL_2010-11_066_meter	Res_Ow_CFL_2010_11_066_DL24_105	66	DL24_105	0.09	1.17	0.10	32	3
Owner	97	Res Owner CFL_2010-11_066_meter	Res_Ow_CFL_2010_11_066_DL24_61	66	DL24_61	0.03	1.17	0.03	32	3
Owner	98	Res Owner CFL_2010-11_066_meter	Res_Ow_CFL_2010_11_066_DL32_44	66	DL32_44	0.15	1.17	0.17	32	3
Owner	99	Res Owner CFL_2010-11_068_meter	Res_Ow_CFL_2010_11_068_DL24_14	68	DL24_14	6.31	1.17	7.35	19	1
Owner	100	Res Owner CFL_2010-11_068_meter	Res_Ow_CFL_2010_11_068_DL24_171	68	DL24_171	1.47	1.17	1.71	19	1
Owner	101	Res Owner CFL_2010-11_068_meter	Res_Ow_CFL_2010_11_068_DL24_186	68	DL24_186	1.87	1.17	2.18	19	1
Owner	102	Res Owner CFL_2010-11_068_meter	Res_Ow_CFL_2010_11_068_DL32_45	68	DL32_45	-	1.17	-	19	1
Owner	103	Res Owner CFL_2010-11_069_meter	Res_Ow_CFL_2010_11_069_DL24_196	69	DL24_196	0.04	1.17	0.04	17	1
Owner	104	Res Owner	Res_Ow_CFL_2010_11_069_DL24_228	69	DL24_228		1.17		17	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_069_meter				0.82		0.95		
Owner	105	Res Owner CFL_2010-11_069_meter	Res_Ow_CFL_2010_11_069_DL24_6	69	DL24_6	0.60	1.17	0.70	17	1
Owner	106	Res Owner CFL_2010-11_069_meter	Res_Ow_CFL_2010_11_069_DL26_75	69	DL26_75	0.20	1.17	0.23	17	1
Owner	107	Res Owner CFL_2010-11_071_meter	Res_Ow_CFL_2010_11_071_DL24_199	71	DL24_199	1.85	1.17	2.16	12	1
Owner	108	Res Owner CFL_2010-11_071_meter	Res_Ow_CFL_2010_11_071_DL24_68	71	DL24_68	0.32	1.17	0.37	12	1
Owner	109	Res Owner CFL_2010-11_071_meter	Res_Ow_CFL_2010_11_071_DL26_34	71	DL26_34	0.33	1.17	0.38	12	1
Owner	110	Res Owner CFL_2010-11_073_meter	Res_Ow_CFL_2010_11_073_DL24_1	73	DL24_1	0.27	1.17	0.31	19	1
Owner	111	Res Owner CFL_2010-11_073_meter	Res_Ow_CFL_2010_11_073_DL24_3	73	DL24_3	23.98	1.00	23.98	19	1
Owner	112	Res Owner CFL_2010-11_073_meter	Res_Ow_CFL_2010_11_073_DL32_15	73	DL32_15	3.42	1.17	3.99	19	1
Owner	113	Res Owner CFL_2010-11_074_meter	Res_Ow_CFL_2010_11_074_DL24_187	74	DL24_187	4.34	1.17	5.06	19	1
Owner	114	Res Owner	Res_Ow_CFL_2010_11_074_DL24_23	74	DL24_23		1.17		19	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_074_meter				0.06		0.07		
Owner	115	Res Owner CFL_2010-11_074_meter	Res_Ow_CFL_2010_11_074_DL24_44	74	DL24_44	1.50	1.17	1.75	19	1
Owner	116	Res Owner CFL_2010-11_075_meter	Res_Ow_CFL_2010_11_075_DL24_136	75	DL24_136	0.16	1.17	0.19	12	1
Owner	117	Res Owner CFL_2010-11_075_meter	Res_Ow_CFL_2010_11_075_DL24_240	75	DL24_240	-	1.17	-	12	1
Owner	118	Res Owner CFL_2010-11_075_meter	Res_Ow_CFL_2010_11_075_DL24_52	75	DL24_52	0.07	1.17	0.08	12	1
Owner	119	Res Owner CFL_2010-11_076_meter	Res_Ow_CFL_2010_11_076_DL24_19	76	DL24_19	0.03	1.17	0.04	5	1
Owner	120	Res Owner CFL_2010-11_076_meter	Res_Ow_CFL_2010_11_076_DL24_72	76	DL24_72	0.08	1.17	0.09	5	1
Owner	121	Res Owner CFL_2010-11_076_meter	Res_Ow_CFL_2010_11_076_DL32_11	76	DL32_11	0.10	1.17	0.12	5	1
Owner	122	Res Owner CFL_2010-11_079_meter	Res_Ow_CFL_2010_11_079_DL32_26	79	DL32_26	0.06	1.17	0.07	7	1
Owner	123	Res Owner CFL_2010-11_079_meter	Res_Ow_CFL_2010_11_079_DL32_3	79	DL32_3	1.29	1.17	1.51	7	1
Owner	124	Res Owner	Res_Ow_CFL_2010_11_079_DL32_47	79	DL32_47		1.17		7	1

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_079_meter				2.67		3.12		
Owner	125	Res Owner CFL_2010-11_092_meter	Res_Ow_CFL_2010_11_092_DL24_11	92	DL24_11	13.88	1.17	16.17	22	9
Owner	126	Res Owner CFL_2010-11_092_meter	Res_Ow_CFL_2010_11_092_DL24_36	92	DL24_36	0.56	1.17	0.65	22	9
Owner	127	Res Owner CFL_2010-11_092_meter	Res_Ow_CFL_2010_11_092_DL24_53	92	DL24_53	0.36	1.17	0.42	22	9
Owner	128	Res Owner CFL_2010-11_093_meter	Res_Ow_CFL_2010_11_093_DL24_102	93	DL24_102	0.54	1.17	0.63	30	9
Owner	129	Res Owner CFL_2010-11_093_meter	Res_Ow_CFL_2010_11_093_DL24_128	93	DL24_128	0.84	1.17	0.98	30	9
Owner	130	Res Owner CFL_2010-11_093_meter	Res_Ow_CFL_2010_11_093_DL24_139	93	DL24_139	1.91	1.17	2.23	30	9
Owner	131	Res Owner CFL_2010-11_097_meter	Res_Ow_CFL_2010_11_097_DL24_188	97	DL24_188	1.56	1.17	1.81	22	9
Owner	132	Res Owner CFL_2010-11_097_meter	Res_Ow_CFL_2010_11_097_DL24_8	97	DL24_8	0.02	1.17	0.02	22	9
Owner	133	Res Owner CFL_2010-11_100_meter	Res_Ow_CFL_2010_11_100_DL24_176	100	DL24_176	1.68	1.17	1.95	22	9
Owner	134	Res Owner	Res_Ow_CFL_2010_11_100_DL24_232	100	DL24_232		1.17		22	9

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_100_meter				0.04		0.05		
Owner	135	Res Owner CFL_2010-11_100_meter	Res_Ow_CFL_2010_11_100_DL24_93	100	DL24_93	1.74	1.17	2.03	22	9
Owner	136	Res Owner CFL_2010-11_101_meter	Res_Ow_CFL_2010_11_101_DL24_132	101	DL24_132	0.12	1.17	0.14	22	4
Owner	137	Res Owner CFL_2010-11_101_meter	Res_Ow_CFL_2010_11_101_DL24_91	101	DL24_91	-	1.17	-	22	4
Owner	138	Res Owner CFL_2010-11_101_meter	Res_Ow_CFL_2010_11_101_DL24_96	101	DL24_96	0.14	1.17	0.16	22	4
Owner	139	Res Owner CFL_2010-11_102_meter	Res_Ow_CFL_2010_11_102_DL24_175	102	DL24_175	0.54	1.17	0.63	22	9
Owner	140	Res Owner CFL_2010-11_102_meter	Res_Ow_CFL_2010_11_102_DL24_184	102	DL24_184	0.06	1.17	0.07	22	9
Owner	141	Res Owner CFL_2010-11_102_meter	Res_Ow_CFL_2010_11_102_DL24_73	102	DL24_73	1.12	1.17	1.31	22	9
Owner	142	Res Owner CFL_2010-11_103_meter	Res_Ow_CFL_2010_11_103_DL24_113	103	DL24_113	0.35	1.17	0.41	15	5
Owner	143	Res Owner CFL_2010-11_103_meter	Res_Ow_CFL_2010_11_103_DL24_98	103	DL24_98	6.28	1.17	7.32	15	5
Owner	144	Res Owner	Res_Ow_CFL_2010_11_104_DL24_202	104	DL24_202		1.17		33	9

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_104_meter				0.26		0.31		
Owner	145	Res Owner CFL_2010-11_104_meter	Res_Ow_CFL_2010_11_104_DL24_54	104	DL24_54	0.21	1.17	0.25	33	9
Owner	146	Res Owner CFL_2010-11_105_meter	Res_Ow_CFL_2010_11_105_DL24_119	105	DL24_119	1.99	1.17	2.31	33	9
Owner	147	Res Owner CFL_2010-11_105_meter	Res_Ow_CFL_2010_11_105_DL24_77	105	DL24_77	2.08	1.17	2.42	33	9
Owner	148	Res Owner CFL_2010-11_105_meter	Res_Ow_CFL_2010_11_105_DL24_78	105	DL24_78	2.26	1.17	2.64	33	9
Owner	149	Res Owner CFL_2010-11_107_meter	Res_Ow_CFL_2010_11_107_DL24_100	107	DL24_100	5.22	1.17	6.08	15	5
Owner	150	Res Owner CFL_2010-11_107_meter	Res_Ow_CFL_2010_11_107_DL24_57	107	DL24_57	4.65	1.17	5.42	15	5
Owner	151	Res Owner CFL_2010-11_107_meter	Res_Ow_CFL_2010_11_107_DL24_83	107	DL24_83	2.49	1.17	2.90	15	5
Owner	152	Res Owner CFL_2010-11_108_meter	Res_Ow_CFL_2010_11_108_DL24_233	108	DL24_233	3.37	1.17	3.92	18	4
Owner	153	Res Owner CFL_2010-11_108_meter	Res_Ow_CFL_2010_11_108_DL26_67	108	DL26_67	-	1.17	-	18	4
Owner	154	Res Owner	Res_Ow_CFL_2010_11_108_DL26_71	108	DL26_71	-	1.17		18	4

Domain	#	Output File Name	Output Sheet Name	Site ID	Logger ID	Metered hours of use per day (HOU), raw	HOU adjustment factor	Adjusted annual avg. HOU	Total # of CFLs at site	Stratum
		CFL_2010-11_108_meter						-		
Owner	155	Res Owner CFL_2010-11_109_meter	Res_Ow_CFL_2010_11_109_DL24_10	109	DL24_10	10.22	1.17	11.90	13	5
Owner	156	Res Owner CFL_2010-11_109_meter	Res_Ow_CFL_2010_11_109_DL24_28	109	DL24_28	1.04	1.17	1.21	13	5
Owner	157	Res Owner CFL_2010-11_109_meter	Res_Ow_CFL_2010_11_109_DL24_55	109	DL24_55	2.21	1.17	2.58	13	5

33.4. Savings Persistence

Table 689: Persistence Study On-Site Visits - Supporting Data

		EULs for failed measures		Measure in place and operational?					Yielding >50% savings?				Future changes affecting measure?				
#	Program name	Count	Average	Yes	Partially	No	Don't know	Total	Yes	No	Don't know	Total	Yes	No	Don't know	N/A	Total
1	E+ Residential Lighting	5	1.4	5	2	6	3	**16**	7	7	2	**16**	0	8	7	1	**16**
2	E+ Audit Home or Business	-		5	8	1	0	**14**	12	2	0	**14**	0	13	1	0	**14**
3	E+ Residential Lighting	2	1.0	2	4	2	2	**10**	5	2	3	**10**	0	7	3	0	**10**
5	E+ Renewable	-		7	1	0	0	**8**	8	0	0	**8**	1	7	0	0	**8**
7	E+ Business Partners	-		6	3	0	0	**9**	9	0	0	**9**	2	7	0	0	**9**
8	E+ Residential Existing Gas Rebate	1	1.0	5	0	1	0	**6**	3	3	0	**6**	0	6	0	0	**6**
9	E+ Residential Existing Electric Rebate	1	-	1	0	1	0	**2**	1	1	0	**2**	0	2	0	0	**2**
10	E+ Commercial Lighting	1	3.0	10	7	2	0	**19**	13	6	0	**19**	0	19	0	0	**19**
11	E+ Audit Home or Business	2	3.0	3	0	7	0	**10**	3	7	0	**10**	0	7	2	1	**10**
12	E+ Commercial Lighting	3	1.3	0	1	7	0	**8**	0	8	0	**8**	0	8	0	0	**8**
13	E+ Renewable	-		7	0	1	0	**8**	5	1	2	**8**	0	6	2	0	**8**
14	E+ Irrigation	-		3	0	0	0	**3**	3	0	0	**3**	1	2	0	0	**3**
16	E+ Electric Motor/Rewind Rebate	-		2	0	0	1	**3**	2	0	1	**3**	0	2	1	0	**3**
17	Vending Miser	-		2	1	0	0	**3**	3	0	0	**3**	0	3	0	0	**3**
TOTAL		**15**	**1.5**	**58**	**27**	**28**	**6**	**119**	**74**	**37**	**8**	**119**	**4**	**97**	**16**	**2**	**119**

Table 690: Persistence Study On-Site Visits - Example Field Notes

Key	CI Custom1	Com Audit Electric13	Com DI CFL4	Com Rebate Lighting3	Res Rebate Electric2	Res Renewable17	Vending Miser DI4
MeasureType	Premium efficiency motor, VFD and Boiler integration controls on water loop	Audit	CFL	Occupancy Sensors	Thermostat Control	Photovoltaic	VendingMiser
TrkCity	BILLIINGS	Helena	MISSOULA	DUTTON	BILLINGS	ENNIS	Butte
Notes	All measures working well, they're very busy so may be hard to track down	No implementation re $$ per customer, recovering from heart attack	0	Customer says fine, 8-4	Customer cell phone	They're working out fine	Customer cell xxx xxx xxxx will double check & cb
Pers_Op_YesNo	Yes	No	No	Partially	Yes	Yes	Partially
Pers_Op_Installed	Approval to pay rebate 9/1/2006	Audit conducted 2/14/08 according to program docs	7/5/2007	Project documentation says Feb 2007	Purchased 4/26/07 according to program docs	Nov. 2007	8/17/2006 per project documentation
Pers_Op_Details	0	No DI and no recommendations were ever installed (due to lack of $$).	CFLs replaced at burnout	one occ sensor disabled (secretary's office)	No changes. Still installed and working.	No changes	One out of the 4 vending machines has been removed
Pers_Op_Timing	0	NA	Replacement at end of EUL	Shortly after installation	NA	NA	Respondent did not know one had been removed
Pers_Svgs_50Pct	Yes	No	No	Yes	Yes	Yes	Yes
Pers_Svgs_Details	Fully functional; with building controls and economizer,	No DI and no recommendations were ever installed	Duration of installation exceeds EUL	35 of 36 occ sensors in place and working.	No reason for any changes in savings status	The System has produced 11,392 kWh since start up	3 out of 4 still installed. Of the 3 still installed, 2 had a green light on, 1 had no light on. All

Key	CI Custom1	Com Audit Electric13	Com DI CFL4	Com Rebate Lighting3	Res Rebate Electric2	Res Renewable17	Vending Miser DI4
	approx. 6000 hours run time per year.	(due to lack of $$).			since '07		were plugged in.
Pers_Fut_Changes	no	Don't know	No	No	No	No	No
Pers_Fut_Timing	0	NA	NA	na	NA	NA	0
Pers_Fut_Savings	0	NA	NA	na	NA	NA	0
Pers_InfoSources	0	Conversation with owner during recruiting call.	Interview, documentation	Interview, project documentation	Visual inspection and discussion with home owner.	Site visit and interview with the home owner.	Visual inspection, discussed with customer, facilities representative
Pers_OtherNotes	VFD worked so well they added VFD to the second motor	No site visit required. Info gathered during recruiting call.	Original bulbs burned out; replaced with CFLs	na	NA	Notes: The pole-mounted PV array is oriented at 168 degrees and had an annual shading factor of about 0.95 due to pine trees to the West of the array. The homeowner is very happy with the performance of the solar system.	0

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