

**Montana-Dakota Utilities Co.  
Gas Utility - South Dakota  
Conservation Portfolio Summary  
2012 - 2014 Program Years**

<u>Programs</u>	<u>Total Participants</u>	<u>Total Energy Reduction</u>	<u>Total Cost</u>	<u>Lifetime Cost/Dk</u>
<b>Conservation Programs</b>				
<b>Residential Program</b>				
Furnaces - 92-94% AFUE	21	4,464	\$3,962	\$0.89
Furnaces - 95+% AFUE - New	57	7,290	21,211	2.91
Furnaces - 95+% AFUE - Replacement	585	137,952	218,795	1.59
Furnace Tune-Up	195	1,132	10,084	8.91
Water Heating (.62 EF)	78	1,090	4,984	4.57
Water Heating (.67 EF)	20	720	2,504	3.48
	<u>956</u>	<u>152,648</u>	<u>\$261,540</u>	1.71
<b>Commercial Program</b>				
Furnaces - 92-94% AFUE	18	6,732	\$3,319	\$0.49
Furnaces - 95+% AFUE - New	23	5,130	8,514	1.66
Furnaces - 95+% AFUE - Replacement	30	12,420	11,101	0.89
Custom Efficiency	18	27,000	13,278	0.49
	<u>89</u>	<u>51,282</u>	<u>\$36,212</u>	0.71
<b>Energy Audit Program Costs</b>			\$33,000	
<b>Total Programs</b>	<u><u>1,045</u></u>	<u><u>203,930</u></u>	<u><u>\$330,752</u></u>	\$1.62

**Montana-Dakota Utilities Co.  
Gas Utility - South Dakota  
Conservation Portfolio Summary  
2012 - 2014 Program Years**

Programs	2012			2013			2014			Lifetime
	Participants	Cost	Dk Savings	Participants	Cost	Dk Savings	Participants	Cost	Dk Savings	Dk Savings
<b>Residential Program</b>										
Furnaces - 92-94% AFUE	7	\$1,362	83	7	\$1,321	83	7	\$1,279	83	4,464
Furnaces - 95+% AFUE - New	12	4,643	85	19	7,125	135	26	9,443	185	7,290
Furnaces - 95+% AFUE - Repl.	170	65,779	2,227	195	73,121	2,555	220	79,895	2,882	137,952
Furnace Tune-Up	50	2,678	145	65	3,376	189	80	4,030	232	1,132
Water Heating (.62 EF)	17	1,128	24	25	1,609	35	36	2,247	50	1,090
Water Heating (.67 EF)	3	392	11	7	886	25	10	1,226	36	720
<b>Total Residential</b>	<b>259</b>	<b>\$75,982</b>	<b>2,575</b>	<b>318</b>	<b>\$87,438</b>	<b>3,022</b>	<b>379</b>	<b>\$98,120</b>	<b>3,468</b>	<b>152,648</b>
<b>Commercial Program</b>										
Furnaces - 92-94% AFUE	3	\$577	62	6	\$1,118	125	9	\$1,624	187	6,732
Furnaces - 95+% AFUE - New	5	1,923	62	8	2,982	99	10	3,609	124	5,130
Furnaces - 95+% AFUE - Repl.	7	2,693	161	9	3,355	207	14	5,053	322	12,420
Custom Efficiency	3	2,308	300	6	4,473	600	9	6,497	900	27,000
<b>Total Commercial</b>	<b>18</b>	<b>\$7,501</b>	<b>585</b>	<b>29</b>	<b>\$11,928</b>	<b>1,031</b>	<b>42</b>	<b>\$16,783</b>	<b>1,533</b>	<b>51,282</b>
<b>Energy Audit Program Costs</b>		<b>\$7,000</b>			<b>\$12,000</b>			<b>\$14,000</b>		
<b>Total Programs</b>	<b>277</b>	<b>\$90,483</b>	<b>3,160</b>	<b>347</b>	<b>\$111,366</b>	<b>4,053</b>	<b>421</b>	<b>\$128,903</b>	<b>5,001</b>	<b>203,930</b>

Montana-Dakota Utilities Co.  
 South Dakota Gas DSM Program Summary

Benefit/Cost Ratios

Program	Customer Class	RIM	Utility	Societal	Participant	Total Resource Cost
Total Portfolio		1.75	2.69	2.54	3.57	1.60
Furnace (92-94%)	Residential	2.27	4.36	2.50	2.50	1.53
Furnace (95+%)- New	Residential	1.05	1.34	1.56	2.90	1.00
Furnace (95+%)- Replacement	Residential	1.61	2.44	2.54	3.78	1.59
Furnace Tune-Up	Residential	0.58	0.65	0.44	1.08	0.37
Water Heating (.62 EF)	Residential	0.85	1.04	1.46	2.80	1.04
Water Heating (.67 EF)	Residential	1.06	1.36	1.92	3.32	1.36
Furnace (92-94%)	Commercial	3.43	7.91	4.46	4.01	2.73
Furnace (95+%)- New	Commercial	1.70	2.35	2.45	3.62	1.54
Furnace (95+%)- Replacement	Commercial	2.54	4.36	4.21	5.14	2.61
Custom Efficiency	Commercial	3.55	8.52	3.11	2.88	2.01

**NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Total South Dakota Program**  
 Program Years: **2012 - 2014**

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =			
Escalation Rate =			
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =			
Escalation Rate =			
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =			
3) Commodity Cost (\$/Dk) =			
Escalation Rate =			
4) Demand Cost (\$/Unit/Yr) =			
Escalation Rate =			
5) Peak Reduction Factor =			
6) Variable O&M (\$/Dk) =			
Escalation Rate =			
7) Non-Gas Fuel Cost (\$/Fuel Unit) =			
Escalation Rate =			
8) Non-Gas Fuel Loss Factor			
9) Gas Environmental Damage Factor =			
Escalation Rate =			
10) Non Gas Fuel Environmental Damage Factor =			
Escalation Rate =			
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 =	2012		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs = 1/	\$25,833	\$31,966	\$34,103
16b) Incentive Costs =	64,650	79,400	94,800
16c) Total Utility Project Costs =	\$90,483	\$111,366	\$128,903
17) Direct Participant Costs (\$/Part.) =			
18) Participant Non-Energy Costs (Annual \$/Part.) =			
Escalation Rate =			
19) Participant Non-Energy Savings (Annual \$/Part) =			
Escalation Rate =			
20) Project Life (Years) =			
21) Avg. Dk/Part. Saved =			
22) Avg Non-Gas Fuel Units/Part. Saved =			
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =			
23) Number of Participants =	277	347	421
24) Total Annual Dk Saved =	3,160	4,053	5,001
25) Incentive/Participant =			
26) Distribution Delivery Charge			
27) Effective Income Tax Rate =			
(Federal & State Taxes)			

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$314,123	1.75
Utility Cost Test	\$459,609	2.69
Societal Test	\$858,380	2.54
Participant Test	\$1,214,079	3.57
Total Resource Cost Test	\$318,417	1.60

1/ Energy Audit program costs of \$7,000, \$12,000, and \$14,000 per year included with Total Program tests only.

**Table 1**  
**Ratepayer Impact Measure Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Total South Dakota Program**

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Dmd Savings /Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Loss Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
1	2012	3,160		\$14,423	\$0	\$14,423	32.0		\$3,917	\$18,340	\$3,574	\$18,833	\$64,650	\$87,057	(\$68,717)	
2	2013	7,212	34,069	34,069	0	34,069	72.0	9,097	43,166	8,369	19,966	79,400	107,735	(64,569)		
3	2014	12,068	58,998	58,998	0	58,998	121.0	15,329	74,327	14,375	20,103	94,800	129,278	(54,951)		
4	2015	11,879	60,120	60,120	0	60,120	119.0	15,207	75,327	14,631	0	0	14,631	60,696		
5	2016	11,647	61,006	61,006	0	61,006	117.0	15,028	76,034	14,827	0	0	14,827	61,207		
6	2017	11,647	63,138	63,138	0	63,138	117.0	15,263	78,401	15,346	0	0	15,346	63,055		
7	2018	11,647	65,353	65,353	0	65,353	117.0	15,377	80,730	15,878	0	0	15,878	64,852		
8	2019	11,647	67,635	67,635	0	67,635	117.0	15,495	83,130	16,437	0	0	16,437	66,693		
9	2020	11,647	69,999	69,999	0	69,999	117.0	15,731	85,730	17,011	0	0	17,011	68,719		
10	2021	11,647	72,457	72,457	0	72,457	117.0	15,844	88,301	17,611	0	0	17,611	70,690		
11	2022	11,612	74,758	74,758	0	74,758	116.0	15,919	90,677	18,164	0	0	18,164	72,513		
12	2023	11,552	76,982	76,982	0	76,982	116.0	16,069	93,051	18,698	0	0	18,698	74,353		
13	2024	11,466	79,081	79,081	0	79,081	115.0	16,058	95,139	19,202	0	0	19,202	75,937		
14	2025	11,466	81,844	81,844	0	81,844	115.0	16,287	98,131	19,873	0	0	19,873	78,258		
15	2026	11,466	84,711	84,711	0	84,711	115.0	16,403	101,114	20,569	0	0	20,569	80,545		
16	2027	11,166	85,386	85,386	0	85,386	112.0	16,085	101,471	20,827	0	0	20,827	80,644		
17	2028	10,566	83,631	83,631	0	83,631	106.0	15,432	99,063	20,596	0	0	20,596	78,467		
18	2029	9,666	79,184	79,184	0	79,184	97.0	14,215	93,399	19,831	0	0	19,831	73,568		
19	2030	6,986	59,228	59,228	0	59,228	70.0	10,416	69,644	14,790	0	0	14,790	54,854		
20	2031	3,783	33,196	33,196	0	33,196	38.0	5,670	38,866	8,261	0	0	8,261	30,605		
21	2032	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	
22	2033	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	
Total =		203,930							\$1,584,041					\$616,622	\$967,419	
Total NPV =			\$314,123						\$731,122					\$416,999	\$314,123	
Benefit/Cost Ratio =			1.75						NPV =							

**Worksheet Calculations**

(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)  
 (B) = Commodity Cost (3) escalated  
 (C) = (A) x (B)  
 (D) = Variable O&M Cost (6), escalated  
 (E) = (A) x (D)  
 (F) = (C) + (E)  
 (G) = (A) x Peak Reduction Factor (5)  
 (H) = Demand Cost (4) escalated.  
 (I) = (G) x (H)  
 (J) = (F) + (I)  
 (K) = Distribution Delivery Charge (26) escalated.  
 (L) = (A) x (K) x (1-Inverse of Tax Rate (27))  
 (M) = Admin & Operating Costs (16a)  
 (N) = Incentive Costs (16b)  
 (O) = (L) + (M) + (N)  
 (P) = (J) - (O)

Table 2  
Utility Cost Test

Company: Montana-Dakota Utilities Co.  
Project: Total South Dakota Program

Year	Benefits			Costs				Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)		
2012	\$14,423	\$3,917	\$18,340	\$18,833	\$64,650	\$83,483	(\$65,143)	
2013	34,069	9,097	43,166	19,966	79,400	99,366	(56,200)	
2014	58,998	15,329	74,327	20,103	94,800	114,903	(40,576)	
2015	60,120	15,207	75,327	0	0	0	75,327	
2016	61,006	15,028	76,034	0	0	0	76,034	
2017	63,138	15,263	78,401	0	0	0	78,401	
2018	65,353	15,377	80,730	0	0	0	80,730	
2019	67,635	15,495	83,130	0	0	0	83,130	
2020	69,999	15,731	85,730	0	0	0	85,730	
2021	72,457	15,844	88,301	0	0	0	88,301	
2022	74,758	15,919	90,677	0	0	0	90,677	
2023	76,982	16,069	93,051	0	0	0	93,051	
2024	79,081	16,058	95,139	0	0	0	95,139	
2025	81,844	16,287	98,131	0	0	0	98,131	
2026	84,711	16,403	101,114	0	0	0	101,114	
2027	85,386	16,085	101,471	0	0	0	101,471	
2028	83,631	15,432	99,063	0	0	0	99,063	
2029	79,184	14,215	93,399	0	0	0	93,399	
2030	59,228	10,416	69,644	0	0	0	69,644	
2031	33,196	5,670	38,866	0	0	0	38,866	
2032	0	0	0	0	0	0	0	
2033	0	0	0	0	0	0	0	
Total =			\$1,584,041			\$297,752	\$1,286,289	
			\$731,122			\$271,513	\$459,609	
Total NPV =			\$459,609					
Benefit/Cost Ratio =			2.69					

Worksheet Calculations

(A) = Table 1 (F)  
 (B) = Table 1 (I)  
 (C) = Table 1 (J)  
 (D) = Table 1 (M)  
 (E) = Table 1 (N)  
 (F) = (D) + (E)  
 (G) = (C) - (F)

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Total South Dakota Program

Year	Benefits					Costs				Annual Benefits Less Costs (K)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	
2012	\$14,423	\$3,917		\$2,856	\$3,289	\$24,485	\$83,483	\$74,780	\$158,263	(\$133,778)
2013	34,069	9,097		6,539	7,681	57,366	99,366	95,470	194,836	(137,450)
2014	58,998	15,329		11,159	13,154	98,640	114,903	116,800	231,703	(133,063)
2015	60,120	15,207		11,624	13,246	100,197	0	0	0	100,197
2016	61,006	15,028		12,088	13,289	101,411	0	0	0	101,411
2017	63,138	15,263		12,554	13,592	104,547	0	0	0	104,547
2018	65,353	15,377		13,019	13,907	107,656	0	0	0	107,656
2019	67,635	15,495		13,484	14,222	110,836	0	0	0	110,836
2020	69,999	15,731		13,949	14,547	114,226	0	0	0	114,226
2021	72,457	15,844		14,413	14,885	117,599	0	0	0	117,599
2022	74,758	15,919		14,878	15,177	120,732	0	0	0	120,732
2023	76,982	16,069		15,343	15,446	123,840	0	0	0	123,840
2024	79,081	16,058		15,808	15,685	126,632	0	0	0	126,632
2025	81,844	16,287		16,274	16,053	130,458	0	0	0	130,458
2026	84,711	16,403		16,739	16,420	134,273	0	0	0	134,273
2027	85,386	16,085		17,669	16,359	135,499	0	0	0	135,499
2028	83,631	15,432		18,133	15,829	133,025	0	0	0	133,025
2029	79,184	14,215		18,598	14,818	126,815	0	0	0	126,815
2030	59,228	10,416		14,077	10,954	94,675	0	0	0	94,675
2031	33,196	5,670		7,768	6,068	52,702	0	0	0	52,702
2032	0	0		0	0	0	0	0	0	0
2033	0	0		0	0	0	0	0	0	0
Total =						\$2,115,634			\$584,802	\$1,530,832
Total NPV =		\$858,380			NPV =	\$1,416,732			\$558,352	\$858,380
Benefit/Cost Ratio =		<u>2.54</u>								

Total NPV = \$858,380  
Benefit/Cost Ratio = 2.54

Worksheet Calculations	
(A) = Table 1 (F)	(H) = Table 2 (F)
(G) = Table 1 (I)	(I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
(C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..	(J) = (H) + (I)
(D) = (C) x (Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)	(K) = (G) - (J)
(E) = Gas Environmental Damage Factor (9), escalated	
(F) = Table 1 (A) x (E)	
(G) = (A) + (B) + (D) + (F)	

Table 4  
Participant Test

Company: Montana-Dakota Utilities Co.  
Project: Total South Dakota Program

Year	Benefits					Costs		Annual Benefits Less Costs (I)	
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate Savings (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)		Direct Participant Costs (H)
2012	\$64,650	3,160		\$24,994		\$13,765	\$103,409	\$139,430	(\$36,021)
2013	79,400	7,212		58,920		31,030	169,350	174,870	(5,520)
2014	94,800	12,068		101,862		52,611	249,273	211,600	37,673
2015	0	11,879		103,749		54,471	158,220	0	158,220
2016	0	11,647		105,256		56,331	161,587	0	161,587
2017	0	11,647		108,935		58,191	167,126	0	167,126
2018	0	11,647		112,750		60,514	173,264	0	173,264
2019	0	11,647		116,702		62,376	179,078	0	179,078
2020	0	11,647		120,780		64,700	185,480	0	185,480
2021	0	11,647		125,009		67,025	192,034	0	192,034
2022	0	11,612		128,992		69,349	198,341	0	198,341
2023	0	11,552		132,805		71,673	204,478	0	204,478
2024	0	11,466		136,419		74,463	210,882	0	210,882
2025	0	11,466		141,191		76,789	217,980	0	217,980
2026	0	11,466		146,133		79,578	225,711	0	225,711
2027	0	11,166		147,433		82,369	229,802	0	229,802
2028	0	10,566		144,700		85,193	229,893	0	229,893
2029	0	9,666		137,519		87,982	225,501	0	225,501
2030	0	6,986		102,802		65,775	168,577	0	168,577
2031	0	3,783		57,573		36,716	94,289	0	94,289
2032	0	0		0		0	0	0	0
2033	10	0		0		0	10	0	10
Total =		203,930					\$3,744,285	\$525,900	\$3,218,385
Total NPV =							\$1,687,358	\$473,279	1,214,079
Benefit/Cost Ratio =							NPV =		

Total NPV = \$1,214,079  
Benefit/Cost Ratio = 3.57

Worksheet Calculations	
(A) =	Table 1 (N)
(B) =	Table 1 (A)
(C) =	Retail Rate (1) escalated.
(D) =	(B) x (C)
(E) =	Non-Gas Fuel Retail Rate (2), escalated.
(F) =	(C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
(G) =	(A) + (D) + (F)
(H) =	Direct Participant Costs (17) x Number of Participants (23)
(I) =	(G) - (H)



**Table 5  
Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project **Total South Dakota Program**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$14,423	\$3,917	\$2,856	\$21,196	\$83,483	\$74,780	\$158,263	(\$137,067)
2013	34,069	9,097	6,539	49,705	99,366	95,470	194,836	(145,131)
2014	58,998	15,329	11,159	85,486	114,903	116,800	231,703	(146,217)
2015	60,120	15,207	11,624	86,951	0	0	0	86,951
2016	61,006	15,028	12,088	88,122	0	0	0	88,122
2017	63,138	15,263	12,554	90,955	0	0	0	90,955
2018	65,353	15,377	13,019	93,749	0	0	0	93,749
2019	67,635	15,495	13,484	96,614	0	0	0	96,614
2020	69,999	15,731	13,949	99,679	0	0	0	99,679
2021	72,457	15,844	14,413	102,714	0	0	0	102,714
2022	74,758	15,919	14,878	105,555	0	0	0	105,555
2023	76,982	16,069	15,343	108,394	0	0	0	108,394
2024	79,081	16,058	15,808	110,947	0	0	0	110,947
2025	81,844	16,287	16,274	114,405	0	0	0	114,405
2026	84,711	16,403	16,739	117,853	0	0	0	117,853
2027	85,386	16,085	17,669	119,140	0	0	0	119,140
2028	83,631	15,432	18,133	117,196	0	0	0	117,196
2029	79,184	14,215	18,598	111,997	0	0	0	111,997
2030	59,228	10,416	14,077	83,721	0	0	0	83,721
2031	33,196	5,670	7,768	46,634	0	0	0	46,634
2032	0	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0	0
			Total =	\$1,851,013			\$584,802	\$1,266,211
			NPV =	\$850,762			\$532,345	318,417

Total NPV = \$318,417  
Benefit/Cost Ratio = 1.60

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Residential 92-94% AFUE Furnace  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =			
Escalation Rate =	\$7.713		
	3.50%		
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =			
Escalation Rate =	\$0.10200		
	3.50%		
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	Kwh		
3) Commodity Cost (\$/Dk) =	\$4.410		
Escalation Rate =	3.50%		
4) Demand Cost (\$/Unit/Yr) =	\$123.18		
Escalation Rate =	1.00%		
5) Peak Reduction Factor =	1.000%		
6) Variable O&M (\$/Dk) =	\$0.000		
Escalation Rate =	0.00%		
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005		
Escalation Rate =	3.50%		
8) Non-Gas Fuel Loss Factor	7.48%		
9) Gas Environmental Damage Factor =	\$1.018		
Escalation Rate =	2.30%		
10) Non Gas Fuel Environmental Damage Factor :	\$0.000		
Escalation Rate =	0.00%		
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 =	2012		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =	\$312	\$271	\$229
16b) Incentive Costs =	1,050	1,050	1,050
16c) Total Utility Project Costs =	\$1,362	\$1,321	\$1,279
17) Direct Participant Costs (\$/Part.) =	\$500	\$500	\$500
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	1.40%
20) Project Life (Years) =	18	18	18
21) Avg. Dk/Part. Saved =	11.800	11.800	11.800
22) Avg Non-Gas Fuel Units/Part. Saved =	0	0	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
23) Number of Participants =	7	7	7
24) Total Annual Dk Saved =	83	83	83
25) Incentive/Participant =	\$150	\$150	\$150
26) Distribution Delivery Charge			\$1.753
27) Effective Income Tax Rate =			35.000%
(Federal & State Taxes)			

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$8,925	2.27
Utility Cost Test	\$12,279	4.36
Societal Test	\$16,284	2.50
Participant Test	\$14,317	2.50
Total Resource Cost Test	\$5,515	1.53

Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 92-94% AFUE Furnace

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
2012	83	\$4,564	\$379	\$0.000	\$0	\$379	0.8	\$124	\$99	\$478	\$1,814	\$98	\$312	\$1,050	\$1,460	(\$982)
2013	165	4,724	779	0.000	0	779	1.7	126	214	993	1,878	201	271	1,050	1,522	(529)
2014	248	4,889	1,212	0.000	0	1,212	2.5	127	318	1,530	1,944	313	229	1,050	1,592	(62)
2015	248	5,061	1,255	0.000	0	1,255	2.5	128	320	1,575	2,012	324	0	0	324	1,251
2016	248	5,238	1,299	0.000	0	1,299	2.5	129	323	1,622	2,082	336	0	0	336	1,286
2017	248	5,421	1,344	0.000	0	1,344	2.5	131	328	1,672	2,155	347	0	0	347	1,325
2018	248	5,611	1,392	0.000	0	1,392	2.5	132	330	1,722	2,230	359	0	0	359	1,363
2019	248	5,807	1,440	0.000	0	1,440	2.5	133	333	1,773	2,308	372	0	0	372	1,401
2020	248	6,010	1,490	0.000	0	1,490	2.5	135	338	1,828	2,389	385	0	0	385	1,443
2021	248	6,221	1,543	0.000	0	1,543	2.5	136	340	1,883	2,473	399	0	0	399	1,484
2022	248	6,438	1,597	0.000	0	1,597	2.5	137	343	1,940	2,559	413	0	0	413	1,527
2023	248	6,664	1,653	0.000	0	1,653	2.5	139	348	2,001	2,649	427	0	0	427	1,574
2024	248	6,897	1,710	0.000	0	1,710	2.5	140	350	2,060	2,742	442	0	0	442	1,618
2025	248	7,138	1,770	0.000	0	1,770	2.5	142	355	2,125	2,838	457	0	0	457	1,668
2026	248	7,388	1,832	0.000	0	1,832	2.5	143	358	2,190	2,937	473	0	0	473	1,717
2027	248	7,647	1,896	0.000	0	1,896	2.5	144	360	2,256	3,040	490	0	0	490	1,766
2028	248	7,915	1,963	0.000	0	1,963	2.5	146	365	2,328	3,146	507	0	0	507	1,821
2029	248	8,192	2,032	0.000	0	2,032	2.5	147	368	2,400	3,256	525	0	0	525	1,875
2030	165	8,478	1,399	0.000	0	1,399	1.7	149	253	1,652	3,370	361	0	0	361	1,291
2031	83	8,775	728	0.000	0	728	0.8	150	120	848	3,488	188	0	0	188	660
2032	0	9,082	0	0.000	0	0	0.0	152	0	0	3,610	0	0	0	0	0
Total =	4,464						NPV =		\$34,876						\$11,379	\$23,497
Total NPV =									\$15,931						\$7,006	\$8,925
Benefit/Cost Ratio =																

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-Inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

**Table 2  
Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential 92-94% AFUE Furnace**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$379	\$99	\$478	\$312	\$1,050	\$1,362	(\$884)
2013	779	214	993	271	1,050	1,321	(328)
2014	1,212	318	1,530	229	1,050	1,279	251
2015	1,255	320	1,575	0	0	0	1,575
2016	1,299	323	1,622	0	0	0	1,622
2017	1,344	328	1,672	0	0	0	1,672
2018	1,392	330	1,722	0	0	0	1,722
2019	1,440	333	1,773	0	0	0	1,773
2020	1,490	338	1,828	0	0	0	1,828
2021	1,543	340	1,883	0	0	0	1,883
2022	1,597	343	1,940	0	0	0	1,940
2023	1,653	348	2,001	0	0	0	2,001
2024	1,710	350	2,060	0	0	0	2,060
2025	1,770	355	2,125	0	0	0	2,125
2026	1,832	358	2,190	0	0	0	2,190
2027	1,896	360	2,256	0	0	0	2,256
2028	1,963	365	2,328	0	0	0	2,328
2029	2,032	368	2,400	0	0	0	2,400
2030	1,399	253	1,652	0	0	0	1,652
2031	728	120	848	0	0	0	848
2032	0	0	0	0	0	0	0
<b>Total =</b>			<b>\$34,876</b>			<b>\$3,962</b>	<b>\$30,914</b>
			<b>\$15,931</b>			<b>\$3,652</b>	<b>\$12,279</b>
			<b>NPV =</b>				
			<b>\$12,279</b>				
			<b>Benefit/Cost Ratio =</b>				
			<b>4.36</b>				

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 92-94% AFUE Furnace

Year	Benefits						Costs				Annual Benefits Less Costs (K)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	
2012	\$379	\$99	\$0.022	\$0	\$1,041	\$86	\$564	\$1,362	\$2,450	\$3,812	(\$3,248)
2013	779	214	0.023	0	1,065	176	1,169	1,321	2,450	3,771	(2,602)
2014	1,212	318	0.024	0	1,090	270	1,800	1,279	2,450	3,729	(1,929)
2015	1,255	320	0.025	0	1,115	277	1,852	0	0	0	1,852
2016	1,299	323	0.026	0	1,141	283	1,905	0	0	0	1,905
2017	1,344	328	0.027	0	1,167	289	1,961	0	0	0	1,961
2018	1,392	330	0.028	0	1,194	296	2,018	0	0	0	2,018
2019	1,440	333	0.029	0	1,221	303	2,076	0	0	0	2,076
2020	1,490	338	0.030	0	1,249	310	2,138	0	0	0	2,138
2021	1,543	340	0.031	0	1,278	317	2,200	0	0	0	2,200
2022	1,597	343	0.032	0	1,307	324	2,264	0	0	0	2,264
2023	1,653	348	0.033	0	1,337	332	2,333	0	0	0	2,333
2024	1,710	350	0.034	0	1,368	339	2,399	0	0	0	2,399
2025	1,770	355	0.035	0	1,400	347	2,472	0	0	0	2,472
2026	1,832	358	0.036	0	1,432	355	2,545	0	0	0	2,545
2027	1,896	360	0.038	0	1,465	363	2,619	0	0	0	2,619
2028	1,963	365	0.039	0	1,498	372	2,700	0	0	0	2,700
2029	2,032	368	0.040	0	1,533	380	2,780	0	0	0	2,780
2030	1,399	253	0.042	0	1,568	259	1,911	0	0	0	1,911
2031	728	120	0.043	0	1,604	133	981	0	0	0	981
2032	0	0	0.045	0	1,641	0	0	0	0	0	0
Total =							\$40,687			\$11,312	\$29,375
							\$27,144			\$10,860	\$16,284
							NPV =				
Total NPV =		\$16,284									
Benefit/Cost Ratio =		<u>2.50</u>									

Worksheet Calculations	
(A) = Table 1 (F)	(H) = Table 2 (F)
(G) = Table 1 (I)	(I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
(C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..	(J) = (H) + (I)
(D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)	(K) = (G) - (J)
(E) = Gas Environmental Damage Factor (9), escalated	
(F) = Table 1 (A) x (E)	
(G) = (A) + (B) + (D) + (F)	

Table 4  
Participant Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 92-94% AFUE Furnace

Year	Benefits					Costs		Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	
2012	\$1,050	83	\$7,983	\$663	\$0.106	\$0	\$1,713	\$3,500
2013	1,050	165	8,262	1,363	0.109	0	2,413	3,500
2014	1,050	248	8,552	2,121	0.113	0	3,171	3,500
2015	0	248	8,851	2,195	0.117	0	2,195	0
2016	0	248	9,161	2,272	0.121	0	2,272	0
2017	0	248	9,481	2,351	0.125	0	2,351	0
2018	0	248	9,813	2,434	0.130	0	2,434	0
2019	0	248	10,157	2,519	0.134	0	2,519	0
2020	0	248	10,512	2,607	0.139	0	2,607	0
2021	0	248	10,880	2,698	0.144	0	2,698	0
2022	0	248	11,261	2,793	0.149	0	2,793	0
2023	0	248	11,655	2,890	0.154	0	2,890	0
2024	0	248	12,063	2,992	0.160	0	2,992	0
2025	0	248	12,485	3,096	0.165	0	3,096	0
2026	0	248	12,922	3,205	0.171	0	3,205	0
2027	0	248	13,374	3,317	0.177	0	3,317	0
2028	0	248	13,842	3,433	0.183	0	3,433	0
2029	0	248	14,327	3,553	0.189	0	3,553	0
2030	0	165	14,828	2,447	0.196	0	2,447	0
2031	0	83	15,347	1,274	0.203	0	1,274	0
2032	0	0	15,884	0	0.210	0	0	0
Total =		4,464					\$53,373	\$10,500
Total NPV =			\$14,317				\$23,891	\$9,574
Benefit/Cost Ratio =			<u>2.50</u>			NPV =		

Worksheet Calculations

- (A) = Table 1 (N)
- (B) = Table 1 (A)
- (C) = Retail Rate (1) escalated.
- (D) = (B) x (C)
- (E) = Non-Gas Fuel Retail Rate (2), escalated.
- (F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
- (G) = (A) + (D) + (F)
- (H) = Direct Participant Costs (17) x Number of Participants (23)
- (I) = (G) - (H)

**Table 5  
Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project **Residential 92-94% AFUE Furnace**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$379	\$99	\$0	\$478	\$1,362	\$2,450	\$3,812	(\$3,334)
2013	779	214	0	993	1,321	2,450	3,771	(2,778)
2014	1,212	318	0	1,530	1,279	2,450	3,729	(2,199)
2015	1,255	320	0	1,575	0	0	0	1,575
2016	1,299	323	0	1,622	0	0	0	1,622
2017	1,344	328	0	1,672	0	0	0	1,672
2018	1,392	330	0	1,722	0	0	0	1,722
2019	1,440	333	0	1,773	0	0	0	1,773
2020	1,490	338	0	1,828	0	0	0	1,828
2021	1,543	340	0	1,883	0	0	0	1,883
2022	1,597	343	0	1,940	0	0	0	1,940
2023	1,653	348	0	2,001	0	0	0	2,001
2024	1,710	350	0	2,060	0	0	0	2,060
2025	1,770	355	0	2,125	0	0	0	2,125
2026	1,832	358	0	2,190	0	0	0	2,190
2027	1,896	360	0	2,256	0	0	0	2,256
2028	1,963	365	0	2,328	0	0	0	2,328
2029	2,032	368	0	2,400	0	0	0	2,400
2030	1,399	253	0	1,652	0	0	0	1,652
2031	728	120	0	848	0	0	0	848
2032	0	0	0	0	0	0	0	0
			Total =	\$34,876			\$11,312	\$23,564
			NPV =	\$15,931			\$10,416	5,515

Total NPV = \$5,515  
Benefit/Cost Ratio = 1.53

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential 95+% AFUE Furnace - New**  
Program Years: **2012 - 2014**

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.713		
Escalation Rate =	3.50%		
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10200		
Escalation Rate =	3.50%		
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	Kwh		
3) Commodity Cost (\$/Dk) =	\$4.410		
Escalation Rate =	3.50%		
4) Demand Cost (\$/Unit/Yr) =	\$123.18		
Escalation Rate =	1.00%		
5) Peak Reduction Factor =	1.000%		
6) Variable O&M (\$/Dk) =	\$0.000		
Escalation Rate =	0.00%		
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005		
Escalation Rate =	3.50%		
8) Non-Gas Fuel Loss Factor	7.48%		
9) Gas Environmental Damage Factor =	\$1.018		
Escalation Rate =	2.30%		
10) Non Gas Fuel Environmental Damage Factor :	\$0.000		
Escalation Rate =	0.00%		
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 =	2012		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =	\$1,043	\$1,425	\$1,643
16b) Incentive Costs =	3,600	5,700	7,800
16c) Total Utility Project Costs =	\$4,643	\$7,125	\$9,443
17) Direct Participant Costs (\$/Part.) =	\$620	\$620	\$620
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	1.40%
20) Project Life (Years) =	18	18	18
21) Avg. Dk/Part. Saved =	7.100	7.100	7.100
22) Avg Non-Gas Fuel Units/Part. Saved =	669	669	669
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
23) Number of Participants =	12	19	26
24) Total Annual Dk Saved =	85	135	185
25) Incentive/Participant =	\$300	\$300	\$300
26) Distribution Delivery Charge			
27) Effective Income Tax Rate =			
(Federal & State Taxes)			35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$1,130	1.05
Utility Cost Test	\$6,539	1.34
Societal Test	\$21,167	1.56
Participant Test	\$59,651	2.90
Total Resource Cost Test	(\$147)	1.00



Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 95+% AFUE Furnace - New

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Demand Reduction (G)	Peak Dk Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
2012	85	\$4,564	\$388	\$0,000	\$0	\$388	0.9	\$124	\$112	\$500	\$1,814	\$100	\$1,043	\$3,600	\$4,743	(\$4,243)
2013	220	4,724	1,039	0,000	0	1,039	2.2	126	277	1,316	1,878	269	1,425	5,700	7,394	(6,078)
2014	405	4,889	1,980	0,000	0	1,980	4.1	127	521	2,501	1,944	512	1,643	7,800	9,955	(7,454)
2015	405	5,061	2,050	0,000	0	2,050	4.1	128	525	2,575	2,012	530	0	0	530	2,045
2016	405	5,238	2,121	0,000	0	2,121	4.1	129	529	2,650	2,082	548	0	0	548	2,102
2017	405	5,421	2,196	0,000	0	2,196	4.1	131	537	2,733	2,155	567	0	0	567	2,166
2018	405	5,611	2,272	0,000	0	2,272	4.1	132	541	2,813	2,230	587	0	0	587	2,226
2019	405	5,807	2,352	0,000	0	2,352	4.1	133	545	2,897	2,308	608	0	0	608	2,289
2020	405	6,010	2,434	0,000	0	2,434	4.1	135	554	2,988	2,389	629	0	0	629	2,359
2021	405	6,221	2,520	0,000	0	2,520	4.1	136	558	3,078	2,473	651	0	0	651	2,427
2022	405	6,438	2,607	0,000	0	2,607	4.1	137	562	3,169	2,559	674	0	0	674	2,495
2023	405	6,664	2,699	0,000	0	2,699	4.1	139	570	3,269	2,649	697	0	0	697	2,572
2024	405	6,897	2,793	0,000	0	2,793	4.1	140	574	3,367	2,742	722	0	0	722	2,645
2025	405	7,138	2,891	0,000	0	2,891	4.1	142	582	3,473	2,838	747	0	0	747	2,726
2026	405	7,388	2,992	0,000	0	2,992	4.1	143	586	3,578	2,937	773	0	0	773	2,805
2027	405	7,647	3,097	0,000	0	3,097	4.1	144	590	3,687	3,040	800	0	0	800	2,887
2028	405	7,915	3,206	0,000	0	3,206	4.1	146	599	3,805	3,146	828	0	0	828	2,977
2029	405	8,192	3,318	0,000	0	3,318	4.1	147	603	3,921	3,256	857	0	0	857	3,064
2030	320	8,478	2,713	0,000	0	2,713	3.2	149	477	3,190	3,370	701	0	0	701	2,489
2031	185	8,775	1,623	0,000	0	1,623	1.9	150	285	1,908	3,488	419	0	0	419	1,489
2032	0	9,082	0	0,000	0	0	0.0	152	0	0	3,610	0	0	0	0	0
Total =	7,290									\$57,418					\$33,430	\$23,988
Total NPV =		\$1,130								\$25,679					\$24,549	\$1,130
Benefit/Cost Ratio =		1.05														

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-Inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

Total = 7,290

Total NPV = \$1,130

Benefit/Cost Ratio = 1.05

NPV =

\$57,418

\$25,679

Table 2  
Utility Cost Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 95+% AFUE Furnace - New

Year	Benefits			Costs				Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)		
2012	\$388	\$112	\$500	\$1,043	\$3,600	\$4,643	(\$4,143)	
2013	1,039	277	1,316	1,425	5,700	7,125	(5,809)	
2014	1,980	521	2,501	1,643	7,800	9,443	(6,942)	
2015	2,050	525	2,575	0	0	0	2,575	
2016	2,121	529	2,650	0	0	0	2,650	
2017	2,196	537	2,733	0	0	0	2,733	
2018	2,272	541	2,813	0	0	0	2,813	
2019	2,352	545	2,897	0	0	0	2,897	
2020	2,434	554	2,988	0	0	0	2,988	
2021	2,520	558	3,078	0	0	0	3,078	
2022	2,607	562	3,169	0	0	0	3,169	
2023	2,699	570	3,269	0	0	0	3,269	
2024	2,793	574	3,367	0	0	0	3,367	
2025	2,891	582	3,473	0	0	0	3,473	
2026	2,992	586	3,578	0	0	0	3,578	
2027	3,097	590	3,687	0	0	0	3,687	
2028	3,206	599	3,805	0	0	0	3,805	
2029	3,318	603	3,921	0	0	0	3,921	
2030	2,713	477	3,190	0	0	0	3,190	
2031	1,623	285	1,908	0	0	0	1,908	
2032	0	0	0	0	0	0	0	
Total =			\$57,418			\$21,211	\$36,207	
			\$25,679			\$19,140	\$6,539	
		NPV =						
Total NPV =			\$6,539					
Benefit/Cost Ratio =			1.34					

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 95+% AFUE Furnace - New

Year	Benefits					Costs					
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	Annual Benefits Less Costs (K)
2012	\$388	\$112	\$0.022	\$177	\$1,041	\$88	\$765	\$4,643	\$3,840	\$8,483	(\$7,718)
2013	1,039	277	0.023	477	1,065	234	2,027	7,125	6,080	13,205	(11,178)
2014	1,980	521	0.024	915	1,090	441	3,857	9,443	8,320	17,763	(13,906)
2015	2,050	525	0.025	953	1,115	452	3,980	0	0	0	3,980
2016	2,121	529	0.026	991	1,141	462	4,103	0	0	0	4,103
2017	2,196	537	0.027	1,030	1,167	473	4,236	0	0	0	4,236
2018	2,272	541	0.028	1,068	1,194	484	4,365	0	0	0	4,365
2019	2,352	545	0.029	1,106	1,221	495	4,498	0	0	0	4,498
2020	2,434	554	0.030	1,144	1,249	506	4,638	0	0	0	4,638
2021	2,520	558	0.031	1,182	1,278	518	4,778	0	0	0	4,778
2022	2,607	562	0.032	1,220	1,307	529	4,918	0	0	0	4,918
2023	2,699	570	0.033	1,258	1,337	541	5,068	0	0	0	5,068
2024	2,793	574	0.034	1,297	1,368	554	5,218	0	0	0	5,218
2025	2,891	582	0.035	1,335	1,400	567	5,375	0	0	0	5,375
2026	2,992	586	0.036	1,373	1,432	580	5,531	0	0	0	5,531
2027	3,097	590	0.038	1,449	1,465	593	5,729	0	0	0	5,729
2028	3,206	599	0.039	1,487	1,498	607	5,899	0	0	0	5,899
2029	3,318	603	0.040	1,525	1,533	621	6,067	0	0	0	6,067
2030	2,713	477	0.042	1,264	1,568	502	4,956	0	0	0	4,956
2031	1,623	285	0.043	748	1,604	297	2,953	0	0	0	2,953
2032	0	0	0.045	0	1,641	0	0	0	0	0	0
Total =							\$88,961			\$39,451	\$49,510
							\$58,661			\$37,494	\$21,167
							NPV =				
Total NPV =		\$21,167									
Benefit/Cost Ratio =		<u>1.56</u>									

**Worksheet Calculations**

(A) = Table 1 (F)  
(G) = Table 1 (I)  
(C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..  
(D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]  
(E) = Gas Environmental Damage Factor (9), escalated  
(F) = Table 1 (A) x (E)  
(G) = (A) + (B) + (D) + (F)

(H) = Table 2 (F)  
(I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)  
(J) = (H) + (I)  
(K) = (G) - (J)

**Table 4  
Participant Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential 95+% AFUE Furnace - New**

Year	Benefits							Costs	
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)	Annual Benefits Less Costs (I)
2012	\$3,600	85	\$7.983	\$679	\$0.106	\$851	\$5,130	\$7,440	(\$2,310)
2013	5,700	220	8.262	1,818	0.109	2,261	9,779	11,780	(2,001)
2014	7,800	405	8.552	3,464	0.113	4,309	15,573	16,120	(547)
2015	0	405	8.851	3,585	0.117	4,462	8,047	0	8,047
2016	0	405	9.161	3,710	0.121	4,614	8,324	0	8,324
2017	0	405	9.481	3,840	0.125	4,767	8,607	0	8,607
2018	0	405	9.813	3,974	0.130	4,957	8,931	0	8,931
2019	0	405	10.157	4,114	0.134	5,110	9,224	0	9,224
2020	0	405	10.512	4,257	0.139	5,300	9,557	0	9,557
2021	0	405	10.880	4,406	0.144	5,491	9,897	0	9,897
2022	0	405	11.261	4,561	0.149	5,682	10,243	0	10,243
2023	0	405	11.655	4,720	0.154	5,872	10,592	0	10,592
2024	0	405	12.063	4,886	0.160	6,101	10,987	0	10,987
2025	0	405	12.485	5,056	0.165	6,292	11,348	0	11,348
2026	0	405	12.922	5,233	0.171	6,521	11,754	0	11,754
2027	0	405	13.374	5,416	0.177	6,750	12,166	0	12,166
2028	0	405	13.842	5,606	0.183	6,978	12,584	0	12,584
2029	0	405	14.327	5,802	0.189	7,207	13,009	0	13,009
2030	0	320	14.828	4,745	0.196	5,901	10,646	0	10,646
2031	0	185	15.347	2,839	0.203	3,531	6,370	0	6,370
2032	0	0	15.884	0	0.210	0	0	0	0
<b>Total =</b>		<b>7,290</b>					<b>\$202,768</b>	<b>\$35,340</b>	<b>\$167,428</b>
					<b>NPV =</b>		<b>\$91,122</b>	<b>\$31,471</b>	<b>59,651</b>
<b>Total NPV =</b>		<b>\$59,651</b>							
<b>Benefit/Cost Ratio =</b>		<b>2.90</b>							

Worksheet Calculations
(A) = Table 1 (N)
(B) = Table 1 (A)
(C) = Retail Rate (1) escalated.
(D) = (B) x (C)
(E) = Non-Gas Fuel Retail Rate (2), escalated.
(F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
(G) = (A) + (D) + (F)
(H) = Direct Participant Costs (17) x Number of Participants (23)
(I) = (G) - (H)

Table 5  
Total Resource Cost Test

Compa Montana-Dakota Utilities Co.  
Project: Residential 95+% AFUE Furnace - New

Year	Benefits			Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$388	\$112	\$177	\$677	\$3,840	\$8,483	(\$7,806)
2013	1,039	277	477	1,793	6,080	13,205	(11,412)
2014	1,980	521	915	3,416	8,320	17,763	(14,347)
2015	2,050	525	953	3,528	0	0	3,528
2016	2,121	529	991	3,641	0	0	3,641
2017	2,196	537	1,030	3,763	0	0	3,763
2018	2,272	541	1,068	3,881	0	0	3,881
2019	2,352	545	1,106	4,003	0	0	4,003
2020	2,434	554	1,144	4,132	0	0	4,132
2021	2,520	558	1,182	4,260	0	0	4,260
2022	2,607	562	1,220	4,389	0	0	4,389
2023	2,699	570	1,258	4,527	0	0	4,527
2024	2,793	574	1,297	4,664	0	0	4,664
2025	2,891	582	1,335	4,808	0	0	4,808
2026	2,992	586	1,373	4,951	0	0	4,951
2027	3,097	590	1,449	5,136	0	0	5,136
2028	3,206	599	1,487	5,292	0	0	5,292
2029	3,318	603	1,525	5,446	0	0	5,446
2030	2,713	477	1,264	4,454	0	0	4,454
2031	1,623	285	748	2,656	0	0	2,656
2032	0	0	0	0	0	0	0
				Total =		\$39,451	\$39,966
				NPV =		\$35,572	(147)

Total NPV = (\$147)  
Benefit/Cost Ratio = 1.00

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (T)	
(C) = Table 3 (D)	
(D) = (A) + (B) + (C)	
(E) = Table 3 (H)	
(F) = Table 3 (I)	
(G) = (E) + (F)	
(H) = (D) - (G)	

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Residential 95+% AFUE Furnace - Replacement  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.713		
Escalation Rate =	3.50%	\$14,779	\$14,621
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10200	\$14,779	\$13,895
Escalation Rate =	3.50%	51,000	66,000
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	Kwh	\$65,779	\$73,121
3) Commodity Cost (\$/Dk) =	\$4.410	\$620	\$620
Escalation Rate =	3.50%	\$0	\$0
4) Demand Cost (\$/Unit/Yr) =	\$123.18	\$0	\$0
Escalation Rate =	1.00%	0.00%	0.00%
5) Peak Reduction Factor =	1.000%	\$0	\$0
6) Variable O&M (\$/Dk) =	\$0.000	\$0	\$0
Escalation Rate =	0.00%	0.00%	0.00%
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	\$0	\$0
Escalation Rate =	3.50%	0.00%	1.40%
8) Non-Gas Fuel Loss Factor	7.48%	18	18
9) Gas Environmental Damage Factor =	\$1.018	18	18
Escalation Rate =	2.30%	13.100	13.100
10) Non Gas Fuel Environmental Damage Factor :	\$0.000	669	669
Escalation Rate =	0.00%	0	0
11) Participant Discount Rate =	10.00%	170	195
12) Utility Discount Rate =	8.94%	2,227	2,555
13) Societal Discount Rate =	4.25%	\$300	\$300
14) General Input Data Year =	2011		
15) Project Analysis Year 1 =	2012		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =			
16b) Incentive Costs =			
16c) Total Utility Project Costs =			
17) Direct Participant Costs (\$/Part.) =			
18) Participant Non-Energy Costs (Annual \$/Part.) =			
Escalation Rate =			
19) Participant Non-Energy Savings (Annual \$/Part.) =			
Escalation Rate =			
20) Project Life (Years) =			
21) Avg. Dk/Part. Saved =			
22) Avg Non-Gas Fuel Units/Part. Saved =			
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =			
23) Number of Participants =			
24) Total Annual Dk Saved =			
25) Incentive/Participant =			
26) Distribution Delivery Charge			
27) Effective Income Tax Rate =			
(Federal & State Taxes)			

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$185,757	1.61
Utility Cost Test	\$288,969	2.44
Societal Test	\$596,714	2.54
Participant Test	\$913,045	3.78
Total Resource Cost Test	\$218,794	1.59

Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Residential 95+% AFUE Furnace - Replacement

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/DK (B)	Gas Commodity Savings (C)	Gas Savings (C)	Variable O & M Cost/DK (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	
2012	2,227	\$4,564	\$10,164	\$0	\$0	\$10,164	22.3	\$124	\$2,765	\$12,929	\$1,814	\$2,626	\$14,779	\$51,000	\$68,405	(\$55,476)
2013	4,782	4,724	22,590	0	22,590	22,590	47.8	126	6,023	28,613	1,878	5,837	14,621	58,500	78,958	(50,345)
2014	7,664	4,889	37,469	0	37,469	37,469	76.6	127	9,728	47,197	1,944	9,684	13,895	66,000	89,579	(42,382)
2015	7,664	5,061	38,788	0	38,788	38,788	76.6	128	9,805	48,593	2,012	10,023	0	0	10,023	38,570
2016	7,664	5,238	40,144	0	40,144	40,144	76.6	129	9,881	50,025	2,082	10,372	0	0	10,372	39,653
2017	7,664	5,421	41,547	0	41,547	41,547	76.6	131	10,035	51,582	2,155	10,735	0	0	10,735	40,847
2018	7,664	5,611	43,003	0	43,003	43,003	76.6	132	10,111	53,114	2,230	11,109	0	0	11,109	42,005
2019	7,664	5,807	44,505	0	44,505	44,505	76.6	133	10,188	54,693	2,308	11,498	0	0	11,498	43,195
2020	7,664	6,010	46,061	0	46,061	46,061	76.6	135	10,341	56,402	2,389	11,901	0	0	11,901	44,501
2021	7,664	6,221	47,678	0	47,678	47,678	76.6	136	10,418	58,096	2,473	12,319	0	0	12,319	45,777
2022	7,664	6,438	49,341	0	49,341	49,341	76.6	137	10,494	59,835	2,559	12,748	0	0	12,748	47,087
2023	7,664	6,664	51,073	0	51,073	51,073	76.6	139	10,647	61,720	2,649	13,196	0	0	13,196	48,524
2024	7,664	6,897	52,859	0	52,859	52,859	76.6	140	10,724	63,583	2,742	13,660	0	0	13,660	49,923
2025	7,664	7,138	54,706	0	54,706	54,706	76.6	142	10,877	65,583	2,838	14,138	0	0	14,138	51,445
2026	7,664	7,388	56,622	0	56,622	56,622	76.6	143	10,954	67,576	2,937	14,631	0	0	14,631	52,945
2027	7,664	7,647	58,607	0	58,607	58,607	76.6	144	11,030	69,637	3,040	15,144	0	0	15,144	54,493
2028	7,664	7,915	60,661	0	60,661	60,661	76.6	146	11,184	71,845	3,146	15,672	0	0	15,672	56,173
2029	7,664	8,192	62,783	0	62,783	62,783	76.6	147	11,260	74,043	3,256	16,220	0	0	16,220	57,823
2030	5,437	8,478	46,095	0	46,095	46,095	54.4	149	8,106	54,201	3,370	11,910	0	0	11,910	42,291
2031	2,882	8,775	25,290	0	25,290	25,290	28.8	150	4,320	29,610	3,488	6,534	0	0	6,534	23,076
2032	0	9,082	0	0	0	0	0.0	152	0	0	3,610	0	0	0	0	0
Total =	137,952									\$1,078,877					\$448,752	\$630,125
Total NPV =										\$489,189					\$303,432	\$185,757
Benefit/Cost Ratio =										NPV =						

**Worksheet Calculations**

(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)  
 (B) = Commodity Cost (3) escalated  
 (C) = (A) x (B)  
 (D) = Variable O&M Cost (6), escalated  
 (E) = (A) x (D)  
 (F) = (C) + (E)  
 (G) = (A) x Peak Reduction Factor (5)  
 (H) = Demand Cost (4) escalated.  
 (I) = (G) x (H)  
 (J) = (F) + (I)  
 (K) = Distribution Delivery Charge (26) escalated.  
 (L) = (A) x (K) x (1-Inverse of Tax Rate (27))  
 (M) = Admin & Operating Costs (16a)  
 (N) = Incentive Costs (16b)  
 (O) = (L) + (M) + (N)  
 (P) = (J) - (O)

**Table 2  
Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential 95+% AFUE Furnace - Replacement**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$10,164	\$2,765	\$12,929	\$14,779	\$51,000	\$65,779	(\$52,850)
2013	22,590	6,023	28,613	14,621	58,500	73,121	(44,508)
2014	37,469	9,728	47,197	13,895	66,000	79,895	(32,698)
2015	38,788	9,805	48,593	0	0	0	48,593
2016	40,144	9,881	50,025	0	0	0	50,025
2017	41,547	10,035	51,582	0	0	0	51,582
2018	43,003	10,111	53,114	0	0	0	53,114
2019	44,505	10,188	54,693	0	0	0	54,693
2020	46,061	10,341	56,402	0	0	0	56,402
2021	47,678	10,418	58,096	0	0	0	58,096
2022	49,341	10,494	59,835	0	0	0	59,835
2023	51,073	10,647	61,720	0	0	0	61,720
2024	52,859	10,724	63,583	0	0	0	63,583
2025	54,706	10,877	65,583	0	0	0	65,583
2026	56,622	10,954	67,576	0	0	0	67,576
2027	58,607	11,030	69,637	0	0	0	69,637
2028	60,661	11,184	71,845	0	0	0	71,845
2029	62,783	11,260	74,043	0	0	0	74,043
2030	46,095	8,106	54,201	0	0	0	54,201
2031	25,290	4,320	29,610	0	0	0	29,610
2032	0	0	0	0	0	0	0
Total =			\$1,078,877		\$218,795	\$860,082	
NPV =			\$489,189		\$200,220	\$288,969	
Total NPV =			\$288,969				
Benefit/Cost Ratio =			<u>2.44</u>				

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (I)
(C) = Table 1 (J)
(D) = Table 1 (M)
(E) = Table 1 (N)
(F) = (D) + (E)
(G) = (C) - (F)



**Table 3  
Societal Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential 95+% AFUE Furnace - Replacement**

Year	Benefits							Costs			Annual Benefits Less Costs (K)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	
2012	\$10,164	\$2,765	\$0.022	\$2,502	\$1.041	\$2,318	\$17,749	\$65,779	\$54,400	\$120,179	(\$102,430)
2013	22,590	6,023	0.023	5,616	1.065	5,093	39,322	73,121	62,400	135,521	(96,199)
2014	37,469	9,728	0.024	9,393	1.090	8,354	64,944	79,895	70,400	150,295	(85,351)
2015	38,788	9,805	0.025	9,784	1.115	8,545	66,922	0	0	0	66,922
2016	40,144	9,881	0.026	10,175	1.141	8,745	68,945	0	0	0	68,945
2017	41,547	10,035	0.027	10,567	1.167	8,944	71,093	0	0	0	71,093
2018	43,003	10,111	0.028	10,958	1.194	9,151	73,223	0	0	0	73,223
2019	44,505	10,188	0.029	11,350	1.221	9,358	75,401	0	0	0	75,401
2020	46,061	10,341	0.030	11,741	1.249	9,572	77,715	0	0	0	77,715
2021	47,678	10,418	0.031	12,132	1.278	9,795	80,023	0	0	0	80,023
2022	49,341	10,494	0.032	12,524	1.307	10,017	82,376	0	0	0	82,376
2023	51,073	10,647	0.033	12,915	1.337	10,247	84,882	0	0	0	84,882
2024	52,859	10,724	0.034	13,306	1.368	10,484	87,373	0	0	0	87,373
2025	54,706	10,877	0.035	13,698	1.400	10,730	90,011	0	0	0	90,011
2026	56,622	10,954	0.036	14,089	1.432	10,975	92,640	0	0	0	92,640
2027	58,607	11,030	0.038	14,872	1.465	11,228	95,737	0	0	0	95,737
2028	60,661	11,184	0.039	15,263	1.498	11,481	98,589	0	0	0	98,589
2029	62,783	11,260	0.040	15,655	1.533	11,749	101,447	0	0	0	101,447
2030	46,095	8,106	0.042	11,661	1.568	8,525	74,387	0	0	0	74,387
2031	25,290	4,320	0.043	6,329	1.604	4,623	40,562	0	0	0	40,562
2032	0	0	0.045	0	1.641	0	0	0	0	0	0

Total = \$1,483,341 \$405,995 \$1,077,346

NPV = \$985,180 \$388,466 \$596,714

Total NPV = \$596,714  
Benefit/Cost Ratio = 2.54

Worksheet Calculations	
(A) = Table 1 (F)	(H) = Table 2 (F)
(G) = Table 1 (I)	(I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
(C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..	(J) = (H) + (I)
(D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]	(K) = (G) - (J)
(E) = Gas Environmental Damage Factor (9), escalated	
(F) = Table 1 (A) x (E)	
(G) = (A) + (B) + (D) + (F)	

**Table 4  
Participant Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential 95+% AFUE Furnace - Replacement**

Year	Benefits						Total Annual Benefits (G)	Direct Participant Costs (H)	Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)			
2012	\$51,000	2,227	\$7.983	\$17,778	\$0.106	\$12,055	\$80,833	\$105,400	(\$24,567)
2013	58,500	4,782	8.262	39,509	0.109	26,616	124,625	120,900	3,725
2014	66,000	7,664	8.552	65,543	0.113	44,224	175,767	136,400	39,367
2015	0	7,664	8.851	67,834	0.117	45,790	113,624	0	113,624
2016	0	7,664	9.161	70,210	0.121	47,355	117,565	0	117,565
2017	0	7,664	9.481	72,662	0.125	48,921	121,583	0	121,583
2018	0	7,664	9.813	75,207	0.130	50,877	126,084	0	126,084
2019	0	7,664	10.157	77,843	0.134	52,443	130,286	0	130,286
2020	0	7,664	10.512	80,564	0.139	54,400	134,964	0	134,964
2021	0	7,664	10.880	83,384	0.144	56,357	139,741	0	139,741
2022	0	7,664	11.261	86,304	0.149	58,313	144,617	0	144,617
2023	0	7,664	11.655	89,324	0.154	60,270	149,594	0	149,594
2024	0	7,664	12.063	92,451	0.160	62,618	155,069	0	155,069
2025	0	7,664	12.485	95,685	0.165	64,575	160,260	0	160,260
2026	0	7,664	12.922	99,034	0.171	66,923	165,957	0	165,957
2027	0	7,664	13.374	102,498	0.177	69,272	171,770	0	171,770
2028	0	7,664	13.842	106,085	0.183	71,620	177,705	0	177,705
2029	0	7,664	14.327	109,802	0.189	73,968	183,770	0	183,770
2030	0	5,437	14.828	80,620	0.196	54,416	135,036	0	135,036
2031	0	2,882	15.347	44,230	0.203	29,878	74,108	0	74,108
2032	0	0	15.884	0	0.210	0	0	0	0
Total =		137,952					\$2,782,958	\$362,700	\$2,420,258
NPV =							\$1,241,081	\$328,036	913,045
Total NPV =		\$913,045							
Benefit/Cost Ratio =		<u>3.78</u>							

Worksheet Calculations
(A) = Table 1 (N)
(B) = Table 1 (A)
(C) = Retail Rate (1) escalated.
(D) = (B) x (C)
(E) = Non-Gas Fuel Retail Rate (2), escalated.
(F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
(G) = (A) + (D) + (F)
(H) = Direct Participant Costs (17) x Number of Participants (23)
(I) = (G) - (H)

**Table 5  
Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project: **Residential 95+% AFUE Furnace - Replacement**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs of Rebate (F)	Total Costs (G)	
2012	\$10,164	\$2,765	\$2,502	\$15,431	\$65,779	\$54,400	\$120,179	(\$104,748)
2013	22,590	6,023	5,616	34,229	73,121	62,400	135,521	(101,292)
2014	37,469	9,728	9,393	56,590	79,895	70,400	150,295	(93,705)
2015	38,788	9,805	9,784	58,377	0	0	0	58,377
2016	40,144	9,881	10,175	60,200	0	0	0	60,200
2017	41,547	10,035	10,567	62,149	0	0	0	62,149
2018	43,003	10,111	10,958	64,072	0	0	0	64,072
2019	44,505	10,188	11,350	66,043	0	0	0	66,043
2020	46,061	10,341	11,741	68,143	0	0	0	68,143
2021	47,678	10,418	12,132	70,228	0	0	0	70,228
2022	49,341	10,494	12,524	72,359	0	0	0	72,359
2023	51,073	10,647	12,915	74,635	0	0	0	74,635
2024	52,859	10,724	13,306	76,889	0	0	0	76,889
2025	54,706	10,877	13,698	79,281	0	0	0	79,281
2026	56,622	10,954	14,089	81,665	0	0	0	81,665
2027	58,607	11,030	14,872	84,509	0	0	0	84,509
2028	60,661	11,184	15,263	87,108	0	0	0	87,108
2029	62,783	11,260	15,655	89,698	0	0	0	89,698
2030	46,095	8,106	11,661	65,862	0	0	0	65,862
2031	25,290	4,320	6,329	35,939	0	0	0	35,939
2032	0	0	0	0	0	0	0	0
			Total =	\$1,303,407			\$405,995	\$897,412
			NPV =	\$590,012			\$371,218	218,794

Total NPV = \$218,794  
Benefit/Cost Ratio = 1.59

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Residential Furnace Tune-Up  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) = Escalation Rate =	\$7.713 3.50%	\$678 2,000	\$776 2,600
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) = Escalation Rate = Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	\$0.10200 3.50% Kwh	\$2,678 \$3,376	\$4,030 \$4,030
3) Commodity Cost (\$/Dk) = Escalation Rate =	\$4.410 3.50%	\$0 0.00%	\$0 0.00%
4) Demand Cost (\$/Unit/Yr) = Escalation Rate =	\$123.18 1.00%	\$0 0.00%	\$0 1.40%
5) Peak Reduction Factor =	1.000%	2	2
6) Variable O&M (\$/Dk) = Escalation Rate =	\$0.000 0.00%	2.900	2.900
7) Non-Gas Fuel Cost (\$/Fuel Unit) = Escalation Rate =	\$0.02005 3.50%	0	0
8) Non-Gas Fuel Loss Factor	7.48%	50	65
9) Gas Environmental Damage Factor = Escalation Rate =	\$1.018 2.30%	145	189
10) Non Gas Fuel Environmental Damage Factor : Escalation Rate =	\$0.000 0.00%	\$40	\$40
11) Participant Discount Rate =	10.00%		\$1.753
12) Utility Discount Rate =	8.94%		35.000%
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 = Project Analysis Year 2 = Project Analysis Year 3 =	2012 2013 2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =		\$776	\$830
16b) Incentive Costs =		2,000	3,200
16c) Total Utility Project Costs =		\$2,678	\$4,030
17) Direct Participant Costs (\$/Part.) =		\$80	\$80
18) Participant Non-Energy Costs (Annual \$/Part.) = Escalation Rate =		\$0 0.00%	\$0 0.00%
19) Participant Non-Energy Savings (Annual \$/Part) = Escalation Rate =		\$0 0.00%	\$0 1.40%
20) Project Life (Years) =		2	2
21) Avg. Dk/Part. Saved =		2.900	2.900
22) Avg Non-Gas Fuel Units/Part. Saved =		0	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =		0	0
23) Number of Participants =		50	65
24) Total Annual Dk Saved =		145	189
25) Incentive/Participant =		\$40	\$40
26) Distribution Delivery Charge			
27) Effective Income Tax Rate = (Federal & State Taxes)			

Test Results	NPV	B/C
Ratepayer Impact Measure Test	(\$4,404)	0.58
Utility Cost Test	(\$3,176)	0.65
Societal Test	(\$9,479)	0.44
Participant Test	\$1,176	1.08
Total Resource Cost Test	(\$10,259)	0.37

**Table 1**  
**Ratepayer Impact Measure Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Furnace Tune-Up**

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
2012	145	\$4,564	\$662	\$0.000	\$0	\$662	1.5	\$124	\$186	\$848	\$1,814	\$171	\$678	\$2,000	\$2,849	(\$2,001)
2013	334	4,724	1,578	0.000	0	1,578	3.3	126	416	1,994	1,878	408	776	2,600	3,784	(1,790)
2014	421	4,889	2,058	0.000	0	2,058	4.2	127	533	2,591	1,944	532	830	3,200	4,562	(1,971)
2015	232	5,061	1,174	0.000	0	1,174	2.3	128	294	1,468	2,012	303	0	0	303	1,165
2016	0	5,238	0	0.000	0	0	0.0	129	0	0	2,082	0	0	0	0	0
2017	0	5,421	0	0.000	0	0	0.0	131	0	0	2,155	0	0	0	0	0
2018	0	5,611	0	0.000	0	0	0.0	132	0	0	2,230	0	0	0	0	0
2019	0	5,807	0	0.000	0	0	0.0	133	0	0	2,308	0	0	0	0	0
2020	0	6,010	0	0.000	0	0	0.0	135	0	0	2,389	0	0	0	0	0
2021	0	6,221	0	0.000	0	0	0.0	136	0	0	2,473	0	0	0	0	0
2022	0	6,438	0	0.000	0	0	0.0	137	0	0	2,559	0	0	0	0	0
2023	0	6,664	0	0.000	0	0	0.0	139	0	0	2,649	0	0	0	0	0
2024	0	6,897	0	0.000	0	0	0.0	140	0	0	2,742	0	0	0	0	0
2025	0	7,138	0	0.000	0	0	0.0	142	0	0	2,838	0	0	0	0	0
2026	0	7,388	0	0.000	0	0	0.0	143	0	0	2,937	0	0	0	0	0
2027	0	7,647	0	0.000	0	0	0.0	144	0	0	3,040	0	0	0	0	0
2028	0	7,915	0	0.000	0	0	0.0	146	0	0	3,146	0	0	0	0	0
2029	0	8,192	0	0.000	0	0	0.0	147	0	0	3,256	0	0	0	0	0
2030	0	8,478	0	0.000	0	0	0.0	149	0	0	3,370	0	0	0	0	0
2031	0	8,775	0	0.000	0	0	0.0	150	0	0	3,488	0	0	0	0	0
2032	0	9,082	0	0.000	0	0	0.0	152	0	0	3,610	0	0	0	0	0
<b>Total =</b>	<b>1,132</b>									<b>\$6,901</b>					<b>\$11,498</b>	<b>(\$4,597)</b>
<b>Total NPV =</b>		<b>(\$4,404)</b>								<b>\$5,997</b>					<b>\$10,401</b>	<b>(\$4,404)</b>
<b>Benefit/Cost Ratio =</b>		<b>0.58</b>														

NPV =

**Worksheet Calculations**

- (A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)
- (B) = Commodity Cost (3) escalated
- (C) = (A) x (B)
- (D) = Variable O&M Cost (6), escalated
- (E) = (A) x (D)
- (F) = (C) + (E)
- (G) = (A) x Peak Reduction Factor (5)
- (H) = Demand Cost (4) escalated.
- (I) = (G) x (H)
- (J) = (F) + (I)
- (K) = Distribution Delivery Charge (26) escalated.
- (L) = (A) x (K) x (1-Inverse of Tax Rate (27))
- (M) = Admin & Operating Costs (16a)
- (N) = Incentive Costs (16b)
- (O) = (L) + (M) + (N)
- (P) = (J) - (O)

**Table 2  
Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Furnace Tune-Up**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$662	\$186	\$848	\$678	\$2,000	\$2,678	(\$1,830)
2013	1,578	416	1,994	776	2,600	3,376	(1,382)
2014	2,058	533	2,591	830	3,200	4,030	(1,439)
2015	1,174	294	1,468	0	0	0	1,468
2016	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
Total =			\$6,901		\$10,084		(\$3,183)
NPV =			\$5,997		\$9,173		(\$3,176)
Total NPV =							(\$3,176)
Benefit/Cost Ratio =							<u>0.65</u>

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (I)
(C) = Table 1 (J)
(D) = Table 1 (M)
(E) = Table 1 (N)
(F) = (D) + (E)
(G) = (C) - (F)

**Table 3  
Societal Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Furnace Tune-Up**

Year	Benefits							Costs			Annual Benefits Less Costs (K)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	
2012	\$662	\$186	\$0.022	\$0	\$1.041	\$151	\$999	\$2,678	\$2,000	\$4,678	(\$3,679)
2013	1,578	416	0.023	0	1.065	356	2,350	3,376	2,600	5,976	(3,626)
2014	2,058	533	0.024	0	1.090	459	3,050	4,030	3,200	7,230	(4,180)
2015	1,174	294	0.025	0	1.115	259	1,727	0	0	0	1,727
2016	0	0	0.026	0	1.141	0	0	0	0	0	0
2017	0	0	0.027	0	1.167	0	0	0	0	0	0
2018	0	0	0.028	0	1.194	0	0	0	0	0	0
2019	0	0	0.029	0	1.221	0	0	0	0	0	0
2020	0	0	0.030	0	1.249	0	0	0	0	0	0
2021	0	0	0.031	0	1.278	0	0	0	0	0	0
2022	0	0	0.032	0	1.307	0	0	0	0	0	0
2023	0	0	0.033	0	1.337	0	0	0	0	0	0
2024	0	0	0.034	0	1.368	0	0	0	0	0	0
2025	0	0	0.035	0	1.400	0	0	0	0	0	0
2026	0	0	0.036	0	1.432	0	0	0	0	0	0
2027	0	0	0.038	0	1.465	0	0	0	0	0	0
2028	0	0	0.039	0	1.498	0	0	0	0	0	0
2029	0	0	0.040	0	1.533	0	0	0	0	0	0
2030	0	0	0.042	0	1.568	0	0	0	0	0	0
2031	0	0	0.043	0	1.604	0	0	0	0	0	0
2032	0	0	0.045	0	1.641	0	0	0	0	0	0
<b>Total =</b>							<b>\$8,126</b>			<b>\$17,884</b>	<b>(\$9,758)</b>
							<b>NPV = \$7,584</b>			<b>\$17,063</b>	<b>(\$9,479)</b>

Total NPV = (\$9,479)  
Benefit/Cost Ratio = 0.44

Worksheet Calculations:	
(A) = Table 1 (F)	(H) = Table 2 (F)
(G) = Table 1 (I)	(I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
(C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated.	(J) = (H) + (I)
(D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]	(K) = (G) - (J)
(E) = Gas Environmental Damage Factor (9), escalated	
(F) = Table 1 (A) x (E)	
(G) = (A) + (B) + (D) + (F)	

Table 4  
Participant Test

Company: Montana-Dakota Utilities Co.  
Project: Residential Furnace Tune-Up

Year	Benefits					Costs		Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	
2012	\$2,000	145	\$7,983	\$1,158	\$0.106	\$0	\$3,158	\$4,000
2013	2,600	334	8,262	2,760	0.109	0	5,360	5,200
2014	3,200	421	8,552	3,600	0.113	0	6,800	6,400
2015	0	232	8,851	2,053	0.117	0	2,053	0
2016	0	0	9,161	0	0.121	0	0	0
2017	0	0	9,481	0	0.125	0	0	0
2018	0	0	9,813	0	0.130	0	0	0
2019	0	0	10,157	0	0.134	0	0	0
2020	0	0	10,512	0	0.139	0	0	0
2021	0	0	10,880	0	0.144	0	0	0
2022	0	0	11,261	0	0.149	0	0	0
2023	0	0	11,655	0	0.154	0	0	0
2024	0	0	12,063	0	0.160	0	0	0
2025	0	0	12,485	0	0.165	0	0	0
2026	0	0	12,922	0	0.171	0	0	0
2027	0	0	13,374	0	0.177	0	0	0
2028	0	0	13,842	0	0.183	0	0	0
2029	0	0	14,327	0	0.189	0	0	0
2030	0	0	14,828	0	0.196	0	0	0
2031	0	0	15,347	0	0.203	0	0	0
2032	0	0	15,884	0	0.210	0	0	0
Total =		1,132					\$17,371	\$15,600
							\$15,193	\$14,017
						NPV =		
Total NPV =		\$1,176						\$1,771
Benefit/Cost Ratio =		1.08						1,176

**Worksheet Calculations**

(A) = Table 1 (N)  
 (B) = Table 1 (A)  
 (C) = Retail Rate (1) escalated.  
 (D) = (B) x (C)  
 (E) = Non-Gas Fuel Retail Rate (2), escalated.  
 (F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]  
 (G) = (A) + (D) + (F)  
 (H) = Direct Participant Costs (17) x Number of Participants (23)  
 (I) = (G) - (H)



**Table 5**  
**Total Resource Cost Test**

Compa Montana-Dakota Utilities Co.  
Project Residential Furnace Tune-Up

Year	Benefits			Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Utility Program Costs (E)	Participants' Costs of Rebate (F)	Total Costs (G)	
2012	\$662	\$186	\$0	\$2,678	\$2,000	\$4,678	(\$3,830)
2013	1,578	416	0	3,376	2,600	5,976	(\$3,982)
2014	2,058	533	0	4,030	3,200	7,230	(4,639)
2015	1,174	294	0	0	0	0	1,468
2016	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
			Total =			\$17,884	(\$10,983)
			NPV =			\$16,256	(10,259)

Total NPV = (\$10,259)  
Benefit/Cost Ratio = 0.37

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (T)	
(C) = Table 3 (D)	
(D) = (A) + (B) + (C)	
(E) = Table 3 (H)	
(F) = Table 3 (I)	
(G) = (E) + (F)	
(H) = (D) - (G)	

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Residential Water Heating .62 EF  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.713		
Escalation Rate =	3.50%	\$278	\$359
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10200	850	1,250
Escalation Rate =	3.50%	\$1,128	\$1,609
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	Kwh	\$50	\$50
3) Commodity Cost (\$/Dk) =	\$4.410	\$0	\$0
Escalation Rate =	3.50%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$123.18	\$0	\$0
Escalation Rate =	1.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	10	10
6) Variable O&M (\$/Dk) =	\$0.000	1.400	1.400
Escalation Rate =	0.00%	0	0
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	0	0
Escalation Rate =	3.50%	0	0
8) Non-Gas Fuel Loss Factor	7.48%	17	25
9) Gas Environmental Damage Factor =	\$1.018	24	35
Escalation Rate =	2.30%	\$50	\$50
10) Non Gas Fuel Environmental Damage Factor :	\$0.000		\$1.753
Escalation Rate =	0.00%		35.000%
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 =	2012		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =		\$278	\$359
16b) Incentive Costs =		850	1,250
16c) Total Utility Project Costs =		\$1,128	\$1,609
17) Direct Participant Costs (\$/Part.) =		\$50	\$50
18) Participant Non-Energy Costs (Annual \$/Part.) =		\$0	\$0
Escalation Rate =		0.00%	0.00%
19) Participant Non-Energy Savings (Annual \$/Part.) =		\$0	\$0
Escalation Rate =		0.00%	1.40%
20) Project Life (Years) =		10	10
21) Avg. Dk/Part. Saved =		1.400	1.400
22) Avg Non-Gas Fuel Units/Part. Saved =		0	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =		0	0
23) Number of Participants =		17	25
24) Total Annual Dk Saved =		24	35
25) Incentive/Participant =		\$50	\$50
26) Distribution Delivery Charge			
27) Effective Income Tax Rate =			
(Federal & State Taxes)			35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	(\$808)	0.85
Utility Cost Test	\$162	1.04
Societal Test	\$2,202	1.46
Participant Test	\$6,237	2.80
Total Resource Cost Test	\$162	1.04

Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Residential Water Heating .62 EF

t	Year	Benefits										Costs					Annual Benefits Less Costs (P)
		Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
1	2012	24	\$4,564	\$110	\$0,000	\$0	\$110	0.2	\$124	\$25	\$135	\$1,814	\$28	\$278	\$850	\$1,156	(\$1,021)
2	2013	59	4,724	279	0.000	0	279	0.6	126	76	355	1,878	72	359	1,250	1,681	(1,326)
3	2014	109	4,889	533	0.000	0	533	1.1	127	140	673	1,944	138	447	1,800	2,385	(1,712)
4	2015	109	5,061	552	0.000	0	552	1.1	128	141	693	2,012	143	0	0	143	550
5	2016	109	5,238	571	0.000	0	571	1.1	129	142	713	2,082	148	0	0	148	565
6	2017	109	5,421	591	0.000	0	591	1.1	131	144	735	2,155	153	0	0	153	582
7	2018	109	5,611	612	0.000	0	612	1.1	132	145	757	2,230	158	0	0	158	599
8	2019	109	5,807	633	0.000	0	633	1.1	133	146	779	2,308	164	0	0	164	615
9	2020	109	6,010	655	0.000	0	655	1.1	135	149	804	2,389	169	0	0	169	635
10	2021	109	6,221	678	0.000	0	678	1.1	136	150	828	2,473	175	0	0	175	653
11	2022	85	6,438	547	0.000	0	547	0.9	137	123	670	2,559	141	0	0	141	529
12	2023	50	6,664	333	0.000	0	333	0.5	139	70	403	2,649	86	0	0	86	317
13	2024	0	6,897	0	0.000	0	0	0.0	140	0	0	2,742	0	0	0	0	0
14	2025	0	7,138	0	0.000	0	0	0.0	142	0	0	2,838	0	0	0	0	0
15	2026	0	7,388	0	0.000	0	0	0.0	143	0	0	2,937	0	0	0	0	0
16	2027	0	7,647	0	0.000	0	0	0.0	144	0	0	3,040	0	0	0	0	0
17	2028	0	7,915	0	0.000	0	0	0.0	146	0	0	3,146	0	0	0	0	0
18	2029	0	8,192	0	0.000	0	0	0.0	147	0	0	3,256	0	0	0	0	0
19	2030	0	8,478	0	0.000	0	0	0.0	149	0	0	3,370	0	0	0	0	0
20	2031	0	8,775	0	0.000	0	0	0.0	150	0	0	3,488	0	0	0	0	0
21	2032	0	9,082	0	0.000	0	0	0.0	152	0	0	3,610	0	0	0	0	0
Total =		1,090							NPV =		\$7,545					\$6,559	\$986
Total NPV =											\$4,660					\$5,468	(\$808)
Benefit/Cost Ratio =																	

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

**Table 2**  
**Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Water Heating .62 EF**

Year	Benefits			Costs				Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)		
2012	\$110	\$25	\$135	\$278	\$850	\$1,128	(\$993)	
2013	279	76	355	359	1,250	1,609	(1,254)	
2014	533	140	673	447	1,800	2,247	(1,574)	
2015	552	141	693	0	0	0	693	
2016	571	142	713	0	0	0	713	
2017	591	144	735	0	0	0	735	
2018	612	145	757	0	0	0	757	
2019	633	146	779	0	0	0	779	
2020	655	149	804	0	0	0	804	
2021	678	150	828	0	0	0	828	
2022	547	123	670	0	0	0	670	
2023	333	70	403	0	0	0	403	
2024	0	0	0	0	0	0	0	
2025	0	0	0	0	0	0	0	
2026	0	0	0	0	0	0	0	
2027	0	0	0	0	0	0	0	
2028	0	0	0	0	0	0	0	
2029	0	0	0	0	0	0	0	
2030	0	0	0	0	0	0	0	
2031	0	0	0	0	0	0	0	
2032	0	0	0	0	0	0	0	
<b>Total =</b>			<b>\$7,545</b>			<b>\$4,984</b>	<b>\$2,561</b>	
							<b>\$162</b>	
							<b>\$4,498</b>	

Total NPV = **\$162**  
Benefit/Cost Ratio = 1.04

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Residential Water Heating .62 EF

Year	Benefits					Costs					
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	Annual Benefits Less Costs (K)
2012	\$110	\$25	\$0.022	\$0	\$1.041	\$25	\$160	\$1,128	\$0	\$1,128	(\$968)
2013	279	76	0.023	0	1.065	63	418	1,609	0	1,609	(1,191)
2014	533	140	0.024	0	1.090	119	792	2,247	0	2,247	(1,455)
2015	552	141	0.025	0	1.115	122	815	0	0	0	815
2016	571	142	0.026	0	1.141	124	837	0	0	0	837
2017	591	144	0.027	0	1.167	127	862	0	0	0	862
2018	612	145	0.028	0	1.194	130	887	0	0	0	887
2019	633	146	0.029	0	1.221	133	912	0	0	0	912
2020	655	149	0.030	0	1.249	136	940	0	0	0	940
2021	678	150	0.031	0	1.278	139	967	0	0	0	967
2022	547	123	0.032	0	1.307	111	781	0	0	0	781
2023	333	70	0.033	0	1.337	67	470	0	0	0	470
2024	0	0	0.034	0	1.368	0	0	0	0	0	0
2025	0	0	0.035	0	1.400	0	0	0	0	0	0
2026	0	0	0.036	0	1.432	0	0	0	0	0	0
2027	0	0	0.038	0	1.465	0	0	0	0	0	0
2028	0	0	0.039	0	1.498	0	0	0	0	0	0
2029	0	0	0.040	0	1.533	0	0	0	0	0	0
2030	0	0	0.042	0	1.568	0	0	0	0	0	0
2031	0	0	0.043	0	1.604	0	0	0	0	0	0
2032	0	0	0.045	0	1.641	0	0	0	0	0	0
Total =							\$8,841	\$4,984		\$4,984	\$3,857
Total NPV =		\$2,202					\$6,941	\$4,739		\$4,739	\$2,202
Benefit/Cost Ratio =		<u>1.46</u>									

NPV =

Worksheet Calculations	
(A) = Table 1 (F)	(H) = Table 2 (F)
(G) = Table 1 (I)	(I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
(C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated.	(J) = (H) + (I)
(D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]	(K) = (G) - (J)
(E) = Gas Environmental Damage Factor (9), escalated	
(F) = Table 1 (A) x (E)	
(G) = (A) + (B) + (D) + (F)	

**Table 4  
Participant Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Water Heating .62 EF**

Year	Benefits						Costs		
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)	Annual Benefits Less Costs (I)
2012	\$850	24	\$7.983	\$192	\$0.106	\$0	\$1,042	\$850	\$192
2013	1,250	59	8.262	487	0.109	0	1,737	1,250	487
2014	1,800	109	8.552	932	0.113	0	2,732	1,800	932
2015	0	109	8.851	965	0.117	0	965	0	965
2016	0	109	9.161	999	0.121	0	999	0	999
2017	0	109	9.481	1,033	0.125	0	1,033	0	1,033
2018	0	109	9.813	1,070	0.130	0	1,070	0	1,070
2019	0	109	10.157	1,107	0.134	0	1,107	0	1,107
2020	0	109	10.512	1,146	0.139	0	1,146	0	1,146
2021	0	109	10.880	1,186	0.144	0	1,186	0	1,186
2022	0	85	11.261	957	0.149	0	957	0	957
2023	0	50	11.655	583	0.154	0	583	0	583
2024	0	0	12.063	0	0.160	0	0	0	0
2025	0	0	12.485	0	0.165	0	0	0	0
2026	0	0	12.922	0	0.171	0	0	0	0
2027	0	0	13.374	0	0.177	0	0	0	0
2028	0	0	13.842	0	0.183	0	0	0	0
2029	0	0	14.327	0	0.189	0	0	0	0
2030	0	0	14.828	0	0.196	0	0	0	0
2031	0	0	15.347	0	0.203	0	0	0	0
2032	0	0	15.884	0	0.210	0	0	0	0

Total = 1,090 NPV = \$14,557 \$3,900 \$10,657  
\$9,711 \$3,474 6,237

Total NPV = \$6,237  
Benefit/Cost Ratio = 2.80

Worksheet Calculations
(A) = Table 1 (N)
(B) = Table 1 (A)
(C) = Retail Rate (1) escalated.
(D) = (B) x (C)
(E) = Non-Gas Fuel Retail Rate (2), escalated.
(F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
(G) = (A) + (D) + (F)
(H) = Direct Participant Costs (17) x Number of Participants (23)
(I) = (G) - (H)

**Table 5  
Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project **Residential Water Heating .62 EF**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$110	\$25	\$0	\$135	\$1,128	\$0	\$1,128	(\$993)
2013	279	76	0	355	1,609	0	1,609	(1,254)
2014	533	140	0	673	2,247	0	2,247	(1,574)
2015	552	141	0	693	0	0	0	693
2016	571	142	0	713	0	0	0	713
2017	591	144	0	735	0	0	0	735
2018	612	145	0	757	0	0	0	757
2019	633	146	0	779	0	0	0	779
2020	655	149	0	804	0	0	0	804
2021	678	150	0	828	0	0	0	828
2022	547	123	0	670	0	0	0	670
2023	333	70	0	403	0	0	0	403
2024	0	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0	0
			Total =	\$7,545			\$4,984	\$2,561
			NPV =	\$4,660			\$4,498	162

Total NPV = \$162  
Benefit/Cost Ratio = 1.04

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Residential Water Heating .67 EF  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) = Escalation Rate =	\$7.713 3.50%		
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) = Escalation Rate = Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	\$0.10200 3.50% Kwh	\$92 300 \$392	\$226 1,000 \$1,226
3) Commodity Cost (\$/Dk) = Escalation Rate =	\$4.410 3.50%	\$100	\$100
4) Demand Cost (\$/Unit/Yr) = Escalation Rate =	\$123.18 1.00%	\$0 0.00%	\$0 0.00%
5) Peak Reduction Factor =	1.000%	10	10
6) Variable O&M (\$/Dk) = Escalation Rate =	\$0.000 0.00%	3.600	3.600
7) Non-Gas Fuel Cost (\$/Fuel Unit) = Escalation Rate =	\$0.02005 3.50%	0 0	0 0
8) Non-Gas Fuel Loss Factor	7.48%	3	7
9) Gas Environmental Damage Factor = Escalation Rate =	\$1.018 2.30%	11	25
10) Non Gas Fuel Environmental Damage Factor : Escalation Rate =	\$0.000 0.00%	\$100	\$100
11) Participant Discount Rate =	10.00%		\$1.753 35.000%
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 = Project Analysis Year 2 = Project Analysis Year 3 =	2012 2013 2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =		\$186	\$226
16b) Incentive Costs =		700	1,000
16c) Total Utility Project Costs =		\$886	\$1,226
17) Direct Participant Costs (\$/Part.) =		\$100	\$100
18) Participant Non-Energy Costs (Annual \$/Part.) = Escalation Rate =		\$0 0.00%	\$0 0.00%
19) Participant Non-Energy Savings (Annual \$/Part.) = Escalation Rate =		\$0 0.00%	\$0 1.40%
20) Project Life (Years) =		10	10
21) Avg. Dk/Part. Saved =		3.600	3.600
22) Avg Non-Gas Fuel Units/Part. Saved =		0	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =		0	0
23) Number of Participants =		3	7
24) Total Annual Dk Saved =		11	25
25) Incentive/Participant =		\$100	\$100
26) Distribution Delivery Charge			\$1.753
27) Effective Income Tax Rate = (Federal & State Taxes)			35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$170	1.06
Utility Cost Test	\$806	1.36
Societal Test	\$2,188	1.92
Participant Test	\$4,092	3.32
Total Resource Cost Test	\$806	1.36



**Table 1**  
**Ratepayer Impact Measure Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Water Heating .67 EF**

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
2012	11	\$4,564	\$50	\$0,000	\$0	\$50	0.1	\$124	\$12	\$62	\$1,814	\$13	\$92	\$300	\$405	(\$343)
2013	36	4,724	170	0.000	0	170	0.4	126	50	220	1,878	44	186	700	930	(710)
2014	72	4,889	352	0.000	0	352	0.7	127	89	441	1,944	91	226	1,000	1,317	(876)
2015	72	5,061	364	0.000	0	364	0.7	128	90	454	2,012	94	0	0	94	360
2016	72	5,238	377	0.000	0	377	0.7	129	90	467	2,082	97	0	0	97	370
2017	72	5,421	390	0.000	0	390	0.7	131	92	482	2,155	101	0	0	101	381
2018	72	5,611	404	0.000	0	404	0.7	132	92	496	2,230	104	0	0	104	392
2019	72	5,807	418	0.000	0	418	0.7	133	93	511	2,308	108	0	0	108	403
2020	72	6,010	433	0.000	0	433	0.7	135	95	528	2,389	112	0	0	112	416
2021	72	6,221	448	0.000	0	448	0.7	136	95	543	2,473	116	0	0	116	427
2022	61	6,438	393	0.000	0	393	0.6	137	82	475	2,559	101	0	0	101	374
2023	36	6,664	240	0.000	0	240	0.4	139	56	296	2,649	62	0	0	62	234
2024	0	6,897	0	0.000	0	0	0.0	140	0	0	2,742	0	0	0	0	0
2025	0	7,138	0	0.000	0	0	0.0	142	0	0	2,838	0	0	0	0	0
2026	0	7,388	0	0.000	0	0	0.0	143	0	0	2,937	0	0	0	0	0
2027	0	7,647	0	0.000	0	0	0.0	144	0	0	3,040	0	0	0	0	0
2028	0	7,915	0	0.000	0	0	0.0	146	0	0	3,146	0	0	0	0	0
2029	0	8,192	0	0.000	0	0	0.0	147	0	0	3,256	0	0	0	0	0
2030	0	8,478	0	0.000	0	0	0.0	149	0	0	3,370	0	0	0	0	0
2031	0	8,775	0	0.000	0	0	0.0	150	0	0	3,488	0	0	0	0	0
2032	0	9,082	0	0.000	0	0	0.0	152	0	0	3,610	0	0	0	0	0
<b>Total =</b>	<b>720</b>									<b>\$4,975</b>					<b>\$3,547</b>	<b>\$1,428</b>
<b>Total NPV =</b>										<b>\$3,044</b>					<b>\$2,875</b>	<b>\$170</b>
<b>Benefit/Cost Ratio =</b>																

NPV =

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

**Table 2**  
**Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Water Heating .67 EF**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$50	\$12	\$62	\$92	\$300	\$392	(\$330)
2013	170	50	220	186	700	886	(666)
2014	352	89	441	226	1,000	1,226	(785)
2015	364	90	454	0	0	0	454
2016	377	90	467	0	0	0	467
2017	390	92	482	0	0	0	482
2018	404	92	496	0	0	0	496
2019	418	93	511	0	0	0	511
2020	433	95	528	0	0	0	528
2021	448	95	543	0	0	0	543
2022	393	82	475	0	0	0	475
2023	240	56	296	0	0	0	296
2024	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
<b>Total =</b>			<b>\$4,975</b>			<b>\$2,504</b>	<b>\$2,471</b>
			<b>\$3,044</b>			<b>\$2,238</b>	<b>\$806</b>
			<b>NPV =</b>				
<b>Total NPV =</b>			<b>\$806</b>				
<b>Benefit/Cost Ratio =</b>			<b>1.36</b>				

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Residential Water Heating .67 EF

Year	Benefits					Costs				Annual Benefits Less Costs (K)	
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)		Annual Total Costs (J)
2012	\$50	\$12	\$0.022	\$0	\$1,041	\$11	\$73	\$392	\$0	\$392	(\$319)
2013	170	50	0.023	0	1,065	38	258	886	0	886	(628)
2014	352	89	0.024	0	1,090	78	519	1,226	0	1,226	(707)
2015	364	90	0.025	0	1,115	80	534	0	0	0	534
2016	377	90	0.026	0	1,141	82	549	0	0	0	549
2017	390	92	0.027	0	1,167	84	566	0	0	0	566
2018	404	92	0.028	0	1,194	86	582	0	0	0	582
2019	418	93	0.029	0	1,221	88	599	0	0	0	599
2020	433	95	0.030	0	1,249	90	618	0	0	0	618
2021	448	95	0.031	0	1,278	92	635	0	0	0	635
2022	393	82	0.032	0	1,307	80	555	0	0	0	555
2023	240	56	0.033	0	1,337	48	344	0	0	0	344
2024	0	0	0.034	0	1,368	0	0	0	0	0	0
2025	0	0	0.035	0	1,400	0	0	0	0	0	0
2026	0	0	0.036	0	1,432	0	0	0	0	0	0
2027	0	0	0.038	0	1,465	0	0	0	0	0	0
2028	0	0	0.039	0	1,498	0	0	0	0	0	0
2029	0	0	0.040	0	1,533	0	0	0	0	0	0
2030	0	0	0.042	0	1,568	0	0	0	0	0	0
2031	0	0	0.043	0	1,604	0	0	0	0	0	0
2032	0	0	0.045	0	1,641	0	0	0	0	0	0
Total =							\$5,832		\$0	\$2,504	\$3,328
Total NPV =							\$4,558			\$2,370	\$2,188
Benefit/Cost Ratio =											

NPV =

Total NPV = \$2,188  
Benefit/Cost Ratio = 1.92

Worksheet Calculations

- (A) = Table 1 (F)
- (G) = Table 1 (I)
- (C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated.
- (D) = (C) x Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)
- (E) = Gas Environmental Damage Factor (9), escalated
- (F) = Table 1 (A) x (E)
- (G) = (A) + (B) + (D) + (F)
- (H) = Table 2 (F)
- (I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
- (J) = (H) + (I)
- (K) = (G) - (J)

Table 4  
Participant Test

Company: Montana-Dakota Utilities Co.  
Project: Residential Water Heating .67 EF

Year	Benefits						Costs		Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)	
2012	\$300	11	\$7,983	\$88	\$0.106	\$0	\$388	\$300	\$88
2013	700	36	8,262	297	0.109	0	997	700	297
2014	1,000	72	8,552	616	0.113	0	1,616	1,000	616
2015	0	72	8,851	637	0.117	0	637	0	637
2016	0	72	9,161	660	0.121	0	660	0	660
2017	0	72	9,481	683	0.125	0	683	0	683
2018	0	72	9,813	707	0.130	0	707	0	707
2019	0	72	10,157	731	0.134	0	731	0	731
2020	0	72	10,512	757	0.139	0	757	0	757
2021	0	72	10,880	783	0.144	0	783	0	783
2022	0	61	11,261	687	0.149	0	687	0	687
2023	0	36	11,655	420	0.154	0	420	0	420
2024	0	0	12,063	0	0.160	0	0	0	0
2025	0	0	12,485	0	0.165	0	0	0	0
2026	0	0	12,922	0	0.171	0	0	0	0
2027	0	0	13,374	0	0.177	0	0	0	0
2028	0	0	13,842	0	0.183	0	0	0	0
2029	0	0	14,327	0	0.189	0	0	0	0
2030	0	0	14,828	0	0.196	0	0	0	0
2031	0	0	15,347	0	0.203	0	0	0	0
2032	0	0	15,884	0	0.210	0	0	0	0
Total =		720					\$9,066	\$2,000	\$7,066
Total NPV =			\$4,092				\$5,855	\$1,763	\$4,092
Benefit/Cost Ratio =			3.32						

NPV =

Total NPV = \$4,092  
Benefit/Cost Ratio = 3.32

Worksheet Calculations	
(A) = Table 1 (N)	
(B) = Table 1 (A)	
(C) = Retail Rate (1) escalated.	
(D) = (B) x (C)	
(E) = Non-Gas Fuel Retail Rate (2), escalated.	
(F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]	
(G) = (A) + (D) + (F)	
(H) = Direct Participant Costs (17) x Number of Participants (23)	
(I) = (G) - (H)	

**Table 5**  
**Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project: **Residential Water Heating .67 EF**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$50	\$12	\$0	\$62	\$392	\$0	\$392	(\$330)
2013	170	50	0	220	886	0	886	(666)
2014	352	89	0	441	1,226	0	1,226	(785)
2015	364	90	0	454	0	0	0	454
2016	377	90	0	467	0	0	0	467
2017	390	92	0	482	0	0	0	482
2018	404	92	0	496	0	0	0	496
2019	418	93	0	511	0	0	0	511
2020	433	95	0	528	0	0	0	528
2021	448	95	0	543	0	0	0	543
2022	393	82	0	475	0	0	0	475
2023	240	56	0	296	0	0	0	296
2024	0	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0	0
			Total =	\$4,975			\$2,504	\$2,471
			NPV =	\$3,044			\$2,238	806

Total NPV = \$806  
Benefit/Cost Ratio = 1.36

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Commercial 92-94% AFUE Furnace  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7,328		
Escalation Rate =	3.50%	\$127	\$218
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10340	450	900
Escalation Rate =	3.50%	\$577	\$1,118
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	\$500	\$500
3) Commodity Cost (\$/Dk) =	\$4.410	\$0	\$0
Escalation Rate =	3.50%	0.00%	0.00%
4) Demand Cost (\$/UnitYr) =	\$123.18	\$0	\$0
Escalation Rate =	1.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	18	18
6) Variable O&M (\$/Dk) =	\$0.000	20.800	20.800
Escalation Rate =	0.00%		
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	0	0
Escalation Rate =	3.50%	0	0
8) Non-Gas Fuel Loss Factor	7.48%	3	6
9) Gas Environmental Damage Factor =	\$1.018	62	125
Escalation Rate =	2.30%	\$150	\$150
10) Non Gas Fuel Environmental Damage Factor :	\$0.000		
Escalation Rate =	0.00%		
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 =	2012		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =		\$127	\$218
16b) Incentive Costs =		450	900
16c) Total Utility Project Costs =		\$577	\$1,118
17) Direct Participant Costs (\$/Part.) =		\$500	\$500
18) Participant Non-Energy Costs (Annual \$/Part.) =		\$0	\$0
Escalation Rate =		0.00%	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =		\$0	\$0
Escalation Rate =		0.00%	1.40%
20) Project Life (Years) =		18	18
21) Avg. Dk/Part. Saved =		20.800	20.800
22) Avg Non-Gas Fuel Units/Part. Saved =		0	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =		0	0
23) Number of Participants =		3	6
24) Total Annual Dk Saved =		62	125
25) Incentive/Participant =		\$150	\$150
26) Distribution Delivery Charge			
27) Effective Income Tax Rate =			
(Federal & State Taxes)			35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$16,649	3.43
Utility Cost Test	\$20,529	7.91
Societal Test	\$31,545	4.46
Participant Test	\$23,939	4.01
Total Resource Cost Test	\$14,897	2.73

Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial 92-94% AFUE Furnace

t	Year	Benefits										Costs					Annual Benefits	
		Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	Less Costs (P)	
1	2012	62	\$4,564	\$283	\$0,000	\$0	\$283	0.6	\$124	\$74	\$357	\$1,416	\$57	\$127	\$450	\$634	(\$277)	
2	2013	187	4,724	883	0,000	0	883	1.9	126	239	1,122	1,465	178	218	900	1,296	(174)	
3	2014	374	4,889	1,828	0,000	0	1,828	3.7	127	470	2,298	1,517	369	274	1,350	1,993	305	
4	2015	374	5,061	1,893	0,000	0	1,893	3.7	128	474	2,367	1,570	382	0	0	382	1,985	
5	2016	374	5,238	1,959	0,000	0	1,959	3.7	129	477	2,436	1,625	395	0	0	395	2,041	
6	2017	374	5,421	2,027	0,000	0	2,027	3.7	131	485	2,512	1,682	409	0	0	409	2,103	
7	2018	374	5,611	2,099	0,000	0	2,099	3.7	132	488	2,587	1,740	423	0	0	423	2,164	
8	2019	374	5,807	2,172	0,000	0	2,172	3.7	133	492	2,664	1,801	438	0	0	438	2,226	
9	2020	374	6,010	2,248	0,000	0	2,248	3.7	135	500	2,748	1,864	453	0	0	453	2,295	
10	2021	374	6,221	2,327	0,000	0	2,327	3.7	136	503	2,830	1,930	469	0	0	469	2,361	
11	2022	374	6,438	2,408	0,000	0	2,408	3.7	137	507	2,915	1,997	485	0	0	485	2,430	
12	2023	374	6,664	2,492	0,000	0	2,492	3.7	139	514	3,006	2,067	502	0	0	502	2,504	
13	2024	374	6,897	2,579	0,000	0	2,579	3.7	140	518	3,097	2,139	520	0	0	520	2,577	
14	2025	374	7,138	2,670	0,000	0	2,670	3.7	142	525	3,195	2,214	538	0	0	538	2,657	
15	2026	374	7,388	2,763	0,000	0	2,763	3.7	143	529	3,292	2,292	557	0	0	557	2,735	
16	2027	374	7,647	2,860	0,000	0	2,860	3.7	144	533	3,393	2,372	577	0	0	577	2,816	
17	2028	374	7,915	2,960	0,000	0	2,960	3.7	146	540	3,500	2,455	597	0	0	597	2,903	
18	2029	374	8,192	3,064	0,000	0	3,064	3.7	147	544	3,608	2,541	618	0	0	618	2,990	
19	2030	312	8,478	2,645	0,000	0	2,645	3.1	149	462	3,107	2,630	533	0	0	533	2,574	
20	2031	187	8,775	1,641	0,000	0	1,641	1.9	150	285	1,926	2,722	331	0	0	331	1,595	
21	2032	0	9,082	0	0,000	0	0	0.0	152	0	0	2,817	0	0	0	0	0	
Total =		6,732									\$52,960				\$12,150	\$40,810		
Total NPV =											\$23,501				\$6,852	\$16,649		
Benefit/Cost Ratio =																		

NPV =

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-Inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

Table 2  
Utility Cost Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial 92.94% AFUE Furnace

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$283	\$74	\$357	\$127	\$450	\$577	(\$220)
2013	883	239	1,122	218	900	1,118	4
2014	1,828	470	2,298	274	1,350	1,624	674
2015	1,893	474	2,367	0	0	0	2,367
2016	1,959	477	2,436	0	0	0	2,436
2017	2,027	485	2,512	0	0	0	2,512
2018	2,099	488	2,587	0	0	0	2,587
2019	2,172	492	2,664	0	0	0	2,664
2020	2,248	500	2,748	0	0	0	2,748
2021	2,327	503	2,830	0	0	0	2,830
2022	2,408	507	2,915	0	0	0	2,915
2023	2,492	514	3,006	0	0	0	3,006
2024	2,579	518	3,097	0	0	0	3,097
2025	2,670	525	3,195	0	0	0	3,195
2026	2,763	529	3,292	0	0	0	3,292
2027	2,860	533	3,393	0	0	0	3,393
2028	2,960	540	3,500	0	0	0	3,500
2029	3,064	544	3,608	0	0	0	3,608
2030	2,645	462	3,107	0	0	0	3,107
2031	1,641	285	1,926	0	0	0	1,926
2032	0	0	0	0	0	0	0
Total =			\$52,960			\$3,319	\$49,641
			\$23,501			\$2,972	\$20,529
			NPV =				
Total NPV =			\$20,529				
Benefit/Cost Ratio =			7.91				

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	



Table 3  
Societal Test

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial 92-94% AFUE Furnace**

Year	Benefits					Costs					
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	Annual Benefits Less Costs (K)
2012	\$283	\$74	\$0.022	\$0	\$1,041	\$65	\$422	\$577	\$1,050	\$1,627	(\$1,205)
2013	883	239	0.023	0	1,065	199	1,321	1,118	2,100	3,218	(1,897)
2014	1,828	470	0.024	0	1,090	408	2,706	1,624	3,150	4,774	(2,068)
2015	1,893	474	0.025	0	1,115	417	2,784	0	0	0	2,784
2016	1,959	477	0.026	0	1,141	427	2,863	0	0	0	2,863
2017	2,027	485	0.027	0	1,167	436	2,948	0	0	0	2,948
2018	2,099	488	0.028	0	1,194	447	3,034	0	0	0	3,034
2019	2,172	492	0.029	0	1,221	457	3,121	0	0	0	3,121
2020	2,248	500	0.030	0	1,249	467	3,215	0	0	0	3,215
2021	2,327	503	0.031	0	1,278	478	3,308	0	0	0	3,308
2022	2,408	507	0.032	0	1,307	489	3,404	0	0	0	3,404
2023	2,492	514	0.033	0	1,337	500	3,506	0	0	0	3,506
2024	2,579	518	0.034	0	1,368	512	3,609	0	0	0	3,609
2025	2,670	525	0.035	0	1,400	524	3,719	0	0	0	3,719
2026	2,763	529	0.036	0	1,432	536	3,828	0	0	0	3,828
2027	2,860	533	0.038	0	1,465	548	3,941	0	0	0	3,941
2028	2,960	540	0.039	0	1,498	560	4,060	0	0	0	4,060
2029	3,064	544	0.040	0	1,533	573	4,181	0	0	0	4,181
2030	2,645	462	0.042	0	1,568	489	3,596	0	0	0	3,596
2031	1,641	285	0.043	0	1,604	300	2,226	0	0	0	2,226
2032	0	0	0.045	0	1,641	0	0	0	0	0	0

Total =

\$9,619  
\$9,106

NPV =

\$61,792  
\$40,651

Total NPV = \$31,545  
Benefit/Cost Ratio = 4.46

**Worksheet Calculations**

- (A) = Table 1 (F)
- (G) = Table 1 (I)
- (C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..
- (D) = (C) x [Avg. Non-Gas Fuel Units/Part. Saved (22) x No. of Part. (23)]
- (E) = Gas Environmental Damage Factor (9), escalated
- (F) = Table 1 (A) x (E)
- (G) = (A) + (B) + (D) + (F)
- (H) = Table 2 (F)
- (I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
- (J) = (H) + (I)
- (K) = (G) - (J)

**Table 4  
Participant Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial 92-94% AFUE Furnace**

Year	Benefits							Costs		Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)		
2012	\$450	62	\$7,584	\$470	\$0.107	\$0	\$920	\$1,500	(\$580)	
2013	900	187	7,850	1,468	0.111	0	2,368	3,000	(632)	
2014	1,350	374	8,125	3,039	0.115	0	4,389	4,500	(111)	
2015	0	374	8,409	3,145	0.119	0	3,145	0	3,145	
2016	0	374	8,703	3,255	0.123	0	3,255	0	3,255	
2017	0	374	9,008	3,369	0.127	0	3,369	0	3,369	
2018	0	374	9,323	3,487	0.132	0	3,487	0	3,487	
2019	0	374	9,650	3,609	0.136	0	3,609	0	3,609	
2020	0	374	9,987	3,735	0.141	0	3,735	0	3,735	
2021	0	374	10,337	3,866	0.146	0	3,866	0	3,866	
2022	0	374	10,699	4,001	0.151	0	4,001	0	4,001	
2023	0	374	11,073	4,141	0.156	0	4,141	0	4,141	
2024	0	374	11,461	4,286	0.162	0	4,286	0	4,286	
2025	0	374	11,862	4,436	0.167	0	4,436	0	4,436	
2026	0	374	12,277	4,592	0.173	0	4,592	0	4,592	
2027	0	374	12,707	4,752	0.179	0	4,752	0	4,752	
2028	0	374	13,151	4,918	0.186	0	4,918	0	4,918	
2029	0	374	13,612	5,091	0.192	0	5,091	0	5,091	
2030	0	312	14,088	4,395	0.199	0	4,395	0	4,395	
2031	0	187	14,581	2,727	0.206	0	2,727	0	2,727	
2032	0	0	15,092	0	0.213	0	0	0	0	
<b>Total =</b>		<b>6,732</b>					<b>\$75,482</b>	<b>\$9,000</b>	<b>\$66,482</b>	
<b>Total NPV =</b>							<b>\$31,886</b>	<b>\$7,946</b>	<b>23,939</b>	
<b>Benefit/Cost Ratio =</b>										
									<b>NPV =</b>	

Worksheet Calculations	
(A) =	Table 1 (N)
(B) =	Table 1 (A)
(C) =	Retail Rate (1) escalated.
(D) =	(B) x (C)
(E) =	Non-Gas Fuel Retail Rate (2), escalated.
(F) =	(C) x [Avg. Non-Gas Fuel Units/Part. Saved (22) x No. of Part. (23)]
(G) =	(A) + (D) + (F)
(H) =	Direct Participant Costs (17) x Number of Participants (23)
(I) =	(G) - (H)

**Table 5  
Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project: **Commercial 92-94% AFUE Furnace**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$283	\$74	\$0	\$357	\$577	\$1,050	\$1,627	(\$1,270)
2013	883	239	0	1,122	1,118	2,100	3,218	(2,096)
2014	1,828	470	0	2,298	1,624	3,150	4,774	(2,476)
2015	1,893	474	0	2,367	0	0	0	2,367
2016	1,959	477	0	2,436	0	0	0	2,436
2017	2,027	485	0	2,512	0	0	0	2,512
2018	2,099	488	0	2,587	0	0	0	2,587
2019	2,172	492	0	2,664	0	0	0	2,664
2020	2,248	500	0	2,748	0	0	0	2,748
2021	2,327	503	0	2,830	0	0	0	2,830
2022	2,408	507	0	2,915	0	0	0	2,915
2023	2,492	514	0	3,006	0	0	0	3,006
2024	2,579	518	0	3,097	0	0	0	3,097
2025	2,670	525	0	3,195	0	0	0	3,195
2026	2,763	529	0	3,292	0	0	0	3,292
2027	2,860	533	0	3,393	0	0	0	3,393
2028	2,960	540	0	3,500	0	0	0	3,500
2029	3,064	544	0	3,608	0	0	0	3,608
2030	2,645	462	0	3,107	0	0	0	3,107
2031	1,641	285	0	1,926	0	0	0	1,926
2032	0	0	0	0	0	0	0	0
			Total =	\$52,960			\$9,619	\$43,341
			NPV =	\$23,501			\$8,604	14,897

Total NPV = \$14,897  
Benefit/Cost Ratio = 2.73

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Commercial 95+-% AFUE Furnace - New  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) = Escalation Rate =	\$7,328 3.50%		
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) = Escalation Rate = Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	\$0.10340 3.50% Kwh	\$423 1,500 \$1,923	\$582 2,400 \$2,982
3) Commodity Cost (\$/Dk) = Escalation Rate =	\$4.410 3.50%	\$620	\$620
4) Demand Cost (\$/Unit/Yr) = Escalation Rate =	\$123.18 1.00%	\$0 0.00%	\$0 0.00%
5) Peak Reduction Factor =	1.000%	18	18
6) Variable O&M (\$/Dk) = Escalation Rate =	\$0.000 0.00%	12,400	12,400
7) Non-Gas Fuel Cost (\$/Fuel Unit) = Escalation Rate =	\$0.02005 3.50%	669 0	669 0
8) Non-Gas Fuel Loss Factor	7.48%	5	8
9) Gas Environmental Damage Factor = Escalation Rate =	\$1.018 2.30%	62	99
10) Non Gas Fuel Environmental Damage Factor : Escalation Rate =	\$0.000 0.00%	\$300	\$300
11) Participant Discount Rate =	10.00%		\$1,368 35.000%
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2011		
15) Project Analysis Year 1 = Project Analysis Year 2 = Project Analysis Year 3 =	2012 2013 2014		
16) Utility Project Costs			
16a) Administrative & Operating Costs =		\$423	\$582
16b) Incentive Costs =		1,500	2,400
16c) Total Utility Project Costs =		\$1,923	\$2,982
17) Direct Participant Costs (\$/Part.) =		\$620	\$620
18) Participant Non-Energy Costs (Annual \$/Part.) = Escalation Rate =		\$0 0.00%	\$0 0.00%
19) Participant Non-Energy Savings (Annual \$/Part) = Escalation Rate =		\$0 0.00%	\$0 0.00%
20) Project Life (Years) =		18	18
21) Avg. Dk/Part. Saved =		12,400	12,400
22) Avg Non-Gas Fuel Units/Part. Saved =		669	669
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =		0	0
23) Number of Participants =		5	8
24) Total Annual Dk Saved =		62	99
25) Incentive/Participant =		\$300	\$300
26) Distribution Delivery Charge			
27) Effective Income Tax Rate = (Federal & State Taxes)			

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$7,428	1.70
Utility Cost Test	\$10,403	2.35
Societal Test	\$21,860	2.45
Participant Test	\$33,337	3.62
Total Resource Cost Test	\$7,694	1.54

Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial 95+% AFUE Furnace - New

Year	Benefits										Costs					Annual Benefits Less Costs (F)
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
2012	62	\$4,564	\$283	\$0,000	\$0	\$283	0.6	\$124	\$74	\$357	\$1,416	\$57	\$423	\$1,500	\$1,980	(\$1,623)
2013	161	4,724	761	0,000	0	761	1.6	126	202	963	1,465	153	582	2,400	3,135	(2,172)
2014	285	4,889	1,393	0,000	0	1,393	2.9	127	368	1,761	1,517	281	609	3,000	3,890	(2,129)
2015	285	5,061	1,442	0,000	0	1,442	2.9	128	371	1,813	1,570	291	0	0	291	1,522
2016	285	5,238	1,493	0,000	0	1,493	2.9	129	374	1,867	1,625	301	0	0	301	1,566
2017	285	5,421	1,545	0,000	0	1,545	2.9	131	380	1,925	1,682	312	0	0	312	1,613
2018	285	5,611	1,599	0,000	0	1,599	2.9	132	383	1,982	1,740	322	0	0	322	1,660
2019	285	5,807	1,655	0,000	0	1,655	2.9	133	386	2,041	1,801	334	0	0	334	1,707
2020	285	6,010	1,713	0,000	0	1,713	2.9	135	392	2,105	1,864	345	0	0	345	1,760
2021	285	6,221	1,773	0,000	0	1,773	2.9	136	394	2,167	1,930	358	0	0	358	1,809
2022	285	6,438	1,835	0,000	0	1,835	2.9	137	397	2,232	1,997	370	0	0	370	1,862
2023	285	6,664	1,899	0,000	0	1,899	2.9	139	403	2,302	2,067	383	0	0	383	1,919
2024	285	6,897	1,966	0,000	0	1,966	2.9	140	406	2,372	2,139	396	0	0	396	1,976
2025	285	7,138	2,034	0,000	0	2,034	2.9	142	412	2,446	2,214	410	0	0	410	2,036
2026	285	7,388	2,106	0,000	0	2,106	2.9	143	415	2,521	2,292	425	0	0	425	2,096
2027	285	7,647	2,179	0,000	0	2,179	2.9	144	418	2,597	2,372	439	0	0	439	2,158
2028	285	7,915	2,256	0,000	0	2,256	2.9	146	423	2,679	2,455	455	0	0	455	2,224
2029	285	8,192	2,335	0,000	0	2,335	2.9	147	426	2,761	2,541	471	0	0	471	2,290
2030	223	8,478	1,891	0,000	0	1,891	2.2	149	328	2,219	2,630	381	0	0	381	1,838
2031	124	8,775	1,088	0,000	0	1,088	1.2	150	180	1,268	2,722	219	0	0	219	1,049
2032	0	9,082	0	0,000	0	0	0.0	152	0	0	2,817	0	0	0	0	0
Total =	5,130									\$40,378					\$15,217	\$25,161
Total NPV =		\$7,428								\$18,104					\$10,676	\$7,428
Benefit/Cost Ratio =		1.70														

NPV =

Total NPV = \$7,428  
Benefit/Cost Ratio = 1.70

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-Inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

**Table 2  
Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial 95+% AFUE Furnace - New**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$283	\$74	\$357	\$423	\$1,500	\$1,923	(\$1,566)
2013	761	202	963	582	2,400	2,982	(2,019)
2014	1,393	368	1,761	609	3,000	3,609	(1,848)
2015	1,442	371	1,813	0	0	0	1,813
2016	1,493	374	1,867	0	0	0	1,867
2017	1,545	380	1,925	0	0	0	1,925
2018	1,599	383	1,982	0	0	0	1,982
2019	1,655	386	2,041	0	0	0	2,041
2020	1,713	392	2,105	0	0	0	2,105
2021	1,773	394	2,167	0	0	0	2,167
2022	1,835	397	2,232	0	0	0	2,232
2023	1,899	403	2,302	0	0	0	2,302
2024	1,966	406	2,372	0	0	0	2,372
2025	2,034	412	2,446	0	0	0	2,446
2026	2,106	415	2,521	0	0	0	2,521
2027	2,179	418	2,597	0	0	0	2,597
2028	2,256	423	2,679	0	0	0	2,679
2029	2,335	426	2,761	0	0	0	2,761
2030	1,891	328	2,219	0	0	0	2,219
2031	1,088	180	1,268	0	0	0	1,268
2032	0	0	0	0	0	0	0
Total =			\$40,378			\$8,514	\$31,864
NPV =			\$18,104			\$7,701	\$10,403
Total NPV =			\$10,403				
Benefit/Cost Ratio =			<u>2.35</u>				

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (I)
(C) = Table 1 (J)
(D) = Table 1 (M)
(E) = Table 1 (N)
(F) = (D) + (E)
(G) = (C) - (F)

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial 95+% AFUE Furnace - New

Year	Benefits					Costs					
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	Annual Benefits Less Costs (K)
2012	\$283	\$74	\$0.022	\$74	\$1,041	\$65	\$496	\$1,923	\$1,600	\$3,523	(\$3,027)
2013	761	202	0.023	200	1,065	171	1,334	2,982	2,560	5,542	(4,208)
2014	1,393	368	0.024	369	1,090	311	2,441	3,609	3,200	6,809	(4,368)
2015	1,442	371	0.025	385	1,115	318	2,516	0	0	0	2,516
2016	1,493	374	0.026	400	1,141	325	2,592	0	0	0	2,592
2017	1,545	380	0.027	415	1,167	333	2,673	0	0	0	2,673
2018	1,599	383	0.028	431	1,194	340	2,753	0	0	0	2,753
2019	1,655	386	0.029	446	1,221	348	2,835	0	0	0	2,835
2020	1,713	392	0.030	462	1,249	356	2,923	0	0	0	2,923
2021	1,773	394	0.031	477	1,278	364	3,008	0	0	0	3,008
2022	1,835	397	0.032	492	1,307	372	3,096	0	0	0	3,096
2023	1,899	403	0.033	508	1,337	381	3,191	0	0	0	3,191
2024	1,966	406	0.034	523	1,368	390	3,285	0	0	0	3,285
2025	2,034	412	0.035	539	1,400	399	3,384	0	0	0	3,384
2026	2,106	415	0.036	554	1,432	408	3,483	0	0	0	3,483
2027	2,179	418	0.038	585	1,465	418	3,600	0	0	0	3,600
2028	2,256	423	0.039	600	1,498	427	3,706	0	0	0	3,706
2029	2,335	426	0.040	615	1,533	437	3,813	0	0	0	3,813
2030	1,891	328	0.042	506	1,568	350	3,075	0	0	0	3,075
2031	1,088	180	0.043	288	1,604	199	1,755	0	0	0	1,755
2032	0	0	0.045	0	1,641	0	0	0	0	0	0
Total =							\$55,959			\$15,874	\$40,085
							\$36,964			\$15,104	\$21,860
Total NPV =		\$21,860						NPV =			
Benefit/Cost Ratio =		<u>2.45</u>									

Worksheet Calculations

- (A) = Table 1 (F)
- (G) = Table 1 (I)
- (C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..
- (D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
- (E) = Gas Environmental Damage Factor (9), escalated
- (F) = Table 1 (A) x (E)
- (G) = (A) + (B) + (D) + (F)
- (H) = Table 2 (F)
- (I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
- (J) = (H) + (I)
- (K) = (G) - (J)

**Table 4  
Participant Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial 95+% AFUE Furnace - New**

Year	Benefits							Costs	Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)	
2012	\$1,500	62	\$7.584	\$470	\$0.107	\$358	\$2,328	\$3,100	(\$772)
2013	2,400	161	7.850	1,264	0.111	965	4,629	4,960	(331)
2014	3,000	285	8.125	2,316	0.115	1,770	7,086	6,200	886
2015	0	285	8.409	2,397	0.119	1,831	4,228	0	4,228
2016	0	285	8.703	2,480	0.123	1,893	4,373	0	4,373
2017	0	285	9.008	2,567	0.127	1,954	4,521	0	4,521
2018	0	285	9.323	2,657	0.132	2,031	4,688	0	4,688
2019	0	285	9.650	2,750	0.136	2,093	4,843	0	4,843
2020	0	285	9.987	2,846	0.141	2,170	5,016	0	5,016
2021	0	285	10.337	2,946	0.146	2,247	5,193	0	5,193
2022	0	285	10.699	3,049	0.151	2,323	5,372	0	5,372
2023	0	285	11.073	3,156	0.156	2,400	5,556	0	5,556
2024	0	285	11.461	3,266	0.162	2,493	5,759	0	5,759
2025	0	285	11.862	3,381	0.167	2,570	5,951	0	5,951
2026	0	285	12.277	3,499	0.173	2,662	6,161	0	6,161
2027	0	285	12.707	3,621	0.179	2,754	6,375	0	6,375
2028	0	285	13.151	3,748	0.186	2,862	6,610	0	6,610
2029	0	285	13.612	3,879	0.192	2,954	6,833	0	6,833
2030	0	223	14.088	3,142	0.199	2,396	5,538	0	5,538
2031	0	124	14.581	1,808	0.206	1,378	3,186	0	3,186
2032	0	0	15.092	0	0.213	0	0	0	0
Total =		5,130					\$104,246	\$14,260	\$89,986
							NPV = \$46,070	\$12,733	33,337
Total NPV =		\$33,337							
Benefit/Cost Ratio =		<u>3.62</u>							

Worksheet Calculations
(A) = Table 1 (N)
(B) = Table 1 (A)
(C) = Retail Rate (1) escalated.
(D) = (B) x (C)
(E) = Non-Gas Fuel Retail Rate (2), escalated.
(F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
(G) = (A) + (D) + (F)
(H) = Direct Participant Costs (17) x Number of Participants (23)
(I) = (G) - (H)



**Table 5**  
**Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project **Commercial 95+% AFUE Furnace - New**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$283	\$74	\$74	\$431	\$1,923	\$1,600	\$3,523	(\$3,092)
2013	761	202	200	1,163	2,982	2,560	5,542	(4,379)
2014	1,393	368	369	2,130	3,609	3,200	6,809	(4,679)
2015	1,442	371	385	2,198	0	0	0	2,198
2016	1,493	374	400	2,267	0	0	0	2,267
2017	1,545	380	415	2,340	0	0	0	2,340
2018	1,599	383	431	2,413	0	0	0	2,413
2019	1,655	386	446	2,487	0	0	0	2,487
2020	1,713	392	462	2,567	0	0	0	2,567
2021	1,773	394	477	2,644	0	0	0	2,644
2022	1,835	397	492	2,724	0	0	0	2,724
2023	1,899	403	508	2,810	0	0	0	2,810
2024	1,966	406	523	2,895	0	0	0	2,895
2025	2,034	412	539	2,985	0	0	0	2,985
2026	2,106	415	554	3,075	0	0	0	3,075
2027	2,179	418	585	3,182	0	0	0	3,182
2028	2,256	423	600	3,279	0	0	0	3,279
2029	2,335	426	615	3,376	0	0	0	3,376
2030	1,891	328	506	2,725	0	0	0	2,725
2031	1,088	180	288	1,556	0	0	0	1,556
2032	0	0	0	0	0	0	0	0
Total =				\$49,247			\$15,874	\$33,373
NPV =				\$22,042			\$14,348	7,694

Total NPV = \$7,694  
Benefit/Cost Ratio = 1.54

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION

Company: Montana-Dakota Utilities Co.  
Project: Commercial 95+% AFUE Furnace - Replacement  
Program Years: 2012 - 2014

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) = \$7.328			
Escalation Rate = 3.50%	\$593	\$655	\$853
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) = \$0.10340	2,100	2,700	4,200
Escalation Rate = 3.50%	\$2,693	\$3,355	\$5,053
Non-Gas Fuel Units (ie. kWh,Gallons, etc) = Kwh	\$620	\$620	\$620
3) Commodity Cost (\$/Dk) = \$4.410	\$0	\$0	\$0
Escalation Rate = 3.50%	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) = \$123.18	\$0	\$0	\$0
Escalation Rate = 1.00%	0.00%	0.00%	1.40%
5) Peak Reduction Factor = 1.000%	18	18	18
6) Variable O&M (\$/Dk) = \$0.000	23,000	23,000	23,000
Escalation Rate = 0.00%			
7) Non-Gas Fuel Cost (\$/Fuel Unit) = \$0.02005	669	669	669
Escalation Rate = 3.50%	0	0	0
8) Non-Gas Fuel Loss Factor = 7.48%	7	9	14
9) Gas Environmental Damage Factor = \$1.018	161	207	322
Escalation Rate = 2.30%	\$300	\$300	\$300
10) Non Gas Fuel Environmental Damage Factor : \$0.000			\$1,368
Escalation Rate = 0.00%			35.000%
11) Participant Discount Rate = 10.00%			
12) Utility Discount Rate = 8.94%			
13) Societal Discount Rate = 4.25%			
14) General Input Data Year = 2011			
15) Project Analysis Year 1 = 2012			
Project Analysis Year 2 = 2013			
Project Analysis Year 3 = 2014			
16) Utility Project Costs			
16a) Administrative & Operating Costs =	\$593	\$655	\$853
16b) Incentive Costs =	2,100	2,700	4,200
16c) Total Utility Project Costs =	\$2,693	\$3,355	\$5,053
17) Direct Participant Costs (\$/Part.) =	\$620	\$620	\$620
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	0.00%
19) Participant Non-Energy Savings (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	1.40%
20) Project Life (Years) =	18	18	18
21) Avg. Dk/Part. Saved =	23,000	23,000	23,000
22) Avg Non-Gas Fuel Units/Part. Saved =	669	669	669
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
23) Number of Participants =	7	9	14
24) Total Annual Dk Saved =	161	207	322
25) Incentive/Participant =	\$300	\$300	\$300
26) Distribution Delivery Charge			\$1,368
27) Effective Income Tax Rate = (Federal & State Taxes)			35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$26,457	2.54
Utility Cost Test	\$33,652	4.36
Societal Test	\$63,117	4.21
Participant Test	\$68,712	5.14
Total Resource Cost Test	\$30,126	2.61

**Table 1  
Ratepayer Impact Measure Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial 95+% AFUE Furnace - Replacement**

t	Year	Benefits								Costs						Annual Benefits Less Costs (P)	
		Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Dk Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)		Total Program Costs (O)
1	2012	161	\$4,564	\$735	\$0.000	\$0	\$735	1.6	\$124	\$198	\$933	\$1,416	\$148	\$593	\$2,100	\$2,841	(\$1,908)
2	2013	368	4,724	1,738	0.000	0	1,738	3.7	126	466	2,204	1,465	350	655	2,700	3,705	(1,501)
3	2014	690	4,889	3,373	0.000	0	3,373	6.9	127	876	4,249	1,517	680	853	4,200	5,733	(1,484)
4	2015	690	5,061	3,492	0.000	0	3,492	6.9	128	883	4,375	1,570	704	0	0	704	3,671
5	2016	690	5,238	3,614	0.000	0	3,614	6.9	129	890	4,504	1,625	729	0	0	729	3,775
6	2017	690	5,421	3,740	0.000	0	3,740	6.9	131	904	4,644	1,682	754	0	0	754	3,890
7	2018	690	5,611	3,872	0.000	0	3,872	6.9	132	911	4,783	1,740	780	0	0	780	4,003
8	2019	690	5,807	4,007	0.000	0	4,007	6.9	133	918	4,925	1,801	808	0	0	808	4,117
9	2020	690	6,010	4,147	0.000	0	4,147	6.9	135	932	5,079	1,864	836	0	0	836	4,243
10	2021	690	6,221	4,292	0.000	0	4,292	6.9	136	938	5,230	1,930	866	0	0	866	4,364
11	2022	690	6,438	4,442	0.000	0	4,442	6.9	137	945	5,387	1,997	896	0	0	896	4,491
12	2023	690	6,664	4,598	0.000	0	4,598	6.9	139	959	5,557	2,067	927	0	0	927	4,630
13	2024	690	6,897	4,759	0.000	0	4,759	6.9	140	966	5,725	2,139	959	0	0	959	4,766
14	2025	690	7,138	4,925	0.000	0	4,925	6.9	142	980	5,905	2,214	993	0	0	993	4,912
15	2026	690	7,388	5,098	0.000	0	5,098	6.9	143	987	6,085	2,292	1,028	0	0	1,028	5,057
16	2027	690	7,647	5,276	0.000	0	5,276	6.9	144	994	6,270	2,372	1,064	0	0	1,064	5,206
17	2028	690	7,915	5,461	0.000	0	5,461	6.9	146	1,007	6,468	2,455	1,101	0	0	1,101	5,367
18	2029	690	8,192	5,652	0.000	0	5,652	6.9	147	1,014	6,666	2,541	1,140	0	0	1,140	5,526
19	2030	529	8,478	4,485	0.000	0	4,485	5.3	149	790	5,275	2,630	904	0	0	904	4,371
20	2031	322	8,775	2,826	0.000	0	2,826	3.2	150	480	3,306	2,722	570	0	0	570	2,736
21	2032	0	9,082	0	0.000	0	0	0.0	152	0	0	2,817	0	0	0	0	0

Total = 12,420

NPV = \$97,570  
\$43,682

\$27,338 \$70,232  
\$17,226 \$26,457

Total NPV = \$26,457  
Benefit/Cost Ratio = 2.54

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	(I) = (G) x (H)
(B) = Commodity Cost (3) escalated	(J) = (F) + (I)
(C) = (A) x (B)	(K) = Distribution Delivery Charge (26) escalated.
(D) = Variable O&M Cost (6), escalated	(L) = (A) x (K) x (1-Inverse of Tax Rate (27))
(E) = (A) x (D)	(M) = Admin & Operating Costs (16a)
(F) = (C) + (E)	(N) = Incentive Costs (16b)
(G) = (A) x Peak Reduction Factor (5)	(O) = (L) + (M) + (N)
(H) = Demand Cost (4) escalated.	(P) = (J) - (O)

**Table 2**  
**Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial 95+% AFUE Furnace - Replacement**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$735	\$198	\$933	\$593	\$2,100	\$2,693	(\$1,760)
2013	1,738	466	2,204	655	2,700	3,355	(1,151)
2014	3,373	876	4,249	853	4,200	5,053	(804)
2015	3,492	883	4,375	0	0	0	4,375
2016	3,614	890	4,504	0	0	0	4,504
2017	3,740	904	4,644	0	0	0	4,644
2018	3,872	911	4,783	0	0	0	4,783
2019	4,007	918	4,925	0	0	0	4,925
2020	4,147	932	5,079	0	0	0	5,079
2021	4,292	938	5,230	0	0	0	5,230
2022	4,442	945	5,387	0	0	0	5,387
2023	4,598	959	5,557	0	0	0	5,557
2024	4,759	966	5,725	0	0	0	5,725
2025	4,925	980	5,905	0	0	0	5,905
2026	5,098	987	6,085	0	0	0	6,085
2027	5,276	994	6,270	0	0	0	6,270
2028	5,461	1,007	6,468	0	0	0	6,468
2029	5,652	1,014	6,666	0	0	0	6,666
2030	4,485	790	5,275	0	0	0	5,275
2031	2,826	480	3,306	0	0	0	3,306
2032	0	0	0	0	0	0	0
<b>Total =</b>			<b>\$97,570</b>			<b>\$11,101</b>	<b>\$86,469</b>
			<b>\$43,682</b>			<b>\$10,030</b>	<b>\$33,652</b>
			<b>NPV =</b>				
			<b>\$33,652</b>				
			<b>Benefit/Cost Ratio =</b>				
			<b>4.36</b>				

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial 95+-% AFUE Furnace - Replacement

Year	Benefits					Costs					
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	Annual Benefits Less Costs (K)
2012	\$735	\$198	\$0.022	\$103	\$1,041	\$168	\$1,204	\$2,693	\$2,240	\$4,933	(\$3,729)
2013	1,738	466	0.023	246	1,065	392	2,842	3,355	2,880	6,235	(3,393)
2014	3,373	876	0.024	482	1,090	752	5,483	5,053	4,480	9,533	(4,050)
2015	3,492	883	0.025	502	1,115	769	5,646	0	0	0	5,646
2016	3,614	890	0.026	522	1,141	787	5,813	0	0	0	5,813
2017	3,740	904	0.027	542	1,167	805	5,991	0	0	0	5,991
2018	3,872	911	0.028	562	1,194	824	6,169	0	0	0	6,169
2019	4,007	918	0.029	582	1,221	842	6,349	0	0	0	6,349
2020	4,147	932	0.030	602	1,249	862	6,543	0	0	0	6,543
2021	4,292	938	0.031	622	1,278	882	6,734	0	0	0	6,734
2022	4,442	945	0.032	642	1,307	902	6,931	0	0	0	6,931
2023	4,598	959	0.033	662	1,337	923	7,142	0	0	0	7,142
2024	4,759	966	0.034	682	1,368	944	7,351	0	0	0	7,351
2025	4,925	980	0.035	702	1,400	966	7,573	0	0	0	7,573
2026	5,098	987	0.036	723	1,432	988	7,796	0	0	0	7,796
2027	5,276	994	0.038	763	1,465	1,011	8,044	0	0	0	8,044
2028	5,461	1,007	0.039	783	1,498	1,034	8,285	0	0	0	8,285
2029	5,652	1,014	0.040	803	1,533	1,058	8,527	0	0	0	8,527
2030	4,485	790	0.042	646	1,568	829	6,750	0	0	0	6,750
2031	2,826	480	0.043	403	1,604	516	4,225	0	0	0	4,225
2032	0	0	0.045	0	1,641	0	0	0	0	0	0
Total =							\$125,398			\$20,701	\$104,697
							\$82,802			\$19,685	\$63,117
Total NPV =			\$63,117								
Benefit/Cost Ratio =			<u>4.21</u>								

Total =

NPV =

Total NPV = \$63,117  
Benefit/Cost Ratio = 4.21

Worksheet Calculations

- (A) = Table 1 (F)
- (G) = Table 1 (I)
- (C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated.
- (D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]
- (E) = Gas Environmental Damage Factor (9), escalated
- (F) = Table 1 (A) x (E)
- (G) = (A) + (B) + (D) + (F)
- (H) = Table 2 (F)
- (I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)
- (J) = (H) + (I)
- (K) = (G) - (J)

Table 4  
Participant Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial 95+% AFUE Furnace - Replacement

Year	Benefits						Costs		Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)	
2012	\$2,100	161	\$7,584	\$1,221	\$0.107	\$501	\$3,822	\$4,340	(\$518)
2013	2,700	368	7,850	2,889	0.111	1,188	6,777	5,580	1,197
2014	4,200	690	8,125	5,606	0.115	2,308	12,114	8,680	3,434
2015	0	690	8,409	5,802	0.119	2,388	8,190	0	8,190
2016	0	690	8,703	6,005	0.123	2,469	8,474	0	8,474
2017	0	690	9,008	6,216	0.127	2,549	8,765	0	8,765
2018	0	690	9,323	6,433	0.132	2,649	9,082	0	9,082
2019	0	690	9,650	6,659	0.136	2,730	9,389	0	9,389
2020	0	690	9,987	6,891	0.141	2,830	9,721	0	9,721
2021	0	690	10,337	7,133	0.146	2,930	10,063	0	10,063
2022	0	690	10,699	7,382	0.151	3,031	10,413	0	10,413
2023	0	690	11,073	7,640	0.156	3,131	10,771	0	10,771
2024	0	690	11,461	7,908	0.162	3,251	11,159	0	11,159
2025	0	690	11,862	8,185	0.167	3,352	11,537	0	11,537
2026	0	690	12,277	8,471	0.173	3,472	11,943	0	11,943
2027	0	690	12,707	8,768	0.179	3,593	12,361	0	12,361
2028	0	690	13,151	9,074	0.186	3,733	12,807	0	12,807
2029	0	690	13,612	9,392	0.192	3,853	13,245	0	13,245
2030	0	529	14,088	7,453	0.199	3,062	10,515	0	10,515
2031	0	322	14,581	4,695	0.206	1,929	6,624	0	6,624
2032	0	0	15,092	0	0.213	0	0	0	0
Total =		12,420					\$197,772	\$18,600	\$179,172
Total NPV =							\$85,298	\$16,586	68,712
Benefit/Cost Ratio =							NPV =		

Total NPV = \$68,712  
Benefit/Cost Ratio = 5.14

Worksheet Calculations	
(A) = Table 1 (N)	
(B) = Table 1 (A)	
(C) = Retail Rate (1) escalated.	
(D) = (B) x (C)	
(E) = Non-Gas Fuel Retail Rate (2), escalated.	
(F) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]	
(G) = (A) + (D) + (F)	
(H) = Direct Participant Costs (17) x Number of Participants (23)	
(I) = (G) - (H)	

**Table 5**  
**Total Resource Cost Test**

Compa **Montana-Dakota Utilities Co.**  
Project **Commercial 95+% AFUE Furnace - Replacement**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$735	\$198	\$103	\$1,036	\$2,693	\$2,240	\$4,933	(\$3,897)
2013	1,738	466	246	2,450	3,355	2,880	6,235	(3,785)
2014	3,373	876	482	4,731	5,053	4,480	9,533	(4,802)
2015	3,492	883	502	4,877	0	0	0	4,877
2016	3,614	890	522	5,026	0	0	0	5,026
2017	3,740	904	542	5,186	0	0	0	5,186
2018	3,872	911	562	5,345	0	0	0	5,345
2019	4,007	918	582	5,507	0	0	0	5,507
2020	4,147	932	602	5,681	0	0	0	5,681
2021	4,292	938	622	5,852	0	0	0	5,852
2022	4,442	945	642	6,029	0	0	0	6,029
2023	4,598	959	662	6,219	0	0	0	6,219
2024	4,759	966	682	6,407	0	0	0	6,407
2025	4,925	980	702	6,607	0	0	0	6,607
2026	5,098	987	723	6,808	0	0	0	6,808
2027	5,276	994	763	7,033	0	0	0	7,033
2028	5,461	1,007	783	7,251	0	0	0	7,251
2029	5,652	1,014	803	7,469	0	0	0	7,469
2030	4,485	790	646	5,921	0	0	0	5,921
2031	2,826	480	403	3,709	0	0	0	3,709
2032	0	0	0	0	0	0	0	0
Total =				\$109,144				\$88,443
NPV =				\$48,815				\$18,689

Total NPV = \$30,126  
Benefit/Cost Ratio = 2.61

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

**NATURAL GAS CONSERVATION PROGRAMS/DEMAND-SIDE MANAGEMENT  
BEN/COST ANALYSIS FOR GAS CONSERVATION**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Commercial Custom Efficiency**  
 Program Years: **2012 - 2014**

Input Data	First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.328		
Escalation Rate =	3.50%	\$508	\$873
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10340	1,800	3,600
Escalation Rate =	3.50%	\$2,308	\$4,473
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	\$3,000	\$3,000
3) Commodity Cost (\$/Dk) =	\$4.410	\$0	\$0
Escalation Rate =	3.50%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$123.18	\$0	\$0
Escalation Rate =	1.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	15	15
6) Variable O&M (\$/Dk) =	\$0.000	100,000	100,000
Escalation Rate =	0.00%	0	0
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	0	0
Escalation Rate =	3.50%	0	0
8) Non-Gas Fuel Loss Factor	7.48%	3	6
9) Gas Environmental Damage Factor =	\$1.018	300	600
Escalation Rate =	2.30%	\$600	\$600
10) Non Gas Fuel Environmental Damage Factor :	\$0.000		
Escalation Rate =	0.00%		\$1.368
11) Participant Discount Rate =	10.00%		35.000%

16) Utility Project Costs			
16a) Administrative & Operating Costs =	\$508	\$873	\$1,097
16b) Incentive Costs =	1,800	3,600	5,400
16c) Total Utility Project Costs =	\$2,308	\$4,473	\$6,497
17) Direct Participant Costs (\$/Part.) =	\$3,000	\$3,000	\$3,000
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	0.00%
19) Participant Non-Energy Savings (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	0.00%	0.00%	1.40%
20) Project Life (Years) =	15	15	15
21) Avg. Dk/Part. Saved =	100,000	100,000	100,000
22) Avg Non-Gas Fuel Units/Part. Saved =	0	0	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
23) Number of Participants =	3	6	9
24) Total Annual Dk Saved =	300	600	900
25) Incentive/Participant =	\$600	\$600	\$600
26) Distribution Delivery Charge			
27) Effective Income Tax Rate =			
(Federal & State Taxes)			35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$72,820	3.55
Utility Cost Test	\$89,447	8.52
Societal Test	\$112,782	3.11
Participant Test	\$89,572	2.88
Total Resource Cost Test	\$60,336	2.01

12) Utility Discount Rate =	8.94%
13) Societal Discount Rate =	4.25%
14) General Input Data Year =	2011
15) Project Analysis Year 1 =	2012
Project Analysis Year 2 =	2013
Project Analysis Year 3 =	2014



Table 1  
Ratepayer Impact Measure Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial Custom Efficiency

Year	Benefits										Costs					Annual Benefits Less Costs (P)
	Total Energy Reduction (A)	Gas Commodity Cost/DK (B)	Gas Commodity Savings (C)	Variable O & M Cost/DK (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak Demand Reduction (G)	Demand Savings Per Unit (H)	Total Demand Savings (I)	Total Savings (J)	Distribution Delivery Charge (K)	Lost Margin (L)	Program Admin Costs (M)	Incentive Costs (N)	Total Program Costs (O)	
2012	300	\$4,564	\$1,369	\$0	\$0	\$1,369	3.0	\$124	\$372	\$1,741	\$1,416	\$276	\$508	\$1,800	\$2,584	(\$843)
2013	900	4,724	4,252	0	0	4,252	9.0	126	1,134	5,386	1,465	857	873	3,600	5,330	56
2014	1,800	4,889	8,800	0	0	8,800	18.0	127	2,286	11,086	1,517	1,775	1,097	5,400	8,272	2,814
2015	1,800	5,061	9,110	0	0	9,110	18.0	128	2,304	11,414	1,570	1,837	0	0	1,837	9,577
2016	1,800	5,238	9,428	0	0	9,428	18.0	129	2,322	11,750	1,625	1,901	0	0	1,901	9,849
2017	1,800	5,421	9,758	0	0	9,758	18.0	131	2,358	12,116	1,682	1,968	0	0	1,968	10,148
2018	1,800	5,611	10,100	0	0	10,100	18.0	132	2,376	12,476	1,740	2,036	0	0	2,036	10,440
2019	1,800	5,807	10,453	0	0	10,453	18.0	133	2,394	12,847	1,801	2,107	0	0	2,107	10,740
2020	1,800	6,010	10,818	0	0	10,818	18.0	135	2,430	13,248	1,864	2,181	0	0	2,181	11,067
2021	1,800	6,221	11,198	0	0	11,198	18.0	136	2,448	13,646	1,930	2,258	0	0	2,258	11,388
2022	1,800	6,438	11,588	0	0	11,588	18.0	137	2,466	14,054	1,997	2,336	0	0	2,336	11,718
2023	1,800	6,664	11,995	0	0	11,995	18.0	139	2,502	14,497	2,067	2,418	0	0	2,418	12,079
2024	1,800	6,897	12,415	0	0	12,415	18.0	140	2,520	14,935	2,139	2,503	0	0	2,503	12,432
2025	1,800	7,138	12,848	0	0	12,848	18.0	142	2,556	15,404	2,214	2,590	0	0	2,590	12,814
2026	1,800	7,388	13,298	0	0	13,298	18.0	143	2,574	15,872	2,292	2,682	0	0	2,682	13,190
2027	1,500	7,647	11,471	0	0	11,471	15.0	144	2,160	13,631	2,372	2,313	0	0	2,313	11,318
2028	900	7,915	7,124	0	0	7,124	9.0	146	1,314	8,438	2,455	1,436	0	0	1,436	7,002
2029	0	8,192	0	0	0	0	0.0	147	0	0	2,541	0	0	0	0	0
2030	0	8,478	0	0	0	0	0.0	149	0	0	2,630	0	0	0	0	0
2031	0	8,775	0	0	0	0	0.0	150	0	0	2,722	0	0	0	0	0
2032	0	9,082	0	0	0	0	0.0	152	0	0	2,817	0	0	0	0	0
Total =	27,000								\$202,541	\$202,541					\$46,752	\$155,789
Total NPV =		\$72,820							\$101,335	\$101,335					\$28,515	\$72,820
Benefit/Cost Ratio =		3.55							NPV =							

Worksheet Calculations	
(A) = Average Dk/Participant Saved (21) x Number of Participants (23) for Project Life (20)	
(B) = Commodity Cost (3) escalated	
(C) = (A) x (B)	
(D) = Variable O&M Cost (6), escalated	
(E) = (A) x (D)	
(F) = (C) + (E)	
(G) = (A) x Peak Reduction Factor (5)	
(H) = Demand Cost (4) escalated.	
(I) = (G) x (H)	
(J) = (F) + (I)	
(K) = Distribution Delivery Charge (26) escalated.	
(L) = (A) x (K) x (1-Inverse of Tax Rate (27)	
(M) = Admin & Operating Costs (16a)	
(N) = Incentive Costs (16b)	
(O) = (L) + (M) + (N)	
(P) = (J) - (O)	

**Table 2**  
**Utility Cost Test**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Custom Efficiency**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2012	\$1,369	\$372	\$1,741	\$508	\$1,800	\$2,308	(\$567)
2013	4,252	1,134	5,386	873	3,600	4,473	913
2014	8,800	2,286	11,086	1,097	5,400	6,497	4,589
2015	9,110	2,304	11,414	0	0	0	11,414
2016	9,428	2,322	11,750	0	0	0	11,750
2017	9,758	2,358	12,116	0	0	0	12,116
2018	10,100	2,376	12,476	0	0	0	12,476
2019	10,453	2,394	12,847	0	0	0	12,847
2020	10,818	2,430	13,248	0	0	0	13,248
2021	11,198	2,448	13,646	0	0	0	13,646
2022	11,588	2,466	14,054	0	0	0	14,054
2023	11,995	2,502	14,497	0	0	0	14,497
2024	12,415	2,520	14,935	0	0	0	14,935
2025	12,848	2,556	15,404	0	0	0	15,404
2026	13,298	2,574	15,872	0	0	0	15,872
2027	11,471	2,160	13,631	0	0	0	13,631
2028	7,124	1,314	8,438	0	0	0	8,438
2029	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
<b>Total =</b>			<b>\$202,541</b>			<b>\$13,278</b>	<b>\$189,263</b>
			<b>NPV = \$101,335</b>			<b>\$11,888</b>	<b>\$89,447</b>
<b>Total NPV =</b>			<b>\$89,447</b>				
<b>Benefit/Cost Ratio =</b>			<b>8.52</b>				

Worksheet Calculations	
(A) = Table 1 (F)	
(B) = Table 1 (I)	
(C) = Table 1 (J)	
(D) = Table 1 (M)	
(E) = Table 1 (N)	
(F) = (D) + (E)	
(G) = (C) - (F)	

Table 3  
Societal Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial Custom Efficiency

Year	Benefits							Costs			
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (\$/Part.) (C)	Non-Gas Energy Savings (D)	Environmental Damage Savings/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	Annual Benefits Less Costs (K)
2012	\$1,369	\$372	\$0.022	\$0	\$1,041	\$312	\$2,053	\$2,308	\$7,200	\$9,508	(\$7,455)
2013	4,252	1,134	0.023	0	1,065	959	6,345	4,473	14,400	18,873	(12,528)
2014	8,800	2,286	0.024	0	1,090	1,962	13,048	6,497	21,600	28,097	(15,049)
2015	9,110	2,304	0.025	0	1,115	2,007	13,421	0	0	0	13,421
2016	9,428	2,322	0.026	0	1,141	2,054	13,804	0	0	0	13,804
2017	9,758	2,358	0.027	0	1,167	2,101	14,217	0	0	0	14,217
2018	10,100	2,376	0.028	0	1,194	2,149	14,625	0	0	0	14,625
2019	10,453	2,394	0.029	0	1,221	2,198	15,045	0	0	0	15,045
2020	10,818	2,430	0.030	0	1,249	2,248	15,496	0	0	0	15,496
2021	11,198	2,448	0.031	0	1,278	2,300	15,946	0	0	0	15,946
2022	11,588	2,466	0.032	0	1,307	2,353	16,407	0	0	0	16,407
2023	11,995	2,502	0.033	0	1,337	2,407	16,904	0	0	0	16,904
2024	12,415	2,520	0.034	0	1,368	2,462	17,397	0	0	0	17,397
2025	12,848	2,556	0.035	0	1,400	2,520	17,924	0	0	0	17,924
2026	13,298	2,574	0.036	0	1,432	2,578	18,450	0	0	0	18,450
2027	11,471	2,160	0.038	0	1,465	2,198	15,829	0	0	0	15,829
2028	7,124	1,314	0.039	0	1,498	1,348	9,786	0	0	0	9,786
2029	0	0	0.040	0	1,533	0	0	0	0	0	0
2030	0	0	0.042	0	1,568	0	0	0	0	0	0
2031	0	0	0.043	0	1,604	0	0	0	0	0	0
2032	0	0	0.045	0	1,641	0	0	0	0	0	0

Total =

\$236,697  
\$166,246  
\$56,478  
\$180,219  
\$53,464  
\$112,782

NPV =

Total NPV = \$112,782  
Benefit/Cost Ratio = 3.11

Worksheet Calculations

(A) = Table 1 (F)  
 (G) = Table 1 (I)  
 (C) = Non-Gas Fuel Cost (7), adjusted for losses (8), escalated..  
 (D) = (C) x [Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)]  
 (E) = Gas Environmental Damage Factor (9), escalated  
 (F) = Table 1 (A) x (E)  
 (G) = (A) + (B) + (D) + (F)  
 (H) = Table 2 (F)  
 (I) = Direct Part. Costs (17) x No. of Part. (23) - Table 1 (N)  
 (J) = (H) + (I)  
 (K) = (G) - (J)

Table 4  
Participant Test

Company: Montana-Dakota Utilities Co.  
Project: Commercial Custom Efficiency

Year	Benefits					Costs		Annual Benefits Less Costs (I)
	Incentives Received (A)	Total Energy Reduction (B)	Retail Rate (C)	Gas Bill Savings (D)	Non-Gas Fuel Retail Rate (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	
2012	\$1,800	300	\$7,584	\$2,275	\$0.107	\$0	\$4,075	\$9,000
2013	3,600	900	7,850	7,065	0.111	0	10,665	18,000
2014	5,400	1,800	8,125	14,625	0.115	0	20,025	27,000
2015	0	1,800	8,409	15,136	0.119	0	15,136	0
2016	0	1,800	8,703	15,665	0.123	0	15,665	0
2017	0	1,800	9,008	16,214	0.127	0	16,214	0
2018	0	1,800	9,323	16,781	0.132	0	16,781	0
2019	0	1,800	9,650	17,370	0.136	0	17,370	0
2020	0	1,800	9,987	17,977	0.141	0	17,977	0
2021	0	1,800	10,337	18,607	0.146	0	18,607	0
2022	0	1,800	10,699	19,258	0.151	0	19,258	0
2023	0	1,800	11,073	19,931	0.156	0	19,931	0
2024	0	1,800	11,461	20,630	0.162	0	20,630	0
2025	0	1,800	11,862	21,352	0.167	0	21,352	0
2026	0	1,800	12,277	22,099	0.173	0	22,099	0
2027	0	1,500	12,707	19,061	0.179	0	19,061	0
2028	0	900	13,151	11,836	0.186	0	11,836	0
2029	0	0	13,612	0	0.192	0	0	0
2030	0	0	14,088	0	0.199	0	0	0
2031	0	0	14,581	0	0.206	0	0	0
2032	0	0	15,092	0	0.213	0	0	0
<b>Total =</b>		<b>27,000</b>					<b>\$286,682</b>	<b>\$54,000</b>
							<b>\$137,250</b>	<b>\$47,678</b>
						<b>NPV =</b>		<b>\$232,682</b>
								<b>89,572</b>
Total NPV =		\$89,572						
Benefit/Cost Ratio =		2.88						

Worksheet Calculations	
(A) =	Table 1 (N)
(B) =	Table 1 (A)
(C) =	Retail Rate (1) escalated.
(D) =	(B) x (C)
(E) =	Non-Gas Fuel Retail Rate (2), escalated.
(F) =	(C) x (Avg. Non-Gas Fuel Units/Part.Saved (22) x No. of Part. (23)
(G) =	(A) + (D) + (F)
(H) =	Direct Participant Costs (17) x Number of Participants (23)
(I) =	(G) - (H)

**Table 5  
Total Resource Cost Test**

Compa Montana-Dakota Utilities Co.  
Project **Commercial Custom Efficiency**

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2012	\$1,369	\$372	\$0	\$1,741	\$2,308	\$7,200	\$9,508	\$1,741
2013	4,252	1,134	0	5,386	4,473	14,400	18,873	(13,487)
2014	8,800	2,286	0	11,086	6,497	21,600	28,097	(17,011)
2015	9,110	2,304	0	11,414	0	0	0	11,414
2016	9,428	2,322	0	11,750	0	0	0	11,750
2017	9,758	2,358	0	12,116	0	0	0	12,116
2018	10,100	2,376	0	12,476	0	0	0	12,476
2019	10,453	2,394	0	12,847	0	0	0	12,847
2020	10,818	2,430	0	13,248	0	0	0	13,248
2021	11,198	2,448	0	13,646	0	0	0	13,646
2022	11,588	2,466	0	14,054	0	0	0	14,054
2023	11,995	2,502	0	14,497	0	0	0	14,497
2024	12,415	2,520	0	14,935	0	0	0	14,935
2025	12,848	2,556	0	15,404	0	0	0	15,404
2026	13,298	2,574	0	15,872	0	0	0	15,872
2027	11,471	2,160	0	13,631	0	0	0	13,631
2028	7,124	1,314	0	8,438	0	0	0	8,438
2029	0	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0	0
				<b>Total = \$202,541</b>			<b>\$56,478</b>	<b>\$155,571</b>
				<b>NPV = \$101,335</b>			<b>\$50,507</b>	<b>60,336</b>

Total NPV = \$60,336  
Benefit/Cost Ratio = 2.01

Worksheet Calculations
(A) = Table 1 (F)
(B) = Table 1 (T)
(C) = Table 3 (D)
(D) = (A) + (B) + (C)
(E) = Table 3 (H)
(F) = Table 3 (I)
(G) = (E) + (F)
(H) = (D) - (G)

Montana-Dakota Utilities Co.  
2011 Input Data Summary  
South Dakota Natural Gas Conservation Model

Input No.	Input Data Description	Information Source	SD Res.	SD Comm.
1	Retail Rate (\$/dk) Escalation Rate	Weighted Average of SD retail rate using projected 2011-2012 gas costs & September 2011 pipeline and distribution	7.713 3.50%	7.328 3.50%
2	Non-Gas Fuel Retail (\$/fuel/unit)  Escalation Rate	Average retail cost of non gas fuel if measures also saves kWh, gallons of water, etc. (for analysis purposes, used electric as Non-Gas Fuel Retail Rate)	0.102 3.50%	0.1034 3.50%
3	Non-Gas Fuel Units (ie. kWh, Gallons, etc) Commodity Cost (\$/dk) Escalation Rate	Estimated gas costs and October 2011 pipeline commodity	Kwh 4.41 3.50%	Kwh 4.41 3.50%
4	Demand Cost (\$/dk/Yr) Escalation Rate	Annual cost of firm capacity on pipeline	\$123.18 1.00%	\$123.18 1.00%
5	Peak Reduction Factor	Estimated average peak day reduction factor caused by implementing the measure (s)	1.000%	1.000%
6	Variable O&M (\$/dk) Escalation Rate	Estimated variable O&M that will be avoided due the implementing the measure	\$0 0.00%	\$0 0.00%
7	Non-Gas Fuel Cost (\$/Fuel Unit)  Escalation Rate	Average commodity cost of non gas fuel if measures also saves kWh, gallons of water, etc. (for analysis purposes, used electric as Non-Gas Fuel Cost)	\$0.02005 3.50%	\$0.02005 3.50%
8	Non-Gas Fuel Loss Factor	Non-Gas fuel loss factor (for analysis purposes, used electric line loss factor for Black Hills)	7.48%	7.48%
9	Gas Environmental Damage Factor Escalation Rate	EPA's Unit Conversions, Emissions Factors and Other Reference Data, November 2004	1.018 2.30%	1.018 2.30%
10	Non Gas Fuel Environmental Damage Factor Escalation Rate	Not Applicable	\$0 0.00%	\$0 0.00%
11	Participant Discount Rate		10.00%	10.00%
12	Utility Discount Rate	Montana-Dakota's authorized average cost of capital	8.94%	8.94%
13	Societal Discount Rate	Equal to the 30 year T-Bill rate average for Twelve Months Ending July 31, 2011	4.25%	4.25%
14	General Input Data Year =	Year data was input	2011	2011

Montana-Dakota Utilities Co.  
 2011 Input Data Summary  
 South Dakota Natural Gas Conservation Model

Input No.	Input Data Description	Information Source	SD Res.	SD Comm.
15	Project Analysis Year	Year(s) program will be implemented	2012 2013 2014	2012 2013 2014
16	Utility Project Costs	Total direct cost to the utility caused by implementing the program(s)		
17	Direct Participant Costs (\$/Part.)	Direct costs that the participant would have to participate in the program		
18	Participant Non-Energy Costs (Annual \$/Part.)	Annual participant non-energy costs if applicable caused by implementing the measure (Not Applicable)	\$0 \$0 \$0	\$0 \$0 \$0
	Yr. 1			
	Yr. 2			
	Yr. 3			
	Escalation Rate Yr. 1		0.00%	0.00%
	Escalation Rate Yr. 2		0.00%	0.00%
	Escalation Rate Yr. 3		0.00%	0.00%
19	Participant Non-Energy Savings (Annual \$/Part) Yr. 1	Participant non energy savings if applicable caused by implementing the measure (Not Applicable)	\$0	\$0
	Yr. 2		\$0	\$0
	Yr. 3		\$0	\$0
	Escalation Rate Yr. 1		0.00%	0.00%
	Escalation Rate Yr. 2		0.00%	0.00%
	Escalation Rate Yr. 3		1.40%	1.40%
20	Project Life (Years)	Based on the estimated useful life of the energy saving equipment (20 years maximum)		
21	Avg. Dk/Part. Saved	Avg energy reduction (Dk) caused by the program(s)		
22	Avg Non-Gas Fuel Units/Part. Saved Yr. 1	Average non-gas fuel units saved or added due to implementing the measure (for analysis purposes, used Kwh)		
	Yr. 2		0	0
	Yr. 3		0	0
22a	Avg Additional Non-Gas Fuel Units/ Part. Used			
	Yr. 1		0	0
	Yr. 2		0	0
	Yr. 3		0	0
23	Number of Participants	Total number of expected participants is the program(s)		
24	Total Annual Dk Saved	Total Dk saved from the program in the year implemented		
25	Incentive/Participant	Incentive provided to the participant		
26	Distribution Delivery Charge	Weighted Average of Montana-Dakota's Distribution Delivery Charge	1.753	1.368
27	Effective Fed & State Income Tax Rate	Montana-Dakota's effective tax rate	35%	35%

South Dakota Natural Gas DSM Programs  
 Technical Assumptions

Participation

<u>2011 - 2013 Program Years</u>	<u>Customer Class</u>	<u>Number of Participants Year 1</u>	<u>Number of Participants Year 2</u>	<u>Number of Participants Year 3</u>	<u>Project Life</u>	<u>Baseline Efficiency</u>	<u>Average High Efficiency</u>
<b>Residential</b>							
Furnace Tier 1 - 92-94% AFUE	Residential	7	7	7	18	78	93
Furnace Tier 2 - 95%+ AFUE - New	Residential	12	19	26	18	85	95
Furnace Tier 2 - 95%+ AFUE - Replacement	Residential	170	195	220	18	78	95
Furnace Tune-up	Residential	50	65	80	2	75	78
Water Heating Tier 1 (.62 EF)	Residential	17	25	36	10	0.58	0.62
Water Heating Tier 2 (.67 EF)	Residential	3	7	10	10	0.58	0.67
<b>Commercial</b>							
Furnace Tier 1 - 92-94% AFUE	Commerical	3	6	9	18	0.78	93
Furnace Tier 2 - 95%+ AFUE - New	Commerical	5	8	10	18	0.85	95
Furnace Tier 2 - 95%+ AFUE - Replacement	Commerical	7	9	14	18	0.78	95
Custom Efficiency	Commerical	3	6	9	15	NA	NA
<b>Totals</b>	<b>1,045</b>	<b>277</b>	<b>347</b>	<b>421</b>			



South Dakota Natural Gas DSM Programs  
 Technical Assumptions

Technical Assumptions

<u>2011 - 2013 Program Years</u>	<u>Customer Class</u>	<u>Average dk Saved / part</u>	<u>Average Non-Energy Benefits / Part</u>	<u>incremental Cost</u>	<u>Average Incentive / Part</u>
<b>Residential</b>					
Furnace Tier 1 - 92-94% AFUE	Residential	11.8	0.0	\$500	\$150
Furnace Tier 2 - 95%+ AFUE - New	Residential	7.1	669.0	620	300
Furnace Tier 2 - 95%+ AFUE - Replacement	Residential	13.1	669.0	620	300
Furnace Tune-up	Residential	2.9	0.0	80	40
Water Heating Tier 1 (.62 EF)	Residential	1.4	0.0	50	50
Water Heating Tier 2 (.67 EF)	Residential	3.6	0.0	100	100
<b>Commercial</b>					
Furnace Tier 1 - 92-94% AFUE	Commerical	20.8	0.0	500	150
Furnace Tier 2 - 95%+ AFUE - New	Commerical	12.4	669.0	620	300
Furnace Tier 2 - 95%+ AFUE - Replacement	Commerical	23.0	669.0	620	300
Custom Efficiency	Commerical	100.0	0.0	3,000	600
<b>Totals</b>		<b>1,045</b>			