

Response No. 2-3
Attachment A

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Attachment A

**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: **Actual 2014**

Input Data	2014	
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 =	7.60%	
13) Societal Discount Rate =	3.98%	
14) General Input Data Year =	2013	
15) Project Analysis Year 1 =	2014	
Project Analysis Year 2 =	2015	
Project Analysis Year 3 =	2016	
	16) Utility Project Costs	
	16a) Administrative & Operating Costs = 1/	\$7,590
	16b) Incentive Costs =	100,640
	16c) Total Utility Project Costs =	\$108,230
	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 =	531
	24) Total Annual Dk Saved =	4,426
	25) Incentive/Participant =	
	26) Distribution Delivery Charge	
	27) Effective Income Tax Rate = (Federal & State Taxes)	
	Test Results	NPV
	Ratepayer Impact Measure Test	\$112,684
	Utility Cost Test	\$178,878
	Societal Test	\$316,407
	Participant Test	\$666,104
	Total Resource Cost Test	\$140,708
		B/C
		1.65
		2.66
		2.47
		4.21
		1.66

1/ Energy Audit program costs included with Total Program tests only.

Table 1
Ratepayer Impact Measure Test

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

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)	Dmd Savings % 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	2014	4,426	27	16,978	0	0	16,978	44	1,001	6,320	\$23,298		5,151	7,560	100,240	\$112,951	(\$89,653)	
2	2015	4,426	28	17,572	0	0	17,572	44	1,008	6,366	23,938		5,331	0	0	\$5,331	\$18,607	
3	2016	4,426	29	18,185	0	0	18,185	44	1,022	6,452	24,637		5,518	0	0	\$5,518	\$19,119	
4	2017	4,426	30	18,825	0	0	18,825	44	1,029	6,498	25,323		5,710	0	0	\$5,710	\$19,613	
5	2018	4,426	31	19,484	0	0	19,484	44	1,043	6,587	26,071		5,911	0	0	\$5,911	\$20,160	
6	2019	4,426	32	20,163	0	0	20,163	44	1,050	6,630	26,793		6,118	0	0	\$6,118	\$20,675	
7	2020	4,426	33	20,869	0	0	20,869	44	1,064	6,719	27,588		6,333	0	0	\$6,333	\$21,255	
8	2021	4,426	34	21,599	0	0	21,599	44	1,071	6,762	28,361		6,555	0	0	\$6,555	\$21,806	
9	2022	4,426	35	22,356	0	0	22,356	44	1,085	6,851	29,207		6,784	0	0	\$6,784	\$22,423	
10	2023	4,426	37	23,139	0	0	23,139	44	1,092	6,894	30,033		7,020	0	0	\$7,020	\$23,013	
11	2024	4,285	38	23,187	0	0	23,187	43	1,106	6,762	29,949		7,032	0	0	\$7,032	\$22,917	
12	2025	4,285	39	23,996	0	0	23,996	43	1,113	6,806	30,802		7,278	0	0	\$7,278	\$23,524	
13	2026	4,285	41	24,835	0	0	24,835	43	1,127	6,890	31,725		7,535	0	0	\$7,535	\$24,190	
14	2027	4,285	42	25,705	0	0	25,705	43	1,134	6,934	32,639		7,797	0	0	\$7,797	\$24,842	
15	2028	4,285	43	26,605	0	0	26,605	43	1,148	7,020	33,625		8,070	0	0	\$8,070	\$25,555	
16	2029	3,743	45	24,053	0	0	24,053	37	1,162	6,208	30,261		7,287	0	0	\$7,287	\$22,974	
17	2030	3,743	47	24,895	0	0	24,895	37	1,169	6,246	31,141		7,543	0	0	\$7,543	\$23,598	
18	2031	3,743	48	25,767	0	0	25,767	37	1,183	6,321	32,088		7,805	0	0	\$7,805	\$24,283	
19	2032	0	50	0	0	0	0	0	1,197	0	0		0	0	0	\$0	\$0	
20	2033	0	52	0	0	0	0	0	1,204	0	0		0	0	0	\$0	\$0	
21	2034	0	53	0	0	0	0	0	1,218	0	0		0	0	0	\$0	\$0	
22	2035	0	0	0	0	0	0	0	0	0	0		0	0	0	\$0	\$0	
Total =		76,914									\$517,479					\$228,578	\$288,901	
																\$173,994	\$112,684	
Total NPV =																		
Benefit/Cost Ratio =																		

NPV =

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)	2 (O) = (L) + (M) + (N)
(H) = Demand Cost (4) escalated.	(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)	
2014	\$16,978	\$6,320	\$23,298	\$7,560	\$100,240	\$107,800	(\$84,502)
2015	17,572	6,366	23,938	0	0	0	23,938
2016	18,185	6,452	24,637	0	0	0	24,637
2017	18,825	6,498	25,323	0	0	0	25,323
2018	19,484	6,587	26,071	0	0	0	26,071
2019	20,163	6,630	26,793	0	0	0	26,793
2020	20,869	6,719	27,588	0	0	0	27,588
2021	21,599	6,762	28,361	0	0	0	28,361
2022	22,356	6,851	29,207	0	0	0	29,207
2023	23,139	6,894	30,033	0	0	0	30,033
2024	23,187	6,762	29,949	0	0	0	29,949
2025	23,996	6,806	30,802	0	0	0	30,802
2026	24,835	6,890	31,725	0	0	0	31,725
2027	25,705	6,934	32,639	0	0	0	32,639
2028	26,605	7,020	33,625	0	0	0	33,625
2029	24,053	6,208	30,261	0	0	0	30,261
2030	24,895	6,246	31,141	0	0	0	31,141
2031	25,767	6,321	32,088	0	0	0	32,088
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0
2035	0	0	0	0	0	0	0
Total =			\$517,479			\$107,800	\$409,679
		NPV =	\$286,678			\$107,800	\$178,878
Total NPV =			\$178,878				
Benefit/Cost Ratio =			<u>2.66</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: **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/Dk (E)	Environmental Damage Savings (F)	Annual Total Savings (G)	Utility Program Costs (H)	Participants' Costs Net of Rebate (I)	Annual Total Costs (J)	
2014	\$16,978	\$6,320	\$23,298	5,217	7	4,607	\$33,122	107,800	107,000	\$214,800	(\$181,678)
2015	17,572	6,366	\$23,938	5,467	7	4,713	34,118	0	0	0	34,118
2016	18,185	6,452	\$24,637	5,715	8	4,825	35,177	0	0	0	35,177
2017	18,825	6,498	\$25,323	5,962	8	4,935	36,220	0	0	0	36,220
2018	19,484	6,587	\$26,071	6,212	8	5,050	37,333	0	0	0	37,333
2019	20,163	6,630	\$26,793	6,459	8	5,167	38,419	0	0	0	38,419
2020	20,869	6,719	\$27,588	6,459	8	5,284	39,331	0	0	0	39,331
2021	21,599	6,762	\$28,361	6,708	9	5,404	40,473	0	0	0	40,473
2022	22,356	6,851	\$29,207	6,957	9	5,527	41,691	0	0	0	41,691
2023	23,139	6,894	\$30,033	7,205	9	5,656	42,894	0	0	0	42,894
2024	23,187	6,762	\$29,949	7,454	9	5,600	43,003	0	0	0	43,003
2025	23,996	6,806	\$30,802	7,702	9	5,730	44,234	0	0	0	44,234
2026	24,835	6,890	\$31,725	7,951	10	5,861	45,537	0	0	0	45,537
2027	25,705	6,934	\$32,639	8,447	10	5,999	47,085	0	0	0	47,085
2028	26,605	7,020	\$33,625	8,696	10	6,136	48,457	0	0	0	48,457
2029	24,053	6,208	\$30,261	7,490	10	5,484	43,235	0	0	0	43,235
2030	24,895	6,246	\$31,141	7,698	10	5,607	44,446	0	0	0	44,446
2031	25,767	6,321	\$32,088	8,114	11	5,738	45,940	0	0	0	45,940
2032	0	0	\$0	0	11	0	0	0	0	0	0
2033	0	0	\$0	0	11	0	0	0	0	0	0
2034	0	0	\$0	0	11	0	0	0	0	0	0
2035	0	0	\$0	0	0	0	0	0	0	0	0

Total = \$740,715 \$214,800 \$525,915
 NPV = \$531,207 \$214,800 \$316,407

Total NPV = \$316,407
 Benefit/Cost Ratio = 2.47

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 (E)	Non-Gas Energy Savings (F)	Total Annual Benefits (G)	Direct Participant Costs (H)	
2014	100,240	4,426	50	32,156	1	37,724	\$170,120	207,240	(\$37,120)
2015	0	4,426	51	33,283	1	39,211	72,494	0	\$72,494
2016	0	4,426	53	34,450	1	40,454	74,904	0	\$74,904
2017	0	4,426	55	35,655	1	41,940	77,595	0	\$77,595
2018	0	4,426	57	36,902	1	43,433	80,335	0	\$80,335
2019	0	4,426	59	38,196	1	44,919	83,115	0	\$83,115
2020	0	4,426	61	39,529	1	46,409	85,938	0	\$85,938
2021	0	4,426	63	40,912	1	48,145	89,057	0	\$89,057
2022	0	4,426	65	42,347	1	49,636	91,983	0	\$91,983
2023	0	4,426	68	43,827	1	51,375	95,202	0	\$95,202
2024	0	4,285	70	43,912	1	53,360	97,272	0	\$97,272
2025	0	4,285	72	45,451	2	55,100	100,551	0	\$100,551
2026	0	4,285	75	47,043	2	57,083	104,126	0	\$104,126
2027	0	4,285	78	48,687	2	59,068	107,755	0	\$107,755
2028	0	4,285	80	50,389	2	61,055	111,444	0	\$111,444
2029	0	3,743	83	45,545	2	52,988	98,533	0	\$98,533
2030	0	3,743	86	47,139	2	54,858	101,997	0	\$101,997
2031	0	3,743	89	48,791	2	56,727	105,518	0	\$105,518
2032	0	0	92	0	2	0	0	0	\$0
2033	0	0	95	0	2	0	0	0	\$0
2034	0	0	99	0	2	0	0	0	\$0
2035	0	0	0	0	0	0	0	0	\$0
Total =		76,914					\$1,747,939	\$207,240	\$1,540,699
							NPV = \$873,344	\$207,240	666,104
Total NPV =		\$666,104							
Benefit/Cost Ratio =		<u>4.21</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) 5	
(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)	
2014	\$16,978	\$6,320	\$5,217	\$28,515	\$107,800	\$107,000	\$214,800	(\$186,285)
2015	17,572	6,366	5,467	29,405	0	0	0	\$29,405
2016	18,185	6,452	5,715	30,352	0	0	0	\$30,352
2017	18,825	6,498	5,962	31,285	0	0	0	\$31,285
2018	19,484	6,587	6,212	32,283	0	0	0	\$32,283
2019	20,163	6,630	6,459	33,252	0	0	0	\$33,252
2020	20,869	6,719	6,459	34,047	0	0	0	\$34,047
2021	21,599	6,762	6,708	35,069	0	0	0	\$35,069
2022	22,356	6,851	6,957	36,164	0	0	0	\$36,164
2023	23,139	6,894	7,205	37,238	0	0	0	\$37,238
2024	23,187	6,762	7,454	37,403	0	0	0	\$37,403
2025	23,996	6,806	7,702	38,504	0	0	0	\$38,504
2026	24,835	6,890	7,951	39,676	0	0	0	\$39,676
2027	25,705	6,934	8,447	41,086	0	0	0	\$41,086
2028	26,605	7,020	8,696	42,321	0	0	0	\$42,321
2029	24,053	6,208	7,490	37,751	0	0	0	\$37,751
2030	24,895	6,246	7,698	38,839	0	0	0	\$38,839
2031	25,767	6,321	8,114	40,202	0	0	0	\$40,202
2032	0	0	0	0	0	0	0	\$0
2033	0	0	0	0	0	0	0	\$0
2034	0	0	0	0	0	0	0	\$0
2035	0	0	0	0	0	0	0	\$0
			Total =	\$643,392			\$214,800	\$428,592
			NPV =	\$355,508			\$214,800	140,708

Total NPV = \$140,708
Benefit/Cost Ratio = 1.66

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: **Actual 2014**

Input Data	2014
1) Retail Rate (\$/Dk) =	\$7.034
Escalation Rate =	3.50%
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.14710
Escalation Rate =	3.50%
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh
3) Commodity Cost (\$/Dk) =	\$3.706
Escalation Rate =	3.50%
4) Demand Cost (\$/Unit/Yr) =	\$141.32
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) =	\$0.01920
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 =	7.60%
13) Societal Discount Rate =	3.98%
14) General Input Data Year =	2013
15) Project Analysis Year 1 =	2014
Project Analysis Year 2 =	2015
Project Analysis Year 3 =	2016
16) Utility Project Costs	
16a) Administrative & Operating Costs =	\$1,561
16b) Incentive Costs =	20,700
16c) Total Utility Project Costs =	\$22,261
17) Direct Participant Costs (\$/Part.) =	\$620
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =	\$0
Escalation Rate =	0.00%
20) Project Life (Years) =	18
21) Avg. Dk/Part. Saved =	7.884
22) Avg Non-Gas Fuel Units/Part. Saved =	669
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
23) Number of Participants =	69
24) Total Annual Dk Saved =	544.0
25) Incentive/Participant =	\$300
26) Distribution Delivery Charge	\$1.744
27) Effective Income Tax Rate = (Federal & State Taxes)	35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$5,413	1.18
Utility Cost Test	\$13,840	1.62
Societal Test	\$28,775	1.65
Participant Test	\$101,746	3.38
Total Resource Cost Test	\$4,809	1.11

Table 1
Ratepayer Impact Measure Test

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

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	2014	544	\$3.836	\$2,087	\$0.000	\$0	\$2,087	5.4	\$143	\$772	\$2,859	\$1,805	\$638	\$1,561	\$20,700	\$22,899	(\$20,040)	
2	2015	544	3.970	2,160	0.000	0	2,160	5.4	144	778	2,938	1,868	661	0	0	661	2,277	
3	2016	544	4.109	2,235	0.000	0	2,235	5.4	146	788	3,023	1,934	684	0	0	684	2,339	
4	2017	544	4.253	2,314	0.000	0	2,314	5.4	147	794	3,108	2,001	708	0	0	708	2,400	
5	2018	544	4.402	2,395	0.000	0	2,395	5.4	149	805	3,200	2,071	732	0	0	732	2,468	
6	2019	544	4.556	2,478	0.000	0	2,478	5.4	150	810	3,288	2,144	758	0	0	758	2,530	
7	2020	544	4.715	2,565	0.000	0	2,565	5.4	152	821	3,386	2,219	785	0	0	785	2,601	
8	2021	544	4.880	2,655	0.000	0	2,655	5.4	153	826	3,481	2,297	812	0	0	812	2,669	
9	2022	544	5.051	2,748	0.000	0	2,748	5.4	155	837	3,585	2,377	841	0	0	841	2,744	
10	2023	544	5.228	2,844	0.000	0	2,844	5.4	156	842	3,686	2,460	870	0	0	870	2,816	
11	2024	544	5.411	2,944	0.000	0	2,944	5.4	158	853	3,797	2,546	900	0	0	900	2,897	
12	2025	544	5.600	3,046	0.000	0	3,046	5.4	159	859	3,905	2,635	932	0	0	932	2,973	
13	2026	544	5.796	3,153	0.000	0	3,153	5.4	161	869	4,022	2,728	965	0	0	965	3,057	
14	2027	544	5.999	3,263	0.000	0	3,263	5.4	162	875	4,138	2,823	998	0	0	998	3,140	
15	2028	544	6.209	3,378	0.000	0	3,378	5.4	164	886	4,264	2,922	1,033	0	0	1,033	3,231	
16	2029	544	6.426	3,496	0.000	0	3,496	5.4	166	896	4,392	3,024	1,069	0	0	1,069	3,323	
17	2030	544	6.651	3,618	0.000	0	3,618	5.4	167	902	4,520	3,130	1,107	0	0	1,107	3,413	
18	2031	544	6.884	3,745	0.000	0	3,745	5.4	169	913	4,658	3,239	1,145	0	0	1,145	3,513	
19	2032	0	7.125	0	0.000	0	0	0.0	171	0	0	3,353	0	0	0	0	0	
20	2033	0	7.374	0	0.000	0	0	0.0	172	0	0	3,470	0	0	0	0	0	
21	2034	0	7.632	0	0.000	0	0	0.0	174	0	0	3,592	0	0	0	0	0	
Total =		9,792									\$66,250					\$37,899	\$28,351	
																	\$30,688	\$5,413
Total NPV =			\$5,413															
Benefit/Cost Ratio =			1.18															

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: **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)	
2014	\$2,087	\$772	\$2,859	\$1,561	\$20,700	\$22,261	(\$19,402)
2015	2,160	778	2,938	0	0	0	2,938
2016	2,235	788	3,023	0	0	0	3,023
2017	2,314	794	3,108	0	0	0	3,108
2018	2,395	805	3,200	0	0	0	3,200
2019	2,478	810	3,288	0	0	0	3,288
2020	2,565	821	3,386	0	0	0	3,386
2021	2,655	826	3,481	0	0	0	3,481
2022	2,748	837	3,585	0	0	0	3,585
2023	2,844	842	3,686	0	0	0	3,686
2024	2,944	853	3,797	0	0	0	3,797
2025	3,046	859	3,905	0	0	0	3,905
2026	3,153	869	4,022	0	0	0	4,022
2027	3,263	875	4,138	0	0	0	4,138
2028	3,378	886	4,264	0	0	0	4,264
2029	3,496	896	4,392	0	0	0	4,392
2030	3,618	902	4,520	0	0	0	4,520
2031	3,745	913	4,658	0	0	0	4,658
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0
Total =			\$66,250		\$22,261		\$43,989
NPV =			\$36,101		\$22,261		\$13,840
Total NPV =			\$13,840				
Benefit/Cost Ratio =			<u>1.62</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 - New**

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)	
2014	\$2,087	\$772	\$0.021	\$969	\$1.041	\$566	\$4,394	\$22,261	\$22,080	\$44,341	(\$39,947)
2015	2,160	778	0.022	1,016	1.065	579	4,533	0	0	0	4,533
2016	2,235	788	0.023	1,062	1.090	593	4,678	0	0	0	4,678
2017	2,314	794	0.024	1,108	1.115	607	4,823	0	0	0	4,823
2018	2,395	805	0.025	1,154	1.141	621	4,975	0	0	0	4,975
2019	2,478	810	0.026	1,200	1.167	635	5,123	0	0	0	5,123
2020	2,565	821	0.026	1,200	1.194	650	5,236	0	0	0	5,236
2021	2,655	826	0.027	1,246	1.221	664	5,391	0	0	0	5,391
2022	2,748	837	0.028	1,293	1.249	679	5,557	0	0	0	5,557
2023	2,844	842	0.029	1,339	1.278	695	5,720	0	0	0	5,720
2024	2,944	853	0.030	1,385	1.307	711	5,893	0	0	0	5,893
2025	3,046	859	0.031	1,431	1.337	727	6,063	0	0	0	6,063
2026	3,153	869	0.032	1,477	1.368	744	6,243	0	0	0	6,243
2027	3,263	875	0.034	1,569	1.400	762	6,469	0	0	0	6,469
2028	3,378	886	0.035	1,616	1.432	779	6,659	0	0	0	6,659
2029	3,496	896	0.036	1,662	1.465	797	6,851	0	0	0	6,851
2030	3,618	902	0.037	1,708	1.498	815	7,043	0	0	0	7,043
2031	3,745	913	0.039	1,800	1.533	834	7,292	0	0	0	7,292
2032	0	0	0.040	0	1.568	0	0	0	0	0	0
2033	0	0	0.041	0	1.604	0	0	0	0	0	0
2034	0	0	0.043	0	1.641	0	0	0	0	0	0

Total = \$102,943 \$44,341 \$58,602
 NPV = \$73,116 \$44,341 \$28,775

Total NPV = \$28,775
 Benefit/Cost Ratio = 1.65

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 - 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)
2014	\$20,700	544	\$7.280	\$3,960	\$0.152	\$7,016	\$31,676	\$42,780	(\$11,104)
2015	0	544	7.535	4,099	0.158	7,293	11,392	0	11,392
2016	0	544	7.799	4,243	0.163	7,524	11,767	0	11,767
2017	0	544	8.072	4,391	0.169	7,801	12,192	0	12,192
2018	0	544	8.354	4,545	0.175	8,078	12,623	0	12,623
2019	0	544	8.647	4,704	0.181	8,355	13,059	0	13,059
2020	0	544	8.949	4,868	0.187	8,632	13,500	0	13,500
2021	0	544	9.262	5,039	0.194	8,955	13,994	0	13,994
2022	0	544	9.587	5,215	0.200	9,232	14,447	0	14,447
2023	0	544	9.922	5,398	0.207	9,555	14,953	0	14,953
2024	0	544	10.269	5,586	0.215	9,925	15,511	0	15,511
2025	0	544	10.629	5,782	0.222	10,248	16,030	0	16,030
2026	0	544	11.001	5,985	0.230	10,617	16,602	0	16,602
2027	0	544	11.386	6,194	0.238	10,986	17,180	0	17,180
2028	0	544	11.784	6,410	0.246	11,356	17,766	0	17,766
2029	0	544	12.197	6,635	0.255	11,771	18,406	0	18,406
2030	0	544	12.624	6,867	0.264	12,187	19,054	0	19,054
2031	0	544	13.066	7,108	0.273	12,602	19,710	0	19,710
2032	0	0	13.523	0	0.283	0	0	0	0
2033	0	0	13.996	0	0.293	0	0	0	0
2034	0	0	14.486	0	0.303	0	0	0	0
Total =		9,792					\$289,862	\$42,780	\$247,082
NPV =							\$144,526	\$42,780	101,746
Total NPV =		\$101,746							
Benefit/Cost Ratio =		<u>3.38</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 - 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)	
2014	\$2,087	\$772	\$969	\$3,828	\$22,261	\$22,080	\$44,341	(\$40,513)
2015	2,160	778	1,016	3,954	0	0	0	3,954
2016	2,235	788	1,062	4,085	0	0	0	4,085
2017	2,314	794	1,108	4,216	0	0	0	4,216
2018	2,395	805	1,154	4,354	0	0	0	4,354
2019	2,478	810	1,200	4,488	0	0	0	4,488
2020	2,565	821	1,200	4,586	0	0	0	4,586
2021	2,655	826	1,246	4,727	0	0	0	4,727
2022	2,748	837	1,293	4,878	0	0	0	4,878
2023	2,844	842	1,339	5,025	0	0	0	5,025
2024	2,944	853	1,385	5,182	0	0	0	5,182
2025	3,046	859	1,431	5,336	0	0	0	5,336
2026	3,153	869	1,477	5,499	0	0	0	5,499
2027	3,263	875	1,569	5,707	0	0	0	5,707
2028	3,378	886	1,616	5,880	0	0	0	5,880
2029	3,496	896	1,662	6,054	0	0	0	6,054
2030	3,618	902	1,708	6,228	0	0	0	6,228
2031	3,745	913	1,800	6,458	0	0	0	6,458
2032	0	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0	0
			Total =	\$90,485			\$44,341	\$46,144
			NPV =	\$49,150			\$44,341	4,809

Total NPV = \$4,809
Benefit/Cost Ratio = 1.11

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: **Actual 2014**

Input Data	2014		
1) Retail Rate (\$/Dk) =	\$7.034	16) Utility Project Costs	
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$5,362
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.14710	16b) Incentive Costs =	71,100
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$76,462
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$620
3) Commodity Cost (\$/Dk) =	\$3.706	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$141.32	19) Participant Non-Energy Savings (Annual \$/Part) =	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	18
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	12.903
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	669
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01920	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
Escalation Rate =	3.50%	23) Number of Participants =	237
8) Non-Gas Fuel Loss Factor	7.48%	24) Total Annual Dk Saved =	3,058.0
9) Gas Environmental Damage Factor =	\$1.018	25) Incentive/Participant =	\$300
Escalation Rate =	2.30%	26) Distribution Delivery Charge	\$1.744
10) Non Gas Fuel Environmental Damage Factor :	\$0.000	27) Effective Income Tax Rate =	35.000%
Escalation Rate =	0.00%	(Federal & State Taxes)	
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	7.60%		
13) Societal Discount Rate =	3.98%		
14) General Input Data Year =	2013		
15) Project Analysis Year 1 =	2014		
Project Analysis Year 2 =	2015		
Project Analysis Year 3 =	2016		

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$79,483	1.64
Utility Cost Test	\$126,852	2.66
Societal Test	\$221,768	2.46
Participant Test	\$447,067	4.04
Total Resource Cost Test	\$95,830	1.63

**Table 1
Ratepayer Impact Measure Test**

Company: **Montana-Dakota Utilities Co.**
Project: **Residential 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	2014	3,058	\$3,836	\$11,730	\$0.000	\$0	\$11,730	30.6	\$143	\$4,376	\$16,106	\$1,805	\$3,588	\$5,362	\$71,100	\$80,050	(\$63,944)	
2	2015	3,058	3,970	12,140	0.000	0	12,140	30.6	144	4,406	16,546	1,868	3,713	0	0	3,713	12,833	
3	2016	3,058	4,109	12,565	0.000	0	12,565	30.6	146	4,468	17,033	1,934	3,844	0	0	3,844	13,189	
4	2017	3,058	4,253	13,006	0.000	0	13,006	30.6	147	4,498	17,504	2,001	3,977	0	0	3,977	13,527	
5	2018	3,058	4,402	13,461	0.000	0	13,461	30.6	149	4,559	18,020	2,071	4,117	0	0	4,117	13,903	
6	2019	3,058	4,556	13,932	0.000	0	13,932	30.6	150	4,590	18,522	2,144	4,262	0	0	4,262	14,260	
7	2020	3,058	4,715	14,418	0.000	0	14,418	30.6	152	4,651	19,069	2,219	4,411	0	0	4,411	14,658	
8	2021	3,058	4,880	14,923	0.000	0	14,923	30.6	153	4,682	19,605	2,297	4,566	0	0	4,566	15,039	
9	2022	3,058	5,051	15,446	0.000	0	15,446	30.6	155	4,743	20,189	2,377	4,725	0	0	4,725	15,464	
10	2023	3,058	5,228	15,987	0.000	0	15,987	30.6	156	4,774	20,761	2,460	4,890	0	0	4,890	15,871	
11	2024	3,058	5,411	16,547	0.000	0	16,547	30.6	158	4,835	21,382	2,546	5,061	0	0	5,061	16,321	
12	2025	3,058	5,600	17,125	0.000	0	17,125	30.6	159	4,865	21,990	2,635	5,238	0	0	5,238	16,752	
13	2026	3,058	5,796	17,724	0.000	0	17,724	30.6	161	4,927	22,651	2,728	5,422	0	0	5,422	17,229	
14	2027	3,058	5,999	18,345	0.000	0	18,345	30.6	162	4,957	23,302	2,823	5,611	0	0	5,611	17,691	
15	2028	3,058	6,209	18,987	0.000	0	18,987	30.6	164	5,018	24,005	2,922	5,808	0	0	5,808	18,197	
16	2029	3,058	6,426	19,651	0.000	0	19,651	30.6	166	5,080	24,731	3,024	6,011	0	0	6,011	18,720	
17	2030	3,058	6,651	20,339	0.000	0	20,339	30.6	167	5,110	25,449	3,130	6,222	0	0	6,222	19,227	
18	2031	3,058	6,884	21,051	0.000	0	21,051	30.6	169	5,171	26,222	3,239	6,438	0	0	6,438	19,784	
19	2032	0	7,125	0	0.000	0	0	0.0	171	0	0	3,353	0	0	0	0	0	
20	2033	0	7,374	0	0.000	0	0	0.0	172	0	0	3,470	0	0	0	0	0	
21	2034	0	7,632	0	0.000	0	0	0.0	174	0	0	3,592	0	0	0	0	0	
Total =		55,044									\$373,087					\$164,366	\$208,721	
																	\$123,831	\$79,483
Total NPV =																		\$79,483
Benefit/Cost Ratio =																		1.64

NPV =

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.	2 (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)	
2014	\$11,730	\$4,376	\$16,106	\$5,362	\$71,100	\$76,462	(\$60,356)
2015	12,140	4,406	16,546	0	0	0	16,546
2016	12,565	4,468	17,033	0	0	0	17,033
2017	13,006	4,498	17,504	0	0	0	17,504
2018	13,461	4,559	18,020	0	0	0	18,020
2019	13,932	4,590	18,522	0	0	0	18,522
2020	14,418	4,651	19,069	0	0	0	19,069
2021	14,923	4,682	19,605	0	0	0	19,605
2022	15,446	4,743	20,189	0	0	0	20,189
2023	15,987	4,774	20,761	0	0	0	20,761
2024	16,547	4,835	21,382	0	0	0	21,382
2025	17,125	4,865	21,990	0	0	0	21,990
2026	17,724	4,927	22,651	0	0	0	22,651
2027	18,345	4,957	23,302	0	0	0	23,302
2028	18,987	5,018	24,005	0	0	0	24,005
2029	19,651	5,080	24,731	0	0	0	24,731
2030	20,339	5,110	25,449	0	0	0	25,449
2031	21,051	5,171	26,222	0	0	0	26,222
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0
Total =			\$373,087			\$76,462	\$296,625
NPV =			\$203,314			\$76,462	\$126,852
Total NPV =			\$126,852				
Benefit/Cost Ratio =			<u>2.66</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)	
2014	\$11,730	\$4,376	\$0.021	\$3,330	\$1.041	\$3,183	\$22,619	\$76,462	\$75,840	\$152,302	(\$129,683)
2015	12,140	4,406	0.022	3,488	1.065	3,257	23,291	0	0	0	23,291
2016	12,565	4,468	0.023	3,647	1.090	3,333	24,013	0	0	0	24,013
2017	13,006	4,498	0.024	3,805	1.115	3,410	24,719	0	0	0	24,719
2018	13,461	4,559	0.025	3,964	1.141	3,489	25,473	0	0	0	25,473
2019	13,932	4,590	0.026	4,122	1.167	3,569	26,213	0	0	0	26,213
2020	14,418	4,651	0.026	4,122	1.194	3,651	26,842	0	0	0	26,842
2021	14,923	4,682	0.027	4,281	1.221	3,734	27,620	0	0	0	27,620
2022	15,446	4,743	0.028	4,439	1.249	3,819	28,447	0	0	0	28,447
2023	15,987	4,774	0.029	4,598	1.278	3,908	29,267	0	0	0	29,267
2024	16,547	4,835	0.030	4,757	1.307	3,997	30,136	0	0	0	30,136
2025	17,125	4,865	0.031	4,915	1.337	4,089	30,994	0	0	0	30,994
2026	17,724	4,927	0.032	5,074	1.368	4,183	31,908	0	0	0	31,908
2027	18,345	4,957	0.034	5,391	1.400	4,281	32,974	0	0	0	32,974
2028	18,987	5,018	0.035	5,549	1.432	4,379	33,933	0	0	0	33,933
2029	19,651	5,080	0.036	5,708	1.465	4,480	34,919	0	0	0	34,919
2030	20,339	5,110	0.037	5,866	1.498	4,581	35,896	0	0	0	35,896
2031	21,051	5,171	0.039	6,184	1.533	4,688	37,094	0	0	0	37,094
2032	0	0	0.040	0	1.568	0	0	0	0	0	0
2033	0	0	0.041	0	1.604	0	0	0	0	0	0
2034	0	0	0.043	0	1.641	0	0	0	0	0	0

Total = NPV = \$526,358 \$374,070 \$152,302 \$374,056
NPV = \$374,070 \$152,302 \$221,768

Total NPV = \$221,768
Benefit/Cost Ratio = 2.46

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							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)	
2014	\$71,100	3,058	\$7.280	\$22,262	\$0.152	\$24,100	\$117,462	\$146,940	(\$29,478)
2015	0	3,058	7.535	23,042	0.158	25,051	48,093	0	48,093
2016	0	3,058	7.799	23,849	0.163	25,844	49,693	0	49,693
2017	0	3,058	8.072	24,684	0.169	26,795	51,479	0	51,479
2018	0	3,058	8.354	25,547	0.175	27,747	53,294	0	53,294
2019	0	3,058	8.647	26,443	0.181	28,698	55,141	0	55,141
2020	0	3,058	8.949	27,366	0.187	29,649	57,015	0	57,015
2021	0	3,058	9.262	28,323	0.194	30,759	59,082	0	59,082
2022	0	3,058	9.587	29,317	0.200	31,711	61,028	0	61,028
2023	0	3,058	9.922	30,341	0.207	32,820	63,161	0	63,161
2024	0	3,058	10.269	31,403	0.215	34,089	65,492	0	65,492
2025	0	3,058	10.629	32,503	0.222	35,199	67,702	0	67,702
2026	0	3,058	11.001	33,641	0.230	36,467	70,108	0	70,108
2027	0	3,058	11.386	34,818	0.238	37,736	72,554	0	72,554
2028	0	3,058	11.784	36,035	0.246	39,004	75,039	0	75,039
2029	0	3,058	12.197	37,298	0.255	40,431	77,729	0	77,729
2030	0	3,058	12.624	38,604	0.264	41,858	80,462	0	80,462
2031	0	3,058	13.066	39,956	0.273	43,285	83,241	0	83,241
2032	0	0	13.523	0	0.283	0	0	0	0
2033	0	0	13.996	0	0.293	0	0	0	0
2034	0	0	14.486	0	0.303	0	0	0	0
Total =		55,044					\$1,207,775	\$146,940	\$1,060,835
							NPV = \$594,007	\$146,940	447,067
Total NPV =		\$447,067							
Benefit/Cost Ratio =		4.04							

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) 5
(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 Net of Rebate (F)	Total Costs (G)	
2014	\$11,730	\$4,376	\$3,330	\$19,436	\$76,462	\$75,840	\$152,302	(\$132,866)
2015	12,140	4,406	3,488	20,034	0	0	0	20,034
2016	12,565	4,468	3,647	20,680	0	0	0	20,680
2017	13,006	4,498	3,805	21,309	0	0	0	21,309
2018	13,461	4,559	3,964	21,984	0	0	0	21,984
2019	13,932	4,590	4,122	22,644	0	0	0	22,644
2020	14,418	4,651	4,122	23,191	0	0	0	23,191
2021	14,923	4,682	4,281	23,886	0	0	0	23,886
2022	15,446	4,743	4,439	24,628	0	0	0	24,628
2023	15,987	4,774	4,598	25,359	0	0	0	25,359
2024	16,547	4,835	4,757	26,139	0	0	0	26,139
2025	17,125	4,865	4,915	26,905	0	0	0	26,905
2026	17,724	4,927	5,074	27,725	0	0	0	27,725
2027	18,345	4,957	5,391	28,693	0	0	0	28,693
2028	18,987	5,018	5,549	29,554	0	0	0	29,554
2029	19,651	5,080	5,708	30,439	0	0	0	30,439
2030	20,339	5,110	5,866	31,315	0	0	0	31,315
2031	21,051	5,171	6,184	32,406	0	0	0	32,406
2032	0	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0	0

Total = \$456,327 \$152,302 \$304,025
 NPV = \$248,132 \$152,302 95,830

Total NPV = \$95,830
 Benefit/Cost Ratio = 1.63

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: **Actual 2014**

Input Data	2014
1) Retail Rate (\$/Dk) =	\$7.034
Escalation Rate =	3.50%
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.14710
Escalation Rate =	3.50%
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	Kwh
3) Commodity Cost (\$/Dk) =	\$3.706
Escalation Rate =	3.50%
4) Demand Cost (\$/Unit/Yr) =	\$141.32
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) =	\$0.01920
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 =	7.60%
13) Societal Discount Rate =	3.98%
14) General Input Data Year =	2013
15) Project Analysis Year 1 =	2014
Project Analysis Year 2 =	2015
Project Analysis Year 3 =	2016
16) Utility Project Costs	
16a) Administrative & Operating Costs =	\$242
16b) Incentive Costs =	3,200
16c) Total Utility Project Costs =	\$3,442
17) Direct Participant Costs (\$/Part.) =	\$100
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =	\$0
Escalation Rate =	0.00%
20) Project Life (Years) =	10
21) Avg. Dk/Part. Saved =	4.406
22) Avg Non-Gas Fuel Units/Part. Saved =	0
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
23) Number of Participants =	32
24) Total Annual Dk Saved =	141.0
25) Incentive/Participant =	\$100
26) Distribution Delivery Charge	\$1.744
27) Effective Income Tax Rate = (Federal & State Taxes)	35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$1,261	1.26
Utility Cost Test	\$2,657	1.77
Societal Test	\$4,983	2.45
Participant Test	\$7,924	3.48
Total Resource Cost Test	\$2,657	1.77

Table 1
Ratepayer Impact Measure Test

Company: **Montana-Dakota Utilities Co.**
Project: **Residential Water Heating .67 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	2014	141	\$3,836	\$541	\$0.000	\$0	\$541	1.4	\$143	\$200	\$741	\$1,805	\$165	\$242	\$3,200	\$3,607	(\$2,866)
2	2015	141	3,970	560	0.000	0	560	1.4	144	202	762	1,868	171	0	0	171	591
3	2016	141	4,109	579	0.000	0	579	1.4	146	204	783	1,934	177	0	0	177	606
4	2017	141	4,253	600	0.000	0	600	1.4	147	206	806	2,001	183	0	0	183	623
5	2018	141	4,402	621	0.000	0	621	1.4	149	209	830	2,071	190	0	0	190	640
6	2019	141	4,556	642	0.000	0	642	1.4	150	210	852	2,144	196	0	0	196	656
7	2020	141	4,715	665	0.000	0	665	1.4	152	213	878	2,219	203	0	0	203	675
8	2021	141	4,880	688	0.000	0	688	1.4	153	214	902	2,297	211	0	0	211	691
9	2022	141	5,051	712	0.000	0	712	1.4	155	217	929	2,377	218	0	0	218	711
10	2023	141	5,228	737	0.000	0	737	1.4	156	218	955	2,460	225	0	0	225	730
11	2024	0	5,411	0	0.000	0	0	0.0	158	0	0	2,546	0	0	0	0	0
12	2025	0	5,600	0	0.000	0	0	0.0	159	0	0	2,635	0	0	0	0	0
13	2026	0	5,796	0	0.000	0	0	0.0	161	0	0	2,728	0	0	0	0	0
14	2027	0	5,999	0	0.000	0	0	0.0	162	0	0	2,823	0	0	0	0	0
15	2028	0	6,209	0	0.000	0	0	0.0	164	0	0	2,922	0	0	0	0	0
16	2029	0	6,426	0	0.000	0	0	0.0	166	0	0	3,024	0	0	0	0	0
17	2030	0	6,651	0	0.000	0	0	0.0	167	0	0	3,130	0	0	0	0	0
18	2031	0	6,884	0	0.000	0	0	0.0	169	0	0	3,239	0	0	0	0	0
19	2032	0	7,125	0	0.000	0	0	0.0	171	0	0	3,353	0	0	0	0	0
20	2033	0	7,374	0	0.000	0	0	0.0	172	0	0	3,470	0	0	0	0	0
21	2034	0	7,632	0	0.000	0	0	0.0	174	0	0	3,592	0	0	0	0	0
Total =		1,410									\$8,438					\$5,381	\$3,057
																\$4,838	\$1,261
Total NPV =			\$1,261														
Benefit/Cost Ratio =			1.26														

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: **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)	
2014	\$541	\$200	\$741	\$242	\$3,200	\$3,442	(\$2,701)
2015	560	202	762	0	0	0	762
2016	579	204	783	0	0	0	783
2017	600	206	806	0	0	0	806
2018	621	209	830	0	0	0	830
2019	642	210	852	0	0	0	852
2020	665	213	878	0	0	0	878
2021	688	214	902	0	0	0	902
2022	712	217	929	0	0	0	929
2023	737	218	955	0	0	0	955
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
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0
Total =			\$8,438			\$3,442	\$4,996
		NPV =	\$6,099			\$3,442	\$2,657
Total NPV =			\$2,657				
Benefit/Cost Ratio =			<u>1.77</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 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)	
2014	\$541	\$200	\$0.021	\$0	\$1.041	\$147	\$888	\$3,442	\$0	\$3,442	(\$2,554)
2015	560	202	0.022	0	1.065	150	912	0	0	0	912
2016	579	204	0.023	0	1.090	154	937	0	0	0	937
2017	600	206	0.024	0	1.115	157	963	0	0	0	963
2018	621	209	0.025	0	1.141	161	991	0	0	0	991
2019	642	210	0.026	0	1.167	165	1,017	0	0	0	1,017
2020	665	213	0.026	0	1.194	168	1,046	0	0	0	1,046
2021	688	214	0.027	0	1.221	172	1,074	0	0	0	1,074
2022	712	217	0.028	0	1.249	176	1,105	0	0	0	1,105
2023	737	218	0.029	0	1.278	180	1,135	0	0	0	1,135
2024	0	0	0.030	0	1.307	0	0	0	0	0	0
2025	0	0	0.031	0	1.337	0	0	0	0	0	0
2026	0	0	0.032	0	1.368	0	0	0	0	0	0
2027	0	0	0.034	0	1.400	0	0	0	0	0	0
2028	0	0	0.035	0	1.432	0	0	0	0	0	0
2029	0	0	0.036	0	1.465	0	0	0	0	0	0
2030	0	0	0.037	0	1.498	0	0	0	0	0	0
2031	0	0	0.039	0	1.533	0	0	0	0	0	0
2032	0	0	0.040	0	1.568	0	0	0	0	0	0
2033	0	0	0.041	0	1.604	0	0	0	0	0	0
2034	0	0	0.043	0	1.641	0	0	0	0	0	0

Total = \$10,068 \$3,442 \$6,626

NPV = \$8,425 \$3,442 \$4,983

Total NPV = \$4,983

Benefit/Cost Ratio = 2.45

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 .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)
2014	\$3,200	141	\$7.280	\$1,026	\$0.152	\$0	\$4,226	\$3,200	\$1,026
2015	0	141	7.535	1,062	0.158	0	1,062	0	1,062
2016	0	141	7.799	1,100	0.163	0	1,100	0	1,100
2017	0	141	8.072	1,138	0.169	0	1,138	0	1,138
2018	0	141	8.354	1,178	0.175	0	1,178	0	1,178
2019	0	141	8.647	1,219	0.181	0	1,219	0	1,219
2020	0	141	8.949	1,262	0.187	0	1,262	0	1,262
2021	0	141	9.262	1,306	0.194	0	1,306	0	1,306
2022	0	141	9.587	1,352	0.200	0	1,352	0	1,352
2023	0	141	9.922	1,399	0.207	0	1,399	0	1,399
2024	0	0	10.269	0	0.215	0	0	0	0
2025	0	0	10.629	0	0.222	0	0	0	0
2026	0	0	11.001	0	0.230	0	0	0	0
2027	0	0	11.386	0	0.238	0	0	0	0
2028	0	0	11.784	0	0.246	0	0	0	0
2029	0	0	12.197	0	0.255	0	0	0	0
2030	0	0	12.624	0	0.264	0	0	0	0
2031	0	0	13.066	0	0.273	0	0	0	0
2032	0	0	13.523	0	0.283	0	0	0	0
2033	0	0	13.996	0	0.293	0	0	0	0
2034	0	0	14.486	0	0.303	0	0	0	0
Total =		1,410					\$15,242	\$3,200	\$12,042
							NPV = \$11,124	\$3,200	7,924
Total NPV =		\$7,924							
Benefit/Cost Ratio =		<u>3.48</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 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)	
2014	\$541	\$200	\$0	\$741	\$3,442	\$0	\$3,442	(\$2,701)
2015	560	202	0	762	0	0	0	762
2016	579	204	0	783	0	0	0	783
2017	600	206	0	806	0	0	0	806
2018	621	209	0	830	0	0	0	830
2019	642	210	0	852	0	0	0	852
2020	665	213	0	878	0	0	0	878
2021	688	214	0	902	0	0	0	902
2022	712	217	0	929	0	0	0	929
2023	737	218	0	955	0	0	0	955
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
2033	0	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0	0

Total = \$8,438 \$3,442 \$4,996
 NPV = \$6,099 \$3,442 2,657

Total NPV = \$2,657
 Benefit/Cost Ratio = 1.77

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: **Programmable Thermostats**
Program Years: **Actual 2014**

Input Data	2014
1) Retail Rate (\$/Dk) =	\$7.034
Escalation Rate =	3.50%
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.14710
Escalation Rate =	3.50%
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh
3) Commodity Cost (\$/Dk) =	\$3.706
Escalation Rate =	3.50%
4) Demand Cost (\$/Unit/Yr) =	\$141.32
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) =	\$0.01920
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 =	7.60%
13) Societal Discount Rate =	3.98%
14) General Input Data Year =	2013
15) Project Analysis Year 1 =	2014
Project Analysis Year 2 =	2015
Project Analysis Year 3 =	2016
16) Utility Project Costs	
16a) Administrative & Operating Costs =	\$282
16b) Incentive Costs =	3,740
16c) Total Utility Project Costs =	\$4,022
17) Direct Participant Costs (\$/Part.) =	\$60
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =	\$0
Escalation Rate =	0.00%
20) Project Life (Years) =	15
21) Avg. Dk/Part. Saved =	2.898
22) Avg Non-Gas Fuel Units/Part. Saved =	216
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
23) Number of Participants =	187
24) Total Annual Dk Saved =	542.0
25) Incentive/Participant =	\$20
26) Distribution Delivery Charge	\$1,744
27) Effective Income Tax Rate = (Federal & State Taxes)	35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$20,414	2.79
Utility Cost Test	\$27,784	7.91
Societal Test	\$48,337	5.20
Participant Test	\$94,845	9.45
Total Resource Cost Test	\$30,321	3.64

Table 1
Ratepayer Impact Measure Test

Company: **Montana-Dakota Utilities Co.**
Project: **Programmable Thermostats**

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	2014	542	\$3,836	\$2,079	\$0.000	\$0	\$2,079	5.4	\$143	\$772	\$2,851	\$1,805	\$636	\$282	\$3,740	\$4,658	(\$1,807)
2	2015	542	3,970	2,152	0.000	0	2,152	5.4	144	778	2,930	1,868	658	0	0	658	2,272
3	2016	542	4,109	2,227	0.000	0	2,227	5.4	146	788	3,015	1,934	681	0	0	681	2,334
4	2017	542	4,253	2,305	0.000	0	2,305	5.4	147	794	3,099	2,001	705	0	0	705	2,394
5	2018	542	4,402	2,386	0.000	0	2,386	5.4	149	805	3,191	2,071	730	0	0	730	2,461
6	2019	542	4,556	2,469	0.000	0	2,469	5.4	150	810	3,279	2,144	755	0	0	755	2,524
7	2020	542	4,715	2,556	0.000	0	2,556	5.4	152	821	3,377	2,219	782	0	0	782	2,595
8	2021	542	4,880	2,645	0.000	0	2,645	5.4	153	826	3,471	2,297	809	0	0	809	2,662
9	2022	542	5,051	2,738	0.000	0	2,738	5.4	155	837	3,575	2,377	837	0	0	837	2,738
10	2023	542	5,228	2,834	0.000	0	2,834	5.4	156	842	3,676	2,460	867	0	0	867	2,809
11	2024	542	5,411	2,933	0.000	0	2,933	5.4	158	853	3,786	2,546	897	0	0	897	2,889
12	2025	542	5,600	3,035	0.000	0	3,035	5.4	159	859	3,894	2,635	928	0	0	928	2,966
13	2026	542	5,796	3,141	0.000	0	3,141	5.4	161	869	4,010	2,728	961	0	0	961	3,049
14	2027	542	5,999	3,251	0.000	0	3,251	5.4	162	875	4,126	2,823	995	0	0	995	3,131
15	2028	542	6,209	3,365	0.000	0	3,365	5.4	164	886	4,251	2,922	1,029	0	0	1,029	3,222
16	2029	0	6,426	0	0.000	0	0	0.0	166	0	0	3,024	0	0	0	0	0
17	2030	0	6,651	0	0.000	0	0	0.0	167	0	0	3,130	0	0	0	0	0
18	2031	0	6,884	0	0.000	0	0	0.0	169	0	0	3,239	0	0	0	0	0
19	2032	0	7,125	0	0.000	0	0	0.0	171	0	0	3,353	0	0	0	0	0
20	2033	0	7,374	0	0.000	0	0	0.0	172	0	0	3,470	0	0	0	0	0
21	2034	0	7,632	0	0.000	0	0	0.0	174	0	0	3,592	0	0	0	0	0
Total =		8,130									\$52,531					\$16,292	\$36,239
																\$11,392	\$20,414
Total NPV =			\$20,414														
Benefit/Cost Ratio =			2.79														

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 3
Societal Test**

Company: **Montana-Dakota Utilities Co.**
Project: **Programmable Thermostats**

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)	
2014	\$2,079	\$772	\$0.021	\$848	\$1.041	\$564	\$4,263	\$4,022	\$7,480	\$11,502	(\$7,239)
2015	2,152	778	0.022	889	1.065	577	4,396	0	0	0	4,396
2016	2,227	788	0.023	929	1.090	591	4,535	0	0	0	4,535
2017	2,305	794	0.024	969	1.115	604	4,672	0	0	0	4,672
2018	2,386	805	0.025	1,010	1.141	618	4,819	0	0	0	4,819
2019	2,469	810	0.026	1,050	1.167	633	4,962	0	0	0	4,962
2020	2,556	821	0.026	1,050	1.194	647	5,074	0	0	0	5,074
2021	2,645	826	0.027	1,091	1.221	662	5,224	0	0	0	5,224
2022	2,738	837	0.028	1,131	1.249	677	5,383	0	0	0	5,383
2023	2,834	842	0.029	1,171	1.278	693	5,540	0	0	0	5,540
2024	2,933	853	0.030	1,212	1.307	708	5,706	0	0	0	5,706
2025	3,035	859	0.031	1,252	1.337	725	5,871	0	0	0	5,871
2026	3,141	869	0.032	1,293	1.368	741	6,044	0	0	0	6,044
2027	3,251	875	0.034	1,373	1.400	759	6,258	0	0	0	6,258
2028	3,365	886	0.035	1,414	1.432	776	6,441	0	0	0	6,441
2029	0	0	0.036	0	1.465	0	0	0	0	0	0
2030	0	0	0.037	0	1.498	0	0	0	0	0	0
2031	0	0	0.039	0	1.533	0	0	0	0	0	0
2032	0	0	0.040	0	1.568	0	0	0	0	0	0
2033	0	0	0.041	0	1.604	0	0	0	0	0	0
2034	0	0	0.043	0	1.641	0	0	0	0	0	0
Total =							\$79,188			\$11,502	\$67,686
							NPV = \$59,839			\$11,502	\$48,337
Total NPV =		\$48,337									
Benefit/Cost Ratio =		<u>5.20</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: **Programmable Thermostats**

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)	
2014	\$3,740	542	\$7.280	\$3,946	\$0.152	\$6,140	\$13,826	\$11,220	\$2,606
2015	0	542	7.535	4,084	0.158	6,382	10,466	0	10,466
2016	0	542	7.799	4,227	0.163	6,584	10,811	0	10,811
2017	0	542	8.072	4,375	0.169	6,826	11,201	0	11,201
2018	0	542	8.354	4,528	0.175	7,069	11,597	0	11,597
2019	0	542	8.647	4,687	0.181	7,311	11,998	0	11,998
2020	0	542	8.949	4,850	0.187	7,553	12,403	0	12,403
2021	0	542	9.262	5,020	0.194	7,836	12,856	0	12,856
2022	0	542	9.587	5,196	0.200	8,078	13,274	0	13,274
2023	0	542	9.922	5,378	0.207	8,361	13,739	0	13,739
2024	0	542	10.269	5,566	0.215	8,684	14,250	0	14,250
2025	0	542	10.629	5,761	0.222	8,967	14,728	0	14,728
2026	0	542	11.001	5,963	0.230	9,290	15,253	0	15,253
2027	0	542	11.386	6,171	0.238	9,613	15,784	0	15,784
2028	0	542	11.784	6,387	0.246	9,936	16,323	0	16,323
2029	0	0	12.197	0	0.255	0	0	0	0
2030	0	0	12.624	0	0.264	0	0	0	0
2031	0	0	13.066	0	0.273	0	0	0	0
2032	0	0	13.523	0	0.283	0	0	0	0
2033	0	0	13.996	0	0.293	0	0	0	0
2034	0	0	14.486	0	0.303	0	0	0	0
Total =		8,130					\$198,509	\$11,220	\$187,289
							NPV = \$106,065	\$11,220	94,845
Total NPV =		\$94,845							
Benefit/Cost Ratio =		<u>9.45</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 Programmable Thermostats

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)	
2014	\$2,079	\$772	\$848	\$3,699	\$4,022	\$7,480	\$11,502	(\$7,803)
2015	2,152	778	889	3,819	0	0	0	3,819
2016	2,227	788	929	3,944	0	0	0	3,944
2017	2,305	794	969	4,068	0	0	0	4,068
2018	2,386	805	1,010	4,201	0	0	0	4,201
2019	2,469	810	1,050	4,329	0	0	0	4,329
2020	2,556	821	1,050	4,427	0	0	0	4,427
2021	2,645	826	1,091	4,562	0	0	0	4,562
2022	2,738	837	1,131	4,706	0	0	0	4,706
2023	2,834	842	1,171	4,847	0	0	0	4,847
2024	2,933	853	1,212	4,998	0	0	0	4,998
2025	3,035	859	1,252	5,146	0	0	0	5,146
2026	3,141	869	1,293	5,303	0	0	0	5,303
2027	3,251	875	1,373	5,499	0	0	0	5,499
2028	3,365	886	1,414	5,665	0	0	0	5,665
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
2033	0	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0	0
			Total =	\$69,213			\$11,502	\$57,711
			NPV =	\$41,823			\$11,502	30,321

Total NPV = \$30,321
Benefit/Cost Ratio = 3.64

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: **Actual 2014**

Input Data	2014
1) Retail Rate (\$/Dk) =	\$6.592
Escalation Rate =	3.50%
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.13536
Escalation Rate =	3.50%
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh
3) Commodity Cost (\$/Dk) =	\$3.706
Escalation Rate =	3.50%
4) Demand Cost (\$/Unit/Yr) =	\$141.32
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) =	\$0.01920
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 =	7.60%
13) Societal Discount Rate =	3.98%
14) General Input Data Year =	2013
15) Project Analysis Year 1 =	2014
Project Analysis Year 2 =	2015
Project Analysis Year 3 =	2016
16) Utility Project Costs	
16a) Administrative & Operating Costs =	\$113
16b) Incentive Costs =	1,500
16c) Total Utility Project Costs =	<u>\$1,613</u>
17) Direct Participant Costs (\$/Part.) =	\$620
18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	0.00%
19) Participant Non-Energy Savings (Annual \$/Part) =	\$0
Escalation Rate =	0.00%
20) Project Life (Years) =	18
21) Avg. Dk/Part. Saved =	28.200
22) Avg Non-Gas Fuel Units/Part. Saved =	669
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
23) Number of Participants =	5
24) Total Annual Dk Saved =	141.0
25) Incentive/Participant =	\$300
26) Distribution Delivery Charge	\$1.302
27) Effective Income Tax Rate = (Federal & State Taxes)	35.000%

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$6,113	2.88
Utility Cost Test	\$7,745	5.80
Societal Test	\$12,543	4.90
Participant Test	\$14,522	5.68
Total Resource Cost Test	\$7,090	3.21

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	2014	141	\$3.836	\$541	\$0.000	\$0	\$541	1.4	\$143	\$200	\$741	\$1,348	\$124	\$113	\$1,500	\$1,737	(\$996)
2	2015	141	3.970	560	0.000	0	560	1.4	144	202	762	1,395	128	0	0	128	634
3	2016	141	4.109	579	0.000	0	579	1.4	146	204	783	1,444	132	0	0	132	651
4	2017	141	4.253	600	0.000	0	600	1.4	147	206	806	1,494	137	0	0	137	669
5	2018	141	4.402	621	0.000	0	621	1.4	149	209	830	1,546	142	0	0	142	688
6	2019	141	4.556	642	0.000	0	642	1.4	150	210	852	1,600	147	0	0	147	705
7	2020	141	4.715	665	0.000	0	665	1.4	152	213	878	1,657	152	0	0	152	726
8	2021	141	4.880	688	0.000	0	688	1.4	153	214	902	1,714	157	0	0	157	745
9	2022	141	5.051	712	0.000	0	712	1.4	155	217	929	1,774	163	0	0	163	766
10	2023	141	5.228	737	0.000	0	737	1.4	156	218	955	1,837	168	0	0	168	787
11	2024	141	5.411	763	0.000	0	763	1.4	158	221	984	1,901	174	0	0	174	810
12	2025	141	5.600	790	0.000	0	790	1.4	159	223	1,013	1,967	180	0	0	180	833
13	2026	141	5.796	817	0.000	0	817	1.4	161	225	1,042	2,036	187	0	0	187	855
14	2027	141	5.999	846	0.000	0	846	1.4	162	227	1,073	2,108	193	0	0	193	880
15	2028	141	6.209	875	0.000	0	875	1.4	164	230	1,105	2,181	200	0	0	200	905
16	2029	141	6.426	906	0.000	0	906	1.4	166	232	1,138	2,258	207	0	0	207	931
17	2030	141	6.651	938	0.000	0	938	1.4	167	234	1,172	2,337	214	0	0	214	958
18	2031	141	6.884	971	0.000	0	971	1.4	169	237	1,208	2,418	222	0	0	222	986
19	2032	0	7.125	0	0.000	0	0	0.0	171	0	0	2,503	0	0	0	0	0
20	2033	0	7.374	0	0.000	0	0	0.0	172	0	0	2,591	0	0	0	0	0
21	2034	0	7.632	0	0.000	0	0	0.0	174	0	0	2,681	0	0	0	0	0
Total =		2,538									\$17,173					\$4,640	\$12,533
																\$3,244	\$6,113
Total NPV =			\$6,113														
Benefit/Cost Ratio =			2.88														

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)	
2014	\$541	\$200	\$741	\$113	\$1,500	\$1,613	(\$872)
2015	560	202	762	0	0	0	762
2016	579	204	783	0	0	0	783
2017	600	206	806	0	0	0	806
2018	621	209	830	0	0	0	830
2019	642	210	852	0	0	0	852
2020	665	213	878	0	0	0	878
2021	688	214	902	0	0	0	902
2022	712	217	929	0	0	0	929
2023	737	218	955	0	0	0	955
2024	763	221	984	0	0	0	984
2025	790	223	1,013	0	0	0	1,013
2026	817	225	1,042	0	0	0	1,042
2027	846	227	1,073	0	0	0	1,073
2028	875	230	1,105	0	0	0	1,105
2029	906	232	1,138	0	0	0	1,138
2030	938	234	1,172	0	0	0	1,172
2031	971	237	1,208	0	0	0	1,208
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0
Total =			\$17,173			\$1,613	\$15,560
		NPV =	\$9,358			\$1,613	\$7,745
Total NPV =			\$7,745				
Benefit/Cost Ratio =			<u>5.80</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 - 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)	
2014	\$541	\$200	\$0.021	\$70	\$1.041	\$147	\$958	\$1,613	\$1,600	\$3,213	(\$2,255)
2015	560	202	0.022	74	1.065	150	986	0	0	0	986
2016	579	204	0.023	77	1.090	154	1,014	0	0	0	1,014
2017	600	206	0.024	80	1.115	157	1,043	0	0	0	1,043
2018	621	209	0.025	84	1.141	161	1,075	0	0	0	1,075
2019	642	210	0.026	87	1.167	165	1,104	0	0	0	1,104
2020	665	213	0.026	87	1.194	168	1,133	0	0	0	1,133
2021	688	214	0.027	90	1.221	172	1,164	0	0	0	1,164
2022	712	217	0.028	94	1.249	176	1,199	0	0	0	1,199
2023	737	218	0.029	97	1.278	180	1,232	0	0	0	1,232
2024	763	221	0.030	100	1.307	184	1,268	0	0	0	1,268
2025	790	223	0.031	104	1.337	189	1,306	0	0	0	1,306
2026	817	225	0.032	107	1.368	193	1,342	0	0	0	1,342
2027	846	227	0.034	114	1.400	197	1,384	0	0	0	1,384
2028	875	230	0.035	117	1.432	202	1,424	0	0	0	1,424
2029	906	232	0.036	120	1.465	207	1,465	0	0	0	1,465
2030	938	234	0.037	124	1.498	211	1,507	0	0	0	1,507
2031	971	237	0.039	130	1.533	216	1,554	0	0	0	1,554
2032	0	0	0.040	0	1.568	0	0	0	0	0	0
2033	0	0	0.041	0	1.604	0	0	0	0	0	0
2034	0	0	0.043	0	1.641	0	0	0	0	0	0

Total = \$22,158 \$3,213 \$18,945

NPV = \$15,756 \$3,213 \$12,543

Total NPV = \$12,543
Benefit/Cost Ratio = 4.90

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: **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)	
2014	\$1,500	141	\$6.823	\$962	\$0.140	\$468	\$2,930	\$3,100	(\$170)
2015	0	141	7.062	996	0.145	485	1,481	0	1,481
2016	0	141	7.309	1,031	0.150	502	1,533	0	1,533
2017	0	141	7.564	1,067	0.155	518	1,585	0	1,585
2018	0	141	7.829	1,104	0.161	539	1,643	0	1,643
2019	0	141	8.103	1,143	0.166	555	1,698	0	1,698
2020	0	141	8.387	1,183	0.172	575	1,758	0	1,758
2021	0	141	8.680	1,224	0.178	595	1,819	0	1,819
2022	0	141	8.984	1,267	0.184	615	1,882	0	1,882
2023	0	141	9.299	1,311	0.191	639	1,950	0	1,950
2024	0	141	9.624	1,357	0.198	662	2,019	0	2,019
2025	0	141	9.961	1,405	0.205	686	2,091	0	2,091
2026	0	141	10.310	1,454	0.212	709	2,163	0	2,163
2027	0	141	10.670	1,504	0.219	733	2,237	0	2,237
2028	0	141	11.044	1,557	0.227	759	2,316	0	2,316
2029	0	141	11.430	1,612	0.235	786	2,398	0	2,398
2030	0	141	11.831	1,668	0.243	813	2,481	0	2,481
2031	0	141	12.245	1,727	0.251	840	2,567	0	2,567
2032	0	0	12.673	0	0.260	0	0	0	0
2033	0	0	13.117	0	0.269	0	0	0	0
2034	0	0	13.576	0	0.279	0	0	0	0
Total =		2,538					\$36,551	\$3,100	\$33,451
							NPV = \$17,622	\$3,100	14,522
Total NPV =		\$14,522							
Benefit/Cost Ratio =		<u>5.68</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 - 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)	
2014	\$541	\$200	\$70	\$811	\$1,613	\$1,600	\$3,213	(\$2,402)
2015	560	202	74	836	0	0	0	836
2016	579	204	77	860	0	0	0	860
2017	600	206	80	886	0	0	0	886
2018	621	209	84	914	0	0	0	914
2019	642	210	87	939	0	0	0	939
2020	665	213	87	965	0	0	0	965
2021	688	214	90	992	0	0	0	992
2022	712	217	94	1,023	0	0	0	1,023
2023	737	218	97	1,052	0	0	0	1,052
2024	763	221	100	1,084	0	0	0	1,084
2025	790	223	104	1,117	0	0	0	1,117
2026	817	225	107	1,149	0	0	0	1,149
2027	846	227	114	1,187	0	0	0	1,187
2028	875	230	117	1,222	0	0	0	1,222
2029	906	232	120	1,258	0	0	0	1,258
2030	938	234	124	1,296	0	0	0	1,296
2031	971	237	130	1,338	0	0	0	1,338
2032	0	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0	0
			Total =	\$18,929			\$3,213	\$15,716
			NPV =	\$10,303			\$3,213	7,090

Total NPV = \$7,090
Benefit/Cost Ratio = 3.21

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)