

**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: **2013**

Input Data	2013
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 =	2012
15) Project Analysis Year 1 =	2013
Project Analysis Year 2 =	2013
Project Analysis Year 3 =	2014
16) Utility Project Costs	
16a) Administrative & Operating Costs = 1/	\$17,656
16b) Incentive Costs =	150,370
16c) Total Utility Project Costs =	\$168,026
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 =	639
24) Total Annual Dk Saved =	4,613
25) Incentive/Participant =	
26) Distribution Delivery Charge	
27) Effective Income Tax Rate =	
(Federal & State Taxes)	

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$181,465	1.88
Utility Cost Test	\$245,019	2.71
Societal Test	\$445,371	2.59
Participant Test	\$623,633	3.35
Total Resource Cost Test	\$190,021	1.68

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	2013	4,613	\$31,000	28,236	0	0	28,236	46	595	5,498	\$33,734		5,383	15,068	128,320	\$148,771	(\$115,037)	
2	2014	4,613	\$32,000	29,223	0	0	29,223	46	600	5,544	34,767		5,573	0	0	\$5,573	\$29,194	
3	2015	4,613	\$33,000	30,247	0	0	30,247	46	605	5,591	35,838		5,770	0	0	\$5,770	\$30,068	
4	2016	4,613	\$34,000	31,304	0	0	31,304	46	615	5,683	36,987		5,971	0	0	\$5,971	\$31,016	
5	2017	4,613	\$35,000	32,402	0	0	32,402	46	620	5,728	38,130		6,179	0	0	\$6,179	\$31,951	
6	2018	4,613	\$36,000	33,536	0	0	33,536	46	625	5,777	39,313		6,396	0	0	\$6,396	\$32,917	
7	2019	4,613	\$38,000	34,708	0	0	34,708	46	630	5,822	40,530		6,618	0	0	\$6,618	\$33,912	
8	2020	4,613	\$39,000	35,925	0	0	35,925	46	635	5,868	41,793		6,851	0	0	\$6,851	\$34,942	
9	2021	4,613	\$40,000	37,182	0	0	37,182	46	645	5,960	43,142		7,090	0	0	\$7,090	\$36,052	
10	2022	4,613	\$42,000	38,482	0	0	38,482	46	650	6,006	44,488		7,339	0	0	\$7,339	\$37,149	
11	2023	4,454	\$43,000	38,456	0	0	38,456	45	655	5,843	44,299		7,330	0	0	\$7,330	\$36,969	
12	2024	4,454	\$45,000	39,800	0	0	39,800	45	665	5,932	45,732		7,589	0	0	\$7,589	\$38,143	
13	2025	4,454	\$46,000	41,195	0	0	41,195	45	670	5,976	47,171		7,855	0	0	\$7,855	\$39,316	
14	2026	4,454	\$48,000	42,639	0	0	42,639	45	675	6,023	48,662		8,129	0	0	\$8,129	\$40,533	
15	2027	4,454	\$50,000	44,130	0	0	44,130	45	685	6,111	50,241		8,413	0	0	\$8,413	\$41,828	
16	2028	4,045	\$51,000	41,482	0	0	41,482	41	690	5,589	47,071		7,900	0	0	\$7,900	\$39,171	
17	2029	4,045	\$53,000	42,933	0	0	42,933	41	695	5,630	48,563		8,175	0	0	\$8,175	\$40,388	
18	2030	4,045	\$55,000	44,434	0	0	44,434	41	705	5,711	50,145		8,461	0	0	\$8,461	\$41,684	
19	2031	0	\$57,000	0	0	0	0	0	710	0	0		0	0	0	\$0	\$0	
20	2032	0	\$59,000	0	0	0	0	0	720	0	0		0	0	0	\$0	\$0	
21	2033	0	\$61,000	0	0	0	0	0	725	0	0		0	0	0	\$0	\$0	
22	2034	0	\$0.000	0	0	0	0	0	0	0	0		0	0	0	\$0	\$0	
Total =		80,535									\$770,606					\$270,410	\$500,196	
																	\$206,942	\$181,465
Total NPV =			\$181,465															
Benefit/Cost Ratio =			1.88															

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: **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)	
2013	\$28,236	\$5,498	\$33,734	\$15,068	\$128,320	\$143,388	(\$109,654)
2014	29,223	5,544	34,767	0	0	0	34,767
2015	30,247	5,591	35,838	0	0	0	35,838
2016	31,304	5,683	36,987	0	0	0	36,987
2017	32,402	5,728	38,130	0	0	0	38,130
2018	33,536	5,777	39,313	0	0	0	39,313
2019	34,708	5,822	40,530	0	0	0	40,530
2020	35,925	5,868	41,793	0	0	0	41,793
2021	37,182	5,960	43,142	0	0	0	43,142
2022	38,482	6,006	44,488	0	0	0	44,488
2023	38,456	5,843	44,299	0	0	0	44,299
2024	39,800	5,932	45,732	0	0	0	45,732
2025	41,195	5,976	47,171	0	0	0	47,171
2026	42,639	6,023	48,662	0	0	0	48,662
2027	44,130	6,111	50,241	0	0	0	50,241
2028	41,482	5,589	47,071	0	0	0	47,071
2029	42,933	5,630	48,563	0	0	0	48,563
2030	44,434	5,711	50,145	0	0	0	50,145
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 =			\$770,606			\$143,388	\$627,218
NPV =			\$388,407			\$143,388	\$245,019
Total NPV =		\$245,019					
Benefit/Cost Ratio =		<u>2.71</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 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)	
2013	\$28,236	\$5,498	\$33,734	6,674	5	4,803	\$45,211	143,388	136,500	\$279,888	(\$234,677)
2014	29,223	5,544	\$34,767	6,979	5	4,913	46,659	0	0	0	46,659
2015	30,247	5,591	\$35,838	7,282	5	5,028	48,148	0	0	0	48,148
2016	31,304	5,683	\$36,987	7,585	6	5,143	49,715	0	0	0	49,715
2017	32,402	5,728	\$38,130	7,889	6	5,263	51,282	0	0	0	51,282
2018	33,536	5,777	\$39,313	8,191	6	5,383	52,887	0	0	0	52,887
2019	34,708	5,822	\$40,530	8,495	6	5,509	54,534	0	0	0	54,534
2020	35,925	5,868	\$41,793	8,799	6	5,632	56,224	0	0	0	56,224
2021	37,182	5,960	\$43,142	9,102	6	5,762	58,006	0	0	0	58,006
2022	38,482	6,006	\$44,488	9,405	6	5,895	59,788	0	0	0	59,788
2023	38,456	5,843	\$44,299	9,710	7	5,822	59,831	0	0	0	59,831
2024	39,800	5,932	\$45,732	10,013	7	5,955	61,700	0	0	0	61,700
2025	41,195	5,976	\$47,171	10,316	7	6,094	63,581	0	0	0	63,581
2026	42,639	6,023	\$48,662	10,620	7	6,236	65,518	0	0	0	65,518
2027	44,130	6,111	\$50,241	10,923	7	6,378	67,542	0	0	0	67,542
2028	41,482	5,589	\$47,071	10,372	7	5,926	63,369	0	0	0	63,369
2029	42,933	5,630	\$48,563	10,645	7	6,060	65,268	0	0	0	65,268
2030	44,434	5,711	\$50,145	10,917	8	6,201	67,263	0	0	0	67,263
2031	0	0	\$0	0	8	0	0	0	0	0	0
2032	0	0	\$0	0	8	0	0	0	0	0	0
2033	0	0	\$0	0	8	0	0	0	0	0	0
2034	0	0	\$0	0	0	0	0	0	0	0	0
Total =							\$1,036,526			\$279,888	\$756,638
NPV =							\$725,259			\$279,888	\$445,371
Total NPV =		\$445,371									
Benefit/Cost Ratio =		<u>2.59</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: **Total South Dakota Program**

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)			
2013	128,320	4,613	39	36,465	1	32,166	\$196,951	264,820	(\$67,869)
2014	0	4,613	41	37,739	1	33,081	70,820	0	\$70,820
2015	0	4,613	42	39,064	1	34,295	73,359	0	\$73,359
2016	0	4,613	43	40,429	1	35,508	75,937	0	\$75,937
2017	0	4,613	45	41,843	1	36,721	78,564	0	\$78,564
2018	0	4,613	47	43,310	1	37,936	81,246	0	\$81,246
2019	0	4,613	48	44,824	1	39,452	84,276	0	\$84,276
2020	0	4,613	50	46,391	1	40,666	87,057	0	\$87,057
2021	0	4,613	52	48,017	1	42,182	90,199	0	\$90,199
2022	0	4,613	53	49,697	1	43,701	93,398	0	\$93,398
2023	0	4,454	55	49,657	1	45,217	94,874	0	\$94,874
2024	0	4,454	57	51,398	1	46,734	98,132	0	\$98,132
2025	0	4,454	59	53,198	1	48,555	101,753	0	\$101,753
2026	0	4,454	61	55,059	1	50,071	105,130	0	\$105,130
2027	0	4,454	63	56,986	1	51,892	108,878	0	\$108,878
2028	0	4,045	66	53,549	1	48,321	101,870	0	\$101,870
2029	0	4,045	68	55,424	1	49,964	105,388	0	\$105,388
2030	0	4,045	70	57,364	1	51,602	108,966	0	\$108,966
2031	0	0	73	0	1	0	0	0	\$0
2032	0	0	75	0	1	0	0	0	\$0
2033	0	0	78	0	1	0	0	0	\$0
2034	0	0	0	0	0	0	0	0	\$0
Total =		80,535					\$1,756,798	\$264,820	\$1,491,978
					NPV =		\$888,453	\$264,820	623,633
Total NPV =		\$623,633							
Benefit/Cost Ratio =		3.35							

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)	
2013	\$28,236	\$5,498	\$6,674	\$40,408	\$143,388	\$136,500	\$279,888	(\$239,480)
2014	29,223	5,544	6,979	41,746	0	0	0	\$41,746
2015	30,247	5,591	7,282	43,120	0	0	0	\$43,120
2016	31,304	5,683	7,585	44,572	0	0	0	\$44,572
2017	32,402	5,728	7,889	46,019	0	0	0	\$46,019
2018	33,536	5,777	8,191	47,504	0	0	0	\$47,504
2019	34,708	5,822	8,495	49,025	0	0	0	\$49,025
2020	35,925	5,868	8,799	50,592	0	0	0	\$50,592
2021	37,182	5,960	9,102	52,244	0	0	0	\$52,244
2022	38,482	6,006	9,405	53,893	0	0	0	\$53,893
2023	38,456	5,843	9,710	54,009	0	0	0	\$54,009
2024	39,800	5,932	10,013	55,745	0	0	0	\$55,745
2025	41,195	5,976	10,316	57,487	0	0	0	\$57,487
2026	42,639	6,023	10,620	59,282	0	0	0	\$59,282
2027	44,130	6,111	10,923	61,164	0	0	0	\$61,164
2028	41,482	5,589	10,372	57,443	0	0	0	\$57,443
2029	42,933	5,630	10,645	59,208	0	0	0	\$59,208
2030	44,434	5,711	10,917	61,062	0	0	0	\$61,062
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 =	\$934,523			\$279,888	\$654,635
			NPV =	\$469,909			\$279,888	190,021

Total NPV = \$190,021
Benefit/Cost Ratio = 1.68

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: **2013**

Input Data	2013		
1) Retail Rate (\$/Dk) =	\$7.658	16) Utility Project Costs	
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$7,432
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10200	16b) Incentive Costs =	63,300
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	<u>\$70,732</u>
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$620
3) Commodity Cost (\$/Dk) =	\$5.914	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$117.73	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 =	6.853
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	669
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
Escalation Rate =	3.50%	23) Number of Participants =	211
8) Non-Gas Fuel Loss Factor	7.48%	24) Total Annual Dk Saved =	1,446
9) Gas Environmental Damage Factor =	\$1.018	25) Incentive/Participant =	\$300
Escalation Rate =	2.30%	26) Distribution Delivery Charge	\$1.753
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 =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2012		
15) Project Analysis Year 1 =	2013		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$33,055	1.36
Utility Cost Test	\$53,623	1.76
Societal Test	\$112,788	1.82
Participant Test	\$229,549	2.75
Total Resource Cost Test	\$24,443	1.18

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	2013	1,446	\$6,121	\$8,851	\$0.000	\$0	\$8,851	14.5	\$119	\$1,726	\$10,577	\$1,814	\$1,705	\$7,432	\$63,300	\$72,437	(\$61,860)
2	2014	1,446	6,335	9,160	0.000	0	9,160	14.5	120	1,740	10,900	1,878	1,765	0	0	1,765	9,135
3	2015	1,446	6,557	9,481	0.000	0	9,481	14.5	121	1,755	11,236	1,944	1,827	0	0	1,827	9,409
4	2016	1,446	6,786	9,813	0.000	0	9,813	14.5	123	1,784	11,597	2,012	1,891	0	0	1,891	9,706
5	2017	1,446	7,024	10,157	0.000	0	10,157	14.5	124	1,798	11,955	2,082	1,957	0	0	1,957	9,998
6	2018	1,446	7,270	10,512	0.000	0	10,512	14.5	125	1,813	12,325	2,155	2,025	0	0	2,025	10,300
7	2019	1,446	7,524	10,880	0.000	0	10,880	14.5	126	1,827	12,707	2,230	2,096	0	0	2,096	10,611
8	2020	1,446	7,788	11,261	0.000	0	11,261	14.5	127	1,842	13,103	2,308	2,169	0	0	2,169	10,934
9	2021	1,446	8,060	11,655	0.000	0	11,655	14.5	129	1,871	13,526	2,389	2,245	0	0	2,245	11,281
10	2022	1,446	8,342	12,063	0.000	0	12,063	14.5	130	1,885	13,948	2,473	2,324	0	0	2,324	11,624
11	2023	1,446	8,634	12,485	0.000	0	12,485	14.5	131	1,900	14,385	2,559	2,405	0	0	2,405	11,980
12	2024	1,446	8,936	12,921	0.000	0	12,921	14.5	133	1,929	14,850	2,649	2,490	0	0	2,490	12,360
13	2025	1,446	9,249	13,374	0.000	0	13,374	14.5	134	1,943	15,317	2,742	2,577	0	0	2,577	12,740
14	2026	1,446	9,573	13,843	0.000	0	13,843	14.5	135	1,958	15,801	2,838	2,667	0	0	2,667	13,134
15	2027	1,446	9,908	14,327	0.000	0	14,327	14.5	137	1,987	16,314	2,937	2,760	0	0	2,760	13,554
16	2028	1,446	10,255	14,829	0.000	0	14,829	14.5	138	2,001	16,830	3,040	2,857	0	0	2,857	13,973
17	2029	1,446	10,614	15,348	0.000	0	15,348	14.5	139	2,016	17,364	3,146	2,957	0	0	2,957	14,407
18	2030	1,446	10,985	15,884	0.000	0	15,884	14.5	141	2,045	17,929	3,256	3,060	0	0	3,060	14,869
19	2031	0	11,370	0	0.000	0	0	0.0	142	0	0	3,370	0	0	0	0	0
20	2032	0	11,768	0	0.000	0	0	0.0	144	0	0	3,488	0	0	0	0	0
21	2033	0	12,179	0	0.000	0	0	0.0	145	0	0	3,610	0	0	0	0	0
Total =		26,028									\$250,664					\$112,509	\$138,155
											NPV =	\$124,355				\$91,299	\$33,055
Total NPV =			\$33,055														
Benefit/Cost Ratio =			1.36														

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)	
2013	\$8,851	\$1,726	\$10,577	\$7,432	\$63,300	\$70,732	(\$60,155)
2014	9,160	1,740	10,900	0	0	0	10,900
2015	9,481	1,755	11,236	0	0	0	11,236
2016	9,813	1,784	11,597	0	0	0	11,597
2017	10,157	1,798	11,955	0	0	0	11,955
2018	10,512	1,813	12,325	0	0	0	12,325
2019	10,880	1,827	12,707	0	0	0	12,707
2020	11,261	1,842	13,103	0	0	0	13,103
2021	11,655	1,871	13,526	0	0	0	13,526
2022	12,063	1,885	13,948	0	0	0	13,948
2023	12,485	1,900	14,385	0	0	0	14,385
2024	12,921	1,929	14,850	0	0	0	14,850
2025	13,374	1,943	15,317	0	0	0	15,317
2026	13,843	1,958	15,801	0	0	0	15,801
2027	14,327	1,987	16,314	0	0	0	16,314
2028	14,829	2,001	16,830	0	0	0	16,830
2029	15,348	2,016	17,364	0	0	0	17,364
2030	15,884	2,045	17,929	0	0	0	17,929
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
Total =			\$250,664			\$70,732	\$179,932
NPV =			\$124,355			\$70,732	\$53,623
Total NPV =			\$53,623				
Benefit/Cost Ratio =			<u>1.76</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)
2013	\$8,851	\$1,726	\$0.022	\$3,105	\$1.041	\$1,505	\$15,187	\$70,732	\$67,520	\$138,252	(\$123,065)
2014	9,160	1,740	0.023	3,247	1.065	1,540	15,687	0	0	0	15,687
2015	9,481	1,755	0.024	3,388	1.090	1,576	16,200	0	0	0	16,200
2016	9,813	1,784	0.025	3,529	1.115	1,612	16,738	0	0	0	16,738
2017	10,157	1,798	0.026	3,670	1.141	1,650	17,275	0	0	0	17,275
2018	10,512	1,813	0.027	3,811	1.167	1,687	17,823	0	0	0	17,823
2019	10,880	1,827	0.028	3,952	1.194	1,727	18,386	0	0	0	18,386
2020	11,261	1,842	0.029	4,094	1.221	1,766	18,963	0	0	0	18,963
2021	11,655	1,871	0.030	4,235	1.249	1,806	19,567	0	0	0	19,567
2022	12,063	1,885	0.031	4,376	1.278	1,848	20,172	0	0	0	20,172
2023	12,485	1,900	0.032	4,517	1.307	1,890	20,792	0	0	0	20,792
2024	12,921	1,929	0.033	4,658	1.337	1,933	21,441	0	0	0	21,441
2025	13,374	1,943	0.034	4,799	1.368	1,978	22,094	0	0	0	22,094
2026	13,843	1,958	0.035	4,941	1.400	2,024	22,766	0	0	0	22,766
2027	14,327	1,987	0.036	5,082	1.432	2,071	23,467	0	0	0	23,467
2028	14,829	2,001	0.038	5,364	1.465	2,118	24,312	0	0	0	24,312
2029	15,348	2,016	0.039	5,505	1.498	2,166	25,035	0	0	0	25,035
2030	15,884	2,045	0.040	5,646	1.533	2,217	25,792	0	0	0	25,792
2031	0	0	0.042	0	1.568	0	0	0	0	0	0
2032	0	0	0.043	0	1.604	0	0	0	0	0	0
2033	0	0	0.045	0	1.641	0	0	0	0	0	0

Total = NPV = \$361,697 \$138,252 \$223,445
NPV = \$251,040 \$138,252 \$112,788

Total NPV = \$112,788
Benefit/Cost Ratio = 1.82

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		
	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)
2013	\$63,300	1,446	\$7.926	\$11,461	\$0.106	\$14,963	\$89,724	\$130,820	(\$41,096)
2014	0	1,446	8.203	11,862	0.109	15,386	27,248	0	27,248
2015	0	1,446	8.491	12,278	0.113	15,951	28,229	0	28,229
2016	0	1,446	8.788	12,707	0.117	16,516	29,223	0	29,223
2017	0	1,446	9.095	13,151	0.121	17,080	30,231	0	30,231
2018	0	1,446	9.414	13,613	0.125	17,645	31,258	0	31,258
2019	0	1,446	9.743	14,088	0.130	18,351	32,439	0	32,439
2020	0	1,446	10.084	14,581	0.134	18,915	33,496	0	33,496
2021	0	1,446	10.437	15,092	0.139	19,621	34,713	0	34,713
2022	0	1,446	10.802	15,620	0.144	20,327	35,947	0	35,947
2023	0	1,446	11.180	16,166	0.149	21,033	37,199	0	37,199
2024	0	1,446	11.572	16,733	0.154	21,738	38,471	0	38,471
2025	0	1,446	11.977	17,319	0.160	22,585	39,904	0	39,904
2026	0	1,446	12.396	17,925	0.165	23,291	41,216	0	41,216
2027	0	1,446	12.830	18,552	0.171	24,138	42,690	0	42,690
2028	0	1,446	13.279	19,201	0.177	24,985	44,186	0	44,186
2029	0	1,446	13.744	19,874	0.183	25,832	45,706	0	45,706
2030	0	1,446	14.225	20,569	0.189	26,679	47,248	0	47,248
2031	0	0	14.723	0	0.196	0	0	0	0
2032	0	0	15.238	0	0.203	0	0	0	0
2033	0	0	15.771	0	0.210	0	0	0	0
Total =		26,028					\$709,128	\$130,820	\$578,308
NPV =							\$360,369	\$130,820	229,549
Total NPV =		\$229,549							
Benefit/Cost Ratio =		<u>2.75</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)	
2013	\$8,851	\$1,726	\$3,105	\$13,682	\$70,732	\$67,520	\$138,252	(\$124,570)
2014	9,160	1,740	3,247	14,147	0	0	0	14,147
2015	9,481	1,755	3,388	14,624	0	0	0	14,624
2016	9,813	1,784	3,529	15,126	0	0	0	15,126
2017	10,157	1,798	3,670	15,625	0	0	0	15,625
2018	10,512	1,813	3,811	16,136	0	0	0	16,136
2019	10,880	1,827	3,952	16,659	0	0	0	16,659
2020	11,261	1,842	4,094	17,197	0	0	0	17,197
2021	11,655	1,871	4,235	17,761	0	0	0	17,761
2022	12,063	1,885	4,376	18,324	0	0	0	18,324
2023	12,485	1,900	4,517	18,902	0	0	0	18,902
2024	12,921	1,929	4,658	19,508	0	0	0	19,508
2025	13,374	1,943	4,799	20,116	0	0	0	20,116
2026	13,843	1,958	4,941	20,742	0	0	0	20,742
2027	14,327	1,987	5,082	21,396	0	0	0	21,396
2028	14,829	2,001	5,364	22,194	0	0	0	22,194
2029	15,348	2,016	5,505	22,869	0	0	0	22,869
2030	15,884	2,045	5,646	23,575	0	0	0	23,575
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
			Total =	\$328,583			\$138,252	\$190,331
			NPV =	\$162,695			\$138,252	24,443

Total NPV = \$24,443
Benefit/Cost Ratio = 1.18

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: **2013**

Input Data	2013
1) Retail Rate (\$/Dk) =	\$7.658
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) =	\$5.914
Escalation Rate =	3.50%
4) Demand Cost (\$/Unit/Yr) =	\$117.73
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 =	2012
15) Project Analysis Year 1 =	2013
Project Analysis Year 2 =	2013
Project Analysis Year 3 =	2014
16) Utility Project Costs	
16a) Administrative & Operating Costs =	\$6,658
16b) Incentive Costs =	56,700
16c) Total Utility Project Costs =	\$63,358
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 =	12.553
22) Avg Non-Gas Fuel Units/Part. Saved =	669
22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
23) Number of Participants =	190
24) Total Annual Dk Saved =	2,385
25) Incentive/Participant =	\$298
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	\$107,799	2.11
Utility Cost Test	\$141,726	3.24
Societal Test	\$249,225	3.00
Participant Test	\$303,130	3.57
Total Resource Cost Test	\$115,151	1.93

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	2013	2,385	\$6,121	\$14,599	\$0.000	\$0	\$14,599	23.9	\$119	\$2,844	\$17,443	\$1,814	\$2,812	\$6,658	\$56,700	\$66,170	(\$48,727)
2	2014	2,385	6,335	15,109	0.000	0	15,109	23.9	120	2,868	17,977	1,878	2,911	0	0	2,911	15,066
3	2015	2,385	6,557	15,638	0.000	0	15,638	23.9	121	2,892	18,530	1,944	3,014	0	0	3,014	15,516
4	2016	2,385	6,786	16,185	0.000	0	16,185	23.9	123	2,940	19,125	2,012	3,119	0	0	3,119	16,006
5	2017	2,385	7,024	16,752	0.000	0	16,752	23.9	124	2,964	19,716	2,082	3,228	0	0	3,228	16,488
6	2018	2,385	7,270	17,339	0.000	0	17,339	23.9	125	2,988	20,327	2,155	3,341	0	0	3,341	16,986
7	2019	2,385	7,524	17,945	0.000	0	17,945	23.9	126	3,011	20,956	2,230	3,457	0	0	3,457	17,499
8	2020	2,385	7,788	18,574	0.000	0	18,574	23.9	127	3,035	21,609	2,308	3,578	0	0	3,578	18,031
9	2021	2,385	8,060	19,223	0.000	0	19,223	23.9	129	3,083	22,306	2,389	3,704	0	0	3,704	18,602
10	2022	2,385	8,342	19,896	0.000	0	19,896	23.9	130	3,107	23,003	2,473	3,834	0	0	3,834	19,169
11	2023	2,385	8,634	20,592	0.000	0	20,592	23.9	131	3,131	23,723	2,559	3,967	0	0	3,967	19,756
12	2024	2,385	8,936	21,312	0.000	0	21,312	23.9	133	3,179	24,491	2,649	4,107	0	0	4,107	20,384
13	2025	2,385	9,249	22,059	0.000	0	22,059	23.9	134	3,203	25,262	2,742	4,251	0	0	4,251	21,011
14	2026	2,385	9,573	22,832	0.000	0	22,832	23.9	135	3,227	26,059	2,838	4,400	0	0	4,400	21,659
15	2027	2,385	9,908	23,631	0.000	0	23,631	23.9	137	3,274	26,905	2,937	4,553	0	0	4,553	22,352
16	2028	2,385	10,255	24,458	0.000	0	24,458	23.9	138	3,298	27,756	3,040	4,713	0	0	4,713	23,043
17	2029	2,385	10,614	25,314	0.000	0	25,314	23.9	139	3,322	28,636	3,146	4,877	0	0	4,877	23,759
18	2030	2,385	10,985	26,199	0.000	0	26,199	23.9	141	3,370	29,569	3,256	5,048	0	0	5,048	24,521
19	2031	0	11,370	0	0.000	0	0	0.0	142	0	0	3,370	0	0	0	0	0
20	2032	0	11,768	0	0.000	0	0	0.0	144	0	0	3,488	0	0	0	0	0
21	2033	0	12,179	0	0.000	0	0	0.0	145	0	0	3,610	0	0	0	0	0
Total =		42,930									\$413,393					\$132,272	\$281,121
											NPV =	\$205,084				\$97,285	\$107,799
Total NPV =			\$107,799														
Benefit/Cost Ratio =			2.11														

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 - 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)	
2013	\$14,599	\$2,844	\$17,443	\$6,658	\$56,700	\$63,358	(\$45,915)
2014	15,109	2,868	17,977	0	0	0	17,977
2015	15,638	2,892	18,530	0	0	0	18,530
2016	16,185	2,940	19,125	0	0	0	19,125
2017	16,752	2,964	19,716	0	0	0	19,716
2018	17,339	2,988	20,327	0	0	0	20,327
2019	17,945	3,011	20,956	0	0	0	20,956
2020	18,574	3,035	21,609	0	0	0	21,609
2021	19,223	3,083	22,306	0	0	0	22,306
2022	19,896	3,107	23,003	0	0	0	23,003
2023	20,592	3,131	23,723	0	0	0	23,723
2024	21,312	3,179	24,491	0	0	0	24,491
2025	22,059	3,203	25,262	0	0	0	25,262
2026	22,832	3,227	26,059	0	0	0	26,059
2027	23,631	3,274	26,905	0	0	0	26,905
2028	24,458	3,298	27,756	0	0	0	27,756
2029	25,314	3,322	28,636	0	0	0	28,636
2030	26,199	3,370	29,569	0	0	0	29,569
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
Total =			\$413,393			\$63,358	\$350,035
NPV =			\$205,084			\$63,358	\$141,726
Total NPV =			\$141,726				
Benefit/Cost Ratio =			<u>3.24</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)
2013	\$14,599	\$2,844	\$0.022	\$2,796	\$1.041	\$2,483	\$22,722	\$63,358	\$61,100	\$124,458	(\$101,736)
2014	15,109	2,868	0.023	2,924	1.065	2,540	23,441	0	0	0	23,441
2015	15,638	2,892	0.024	3,051	1.090	2,600	24,181	0	0	0	24,181
2016	16,185	2,940	0.025	3,178	1.115	2,659	24,962	0	0	0	24,962
2017	16,752	2,964	0.026	3,305	1.141	2,721	25,742	0	0	0	25,742
2018	17,339	2,988	0.027	3,432	1.167	2,783	26,542	0	0	0	26,542
2019	17,945	3,011	0.028	3,559	1.194	2,848	27,363	0	0	0	27,363
2020	18,574	3,035	0.029	3,686	1.221	2,912	28,207	0	0	0	28,207
2021	19,223	3,083	0.030	3,813	1.249	2,979	29,098	0	0	0	29,098
2022	19,896	3,107	0.031	3,940	1.278	3,048	29,991	0	0	0	29,991
2023	20,592	3,131	0.032	4,068	1.307	3,117	30,908	0	0	0	30,908
2024	21,312	3,179	0.033	4,195	1.337	3,189	31,875	0	0	0	31,875
2025	22,059	3,203	0.034	4,322	1.368	3,263	32,847	0	0	0	32,847
2026	22,832	3,227	0.035	4,449	1.400	3,339	33,847	0	0	0	33,847
2027	23,631	3,274	0.036	4,576	1.432	3,415	34,896	0	0	0	34,896
2028	24,458	3,298	0.038	4,830	1.465	3,494	36,080	0	0	0	36,080
2029	25,314	3,322	0.039	4,957	1.498	3,573	37,166	0	0	0	37,166
2030	26,199	3,370	0.040	5,084	1.533	3,656	38,309	0	0	0	38,309
2031	0	0	0.042	0	1.568	0	0	0	0	0	0
2032	0	0	0.043	0	1.604	0	0	0	0	0	0
2033	0	0	0.045	0	1.641	0	0	0	0	0	0
Total =							\$538,177			\$124,458	\$413,719
NPV =							\$373,683			\$124,458	\$249,225
Total NPV =		\$249,225									
Benefit/Cost Ratio =		<u>3.00</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 95+% AFUE Furnace - Replacement**

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)
2013	\$56,700	2,385	\$7.926	\$18,904	\$0.106	\$13,474	\$89,078	\$117,800	(\$28,722)
2014	0	2,385	8.203	19,564	0.109	13,855	33,419	0	33,419
2015	0	2,385	8.491	20,251	0.113	14,363	34,614	0	34,614
2016	0	2,385	8.788	20,959	0.117	14,872	35,831	0	35,831
2017	0	2,385	9.095	21,692	0.121	15,380	37,072	0	37,072
2018	0	2,385	9.414	22,452	0.125	15,889	38,341	0	38,341
2019	0	2,385	9.743	23,237	0.130	16,524	39,761	0	39,761
2020	0	2,385	10.084	24,050	0.134	17,033	41,083	0	41,083
2021	0	2,385	10.437	24,892	0.139	17,668	42,560	0	42,560
2022	0	2,385	10.802	25,763	0.144	18,304	44,067	0	44,067
2023	0	2,385	11.180	26,664	0.149	18,939	45,603	0	45,603
2024	0	2,385	11.572	27,599	0.154	19,575	47,174	0	47,174
2025	0	2,385	11.977	28,565	0.160	20,338	48,903	0	48,903
2026	0	2,385	12.396	29,564	0.165	20,973	50,537	0	50,537
2027	0	2,385	12.830	30,600	0.171	21,736	52,336	0	52,336
2028	0	2,385	13.279	31,670	0.177	22,498	54,168	0	54,168
2029	0	2,385	13.744	32,779	0.183	23,261	56,040	0	56,040
2030	0	2,385	14.225	33,927	0.189	24,024	57,951	0	57,951
2031	0	0	14.723	0	0.196	0	0	0	0
2032	0	0	15.238	0	0.203	0	0	0	0
2033	0	0	15.771	0	0.210	0	0	0	0
Total =		42,930					\$848,538	\$117,800	\$730,738
NPV =							\$420,930	\$117,800	303,130
Total NPV =		\$303,130							
Benefit/Cost Ratio =		<u>3.57</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 Net of Rebate (F)	Total Costs (G)	
2013	\$14,599	\$2,844	\$2,796	\$20,239	\$63,358	\$61,100	\$124,458	(\$104,219)
2014	15,109	2,868	2,924	20,901	0	0	0	20,901
2015	15,638	2,892	3,051	21,581	0	0	0	21,581
2016	16,185	2,940	3,178	22,303	0	0	0	22,303
2017	16,752	2,964	3,305	23,021	0	0	0	23,021
2018	17,339	2,988	3,432	23,759	0	0	0	23,759
2019	17,945	3,011	3,559	24,515	0	0	0	24,515
2020	18,574	3,035	3,686	25,295	0	0	0	25,295
2021	19,223	3,083	3,813	26,119	0	0	0	26,119
2022	19,896	3,107	3,940	26,943	0	0	0	26,943
2023	20,592	3,131	4,068	27,791	0	0	0	27,791
2024	21,312	3,179	4,195	28,686	0	0	0	28,686
2025	22,059	3,203	4,322	29,584	0	0	0	29,584
2026	22,832	3,227	4,449	30,508	0	0	0	30,508
2027	23,631	3,274	4,576	31,481	0	0	0	31,481
2028	24,458	3,298	4,830	32,586	0	0	0	32,586
2029	25,314	3,322	4,957	33,593	0	0	0	33,593
2030	26,199	3,370	5,084	34,653	0	0	0	34,653
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
Total =				\$483,558			\$124,458	\$359,100
NPV =				\$239,609			\$124,458	115,151

Total NPV = \$115,151
Benefit/Cost Ratio = 1.93

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: **2013**

Input Data	2013		
1) Retail Rate (\$/Dk) =	\$7.658	16) Utility Project Costs	
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$399
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10200	16b) Incentive Costs =	3,400
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$3,799
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$100
3) Commodity Cost (\$/Dk) =	\$5.914	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$117.73	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) =	10
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	4.676
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	0
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
Escalation Rate =	3.50%	23) Number of Participants =	34
8) Non-Gas Fuel Loss Factor	7.48%	24) Total Annual Dk Saved =	159
9) Gas Environmental Damage Factor =	\$1.018	25) Incentive/Participant =	\$100
Escalation Rate =	2.30%	26) Distribution Delivery Charge	\$1.753
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 =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2012		
15) Project Analysis Year 1 =	2013		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$3,894	1.73
Utility Cost Test	\$5,399	2.42
Societal Test	\$8,803	3.32
Participant Test	\$9,727	3.86
Total Resource Cost Test	\$5,399	2.42

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	2013	159	\$6,121	\$973	\$0.000	\$0	\$973	1.6	\$119	\$190	\$1,163	\$1,814	\$187	\$399	\$3,400	\$3,986	(\$2,823)	
2	2014	159	6,335	1,007	0.000	0	1,007	1.6	120	192	1,199	1,878	194	0	0	194	1,005	
3	2015	159	6,557	1,043	0.000	0	1,043	1.6	121	194	1,237	1,944	201	0	0	201	1,036	
4	2016	159	6,786	1,079	0.000	0	1,079	1.6	123	197	1,276	2,012	208	0	0	208	1,068	
5	2017	159	7,024	1,117	0.000	0	1,117	1.6	124	198	1,315	2,082	215	0	0	215	1,100	
6	2018	159	7,270	1,156	0.000	0	1,156	1.6	125	200	1,356	2,155	223	0	0	223	1,133	
7	2019	159	7,524	1,196	0.000	0	1,196	1.6	126	202	1,398	2,230	230	0	0	230	1,168	
8	2020	159	7,788	1,238	0.000	0	1,238	1.6	127	203	1,441	2,308	239	0	0	239	1,202	
9	2021	159	8,060	1,282	0.000	0	1,282	1.6	129	206	1,488	2,389	247	0	0	247	1,241	
10	2022	159	8,342	1,326	0.000	0	1,326	1.6	130	208	1,534	2,473	256	0	0	256	1,278	
11	2023	0	8,634	0	0.000	0	0	0.0	131	0	0	2,559	0	0	0	0	0	
12	2024	0	8,936	0	0.000	0	0	0.0	133	0	0	2,649	0	0	0	0	0	
13	2025	0	9,249	0	0.000	0	0	0.0	134	0	0	2,742	0	0	0	0	0	
14	2026	0	9,573	0	0.000	0	0	0.0	135	0	0	2,838	0	0	0	0	0	
15	2027	0	9,908	0	0.000	0	0	0.0	137	0	0	2,937	0	0	0	0	0	
16	2028	0	10,255	0	0.000	0	0	0.0	138	0	0	3,040	0	0	0	0	0	
17	2029	0	10,614	0	0.000	0	0	0.0	139	0	0	3,146	0	0	0	0	0	
18	2030	0	10,985	0	0.000	0	0	0.0	141	0	0	3,256	0	0	0	0	0	
19	2031	0	11,370	0	0.000	0	0	0.0	142	0	0	3,370	0	0	0	0	0	
20	2032	0	11,768	0	0.000	0	0	0.0	144	0	0	3,488	0	0	0	0	0	
21	2033	0	12,179	0	0.000	0	0	0.0	145	0	0	3,610	0	0	0	0	0	
Total =		1,590									\$13,407					\$5,999	\$7,408	
																	\$5,304	\$3,894
Total NPV =			\$3,894															
Benefit/Cost Ratio =			1.73															

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)	
2013	\$973	\$190	\$1,163	\$399	\$3,400	\$3,799	(\$2,636)
2014	1,007	192	1,199	0	0	0	1,199
2015	1,043	194	1,237	0	0	0	1,237
2016	1,079	197	1,276	0	0	0	1,276
2017	1,117	198	1,315	0	0	0	1,315
2018	1,156	200	1,356	0	0	0	1,356
2019	1,196	202	1,398	0	0	0	1,398
2020	1,238	203	1,441	0	0	0	1,441
2021	1,282	206	1,488	0	0	0	1,488
2022	1,326	208	1,534	0	0	0	1,534
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
2033	0	0	0	0	0	0	0
Total =			\$13,407			\$3,799	\$9,608
		NPV =	\$9,198			\$3,799	\$5,399
Total NPV =			\$5,399				
Benefit/Cost Ratio =			<u>2.42</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)
2013	\$973	\$190	\$0.022	\$0	\$1.041	\$166	\$1,329	\$3,799	\$0	\$3,799	(\$2,470)
2014	1,007	192	0.023	0	1.065	169	1,368	0	0	0	1,368
2015	1,043	194	0.024	0	1.090	173	1,410	0	0	0	1,410
2016	1,079	197	0.025	0	1.115	177	1,453	0	0	0	1,453
2017	1,117	198	0.026	0	1.141	181	1,496	0	0	0	1,496
2018	1,156	200	0.027	0	1.167	186	1,542	0	0	0	1,542
2019	1,196	202	0.028	0	1.194	190	1,588	0	0	0	1,588
2020	1,238	203	0.029	0	1.221	194	1,635	0	0	0	1,635
2021	1,282	206	0.030	0	1.249	199	1,687	0	0	0	1,687
2022	1,326	208	0.031	0	1.278	203	1,737	0	0	0	1,737
2023	0	0	0.032	0	1.307	0	0	0	0	0	0
2024	0	0	0.033	0	1.337	0	0	0	0	0	0
2025	0	0	0.034	0	1.368	0	0	0	0	0	0
2026	0	0	0.035	0	1.400	0	0	0	0	0	0
2027	0	0	0.036	0	1.432	0	0	0	0	0	0
2028	0	0	0.038	0	1.465	0	0	0	0	0	0
2029	0	0	0.039	0	1.498	0	0	0	0	0	0
2030	0	0	0.040	0	1.533	0	0	0	0	0	0
2031	0	0	0.042	0	1.568	0	0	0	0	0	0
2032	0	0	0.043	0	1.604	0	0	0	0	0	0
2033	0	0	0.045	0	1.641	0	0	0	0	0	0

Total = \$15,245 \$3,799 \$11,446

NPV = \$12,602 \$3,799 \$8,803

Total NPV = \$8,803
Benefit/Cost Ratio = 3.32

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)	
2013	\$3,400	159	\$7.926	\$1,260	\$0.106	\$0	\$4,660	\$3,400	\$1,260
2014	0	159	8.203	1,304	0.109	0	1,304	0	1,304
2015	0	159	8.491	1,350	0.113	0	1,350	0	1,350
2016	0	159	8.788	1,397	0.117	0	1,397	0	1,397
2017	0	159	9.095	1,446	0.121	0	1,446	0	1,446
2018	0	159	9.414	1,497	0.125	0	1,497	0	1,497
2019	0	159	9.743	1,549	0.130	0	1,549	0	1,549
2020	0	159	10.084	1,603	0.134	0	1,603	0	1,603
2021	0	159	10.437	1,659	0.139	0	1,659	0	1,659
2022	0	159	10.802	1,718	0.144	0	1,718	0	1,718
2023	0	0	11.180	0	0.149	0	0	0	0
2024	0	0	11.572	0	0.154	0	0	0	0
2025	0	0	11.977	0	0.160	0	0	0	0
2026	0	0	12.396	0	0.165	0	0	0	0
2027	0	0	12.830	0	0.171	0	0	0	0
2028	0	0	13.279	0	0.177	0	0	0	0
2029	0	0	13.744	0	0.183	0	0	0	0
2030	0	0	14.225	0	0.189	0	0	0	0
2031	0	0	14.723	0	0.196	0	0	0	0
2032	0	0	15.238	0	0.203	0	0	0	0
2033	0	0	15.771	0	0.210	0	0	0	0
Total =		1,590					\$18,183	\$3,400	\$14,783
						NPV =	\$13,127	\$3,400	9,727
Total NPV =		\$9,727							
Benefit/Cost Ratio =		<u>3.86</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)	
2013	\$973	\$190	\$0	\$1,163	\$3,799	\$0	\$3,799	(\$2,636)
2014	1,007	192	0	1,199	0	0	0	1,199
2015	1,043	194	0	1,237	0	0	0	1,237
2016	1,079	197	0	1,276	0	0	0	1,276
2017	1,117	198	0	1,315	0	0	0	1,315
2018	1,156	200	0	1,356	0	0	0	1,356
2019	1,196	202	0	1,398	0	0	0	1,398
2020	1,238	203	0	1,441	0	0	0	1,441
2021	1,282	206	0	1,488	0	0	0	1,488
2022	1,326	208	0	1,534	0	0	0	1,534
2023	0	0	0	0	0	0	0	0
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
			Total =	\$13,407			\$3,799	\$9,608
			NPV =	\$9,198			\$3,799	5,399

Total NPV = \$5,399
Benefit/Cost Ratio = 2.42

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: **2013**

Input Data	2013		
1) Retail Rate (\$/Dk) =	\$7.658	16) Utility Project Costs	
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$332
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10200	16b) Incentive Costs =	2,820
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$3,152
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$60
3) Commodity Cost (\$/Dk) =	\$5.914	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$117.73	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) =	15
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	2.901
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	216
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
Escalation Rate =	3.50%	23) Number of Participants =	141
8) Non-Gas Fuel Loss Factor	7.48%	24) Total Annual Dk Saved =	409
9) Gas Environmental Damage Factor =	\$1.018	25) Incentive/Participant =	\$20
Escalation Rate =	2.30%	26) Distribution Delivery Charge	\$1,753
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 =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2012		
15) Project Analysis Year 1 =	2013		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$23,091	3.77
Utility Cost Test	\$28,270	9.97
Societal Test	\$48,250	6.49
Participant Test	\$59,803	8.07
Total Resource Cost Test	\$29,995	4.41

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	2013	409	\$6,121	\$2,503	\$0.000	\$0	\$2,503	4.1	\$119	\$488	\$2,991	\$1,814	\$482	\$332	\$2,820	\$3,634	(\$643)
2	2014	409	6,335	2,591	0.000	0	2,591	4.1	120	492	3,083	1,878	499	0	0	499	2,584
3	2015	409	6,557	2,682	0.000	0	2,682	4.1	121	496	3,178	1,944	517	0	0	517	2,661
4	2016	409	6,786	2,775	0.000	0	2,775	4.1	123	504	3,279	2,012	535	0	0	535	2,744
5	2017	409	7,024	2,873	0.000	0	2,873	4.1	124	508	3,381	2,082	553	0	0	553	2,828
6	2018	409	7,270	2,973	0.000	0	2,973	4.1	125	513	3,486	2,155	573	0	0	573	2,913
7	2019	409	7,524	3,077	0.000	0	3,077	4.1	126	517	3,594	2,230	593	0	0	593	3,001
8	2020	409	7,788	3,185	0.000	0	3,185	4.1	127	521	3,706	2,308	614	0	0	614	3,092
9	2021	409	8,060	3,297	0.000	0	3,297	4.1	129	529	3,826	2,389	635	0	0	635	3,191
10	2022	409	8,342	3,412	0.000	0	3,412	4.1	130	533	3,945	2,473	657	0	0	657	3,288
11	2023	409	8,634	3,531	0.000	0	3,531	4.1	131	537	4,068	2,559	680	0	0	680	3,388
12	2024	409	8,936	3,655	0.000	0	3,655	4.1	133	545	4,200	2,649	704	0	0	704	3,496
13	2025	409	9,249	3,783	0.000	0	3,783	4.1	134	549	4,332	2,742	729	0	0	729	3,603
14	2026	409	9,573	3,915	0.000	0	3,915	4.1	135	554	4,469	2,838	754	0	0	754	3,715
15	2027	409	9,908	4,052	0.000	0	4,052	4.1	137	562	4,614	2,937	781	0	0	781	3,833
16	2028	0	10,255	0	0.000	0	0	0.0	138	0	0	3,040	0	0	0	0	0
17	2029	0	10,614	0	0.000	0	0	0.0	139	0	0	3,146	0	0	0	0	0
18	2030	0	10,985	0	0.000	0	0	0.0	141	0	0	3,256	0	0	0	0	0
19	2031	0	11,370	0	0.000	0	0	0.0	142	0	0	3,370	0	0	0	0	0
20	2032	0	11,768	0	0.000	0	0	0.0	144	0	0	3,488	0	0	0	0	0
21	2033	0	12,179	0	0.000	0	0	0.0	145	0	0	3,610	0	0	0	0	0
Total =		6,135									\$56,152					\$12,458	\$43,694
											NPV = \$31,422					\$8,331	\$23,091
Total NPV =			\$23,091														
Benefit/Cost Ratio =			3.77														

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: **Programmable Thermostats**

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)	
2013	\$2,503	\$488	\$2,991	\$332	\$2,820	\$3,152	(\$161)
2014	2,591	492	3,083	0	0	0	3,083
2015	2,682	496	3,178	0	0	0	3,178
2016	2,775	504	3,279	0	0	0	3,279
2017	2,873	508	3,381	0	0	0	3,381
2018	2,973	513	3,486	0	0	0	3,486
2019	3,077	517	3,594	0	0	0	3,594
2020	3,185	521	3,706	0	0	0	3,706
2021	3,297	529	3,826	0	0	0	3,826
2022	3,412	533	3,945	0	0	0	3,945
2023	3,531	537	4,068	0	0	0	4,068
2024	3,655	545	4,200	0	0	0	4,200
2025	3,783	549	4,332	0	0	0	4,332
2026	3,915	554	4,469	0	0	0	4,469
2027	4,052	562	4,614	0	0	0	4,614
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
Total =			\$56,152			\$3,152	\$53,000
		NPV =	\$31,422			\$3,152	\$28,270
Total NPV =			\$28,270				
Benefit/Cost Ratio =			<u>9.97</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: **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)
2013	\$2,503	\$488	\$0.022	\$670	\$1.041	\$426	\$4,087	\$3,152	\$5,640	\$8,792	(\$4,705)
2014	2,591	492	0.023	700	1.065	436	4,219	0	0	0	4,219
2015	2,682	496	0.024	731	1.090	446	4,355	0	0	0	4,355
2016	2,775	504	0.025	761	1.115	456	4,496	0	0	0	4,496
2017	2,873	508	0.026	792	1.141	467	4,640	0	0	0	4,640
2018	2,973	513	0.027	822	1.167	477	4,785	0	0	0	4,785
2019	3,077	517	0.028	853	1.194	488	4,935	0	0	0	4,935
2020	3,185	521	0.029	883	1.221	499	5,088	0	0	0	5,088
2021	3,297	529	0.030	914	1.249	511	5,251	0	0	0	5,251
2022	3,412	533	0.031	944	1.278	523	5,412	0	0	0	5,412
2023	3,531	537	0.032	975	1.307	535	5,578	0	0	0	5,578
2024	3,655	545	0.033	1,005	1.337	547	5,752	0	0	0	5,752
2025	3,783	549	0.034	1,036	1.368	560	5,928	0	0	0	5,928
2026	3,915	554	0.035	1,066	1.400	573	6,108	0	0	0	6,108
2027	4,052	562	0.036	1,096	1.432	586	6,296	0	0	0	6,296
2028	0	0	0.038	0	1.465	0	0	0	0	0	0
2029	0	0	0.039	0	1.498	0	0	0	0	0	0
2030	0	0	0.040	0	1.533	0	0	0	0	0	0
2031	0	0	0.042	0	1.568	0	0	0	0	0	0
2032	0	0	0.043	0	1.604	0	0	0	0	0	0
2033	0	0	0.045	0	1.641	0	0	0	0	0	0

Total = \$76,930 \$8,792 \$68,138
 NPV = \$57,042 \$8,792 \$48,250

Total NPV = \$48,250
 Benefit/Cost Ratio = 6.49

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)	
2013	\$2,820	409	\$7.926	\$3,242	\$0.106	\$3,228	\$9,290	\$8,460	\$830
2014	0	409	8.203	3,355	0.109	3,320	6,675	0	6,675
2015	0	409	8.491	3,473	0.113	3,442	6,915	0	6,915
2016	0	409	8.788	3,594	0.117	3,563	7,157	0	7,157
2017	0	409	9.095	3,720	0.121	3,685	7,405	0	7,405
2018	0	409	9.414	3,850	0.125	3,807	7,657	0	7,657
2019	0	409	9.743	3,985	0.130	3,959	7,944	0	7,944
2020	0	409	10.084	4,124	0.134	4,081	8,205	0	8,205
2021	0	409	10.437	4,269	0.139	4,233	8,502	0	8,502
2022	0	409	10.802	4,418	0.144	4,386	8,804	0	8,804
2023	0	409	11.180	4,573	0.149	4,538	9,111	0	9,111
2024	0	409	11.572	4,733	0.154	4,690	9,423	0	9,423
2025	0	409	11.977	4,899	0.160	4,873	9,772	0	9,772
2026	0	409	12.396	5,070	0.165	5,025	10,095	0	10,095
2027	0	409	12.830	5,247	0.171	5,208	10,455	0	10,455
2028	0	0	13.279	0	0.177	0	0	0	0
2029	0	0	13.744	0	0.183	0	0	0	0
2030	0	0	14.225	0	0.189	0	0	0	0
2031	0	0	14.723	0	0.196	0	0	0	0
2032	0	0	15.238	0	0.203	0	0	0	0
2033	0	0	15.771	0	0.210	0	0	0	0

Total = 6,135 NPV = \$127,410 \$8,460 \$118,950
\$68,263 \$8,460 59,803

Total NPV = \$59,803
Benefit/Cost Ratio = 8.07

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)	
2013	\$2,503	\$488	\$670	\$3,661	\$3,152	\$5,640	\$8,792	(\$5,131)
2014	2,591	492	700	3,783	0	0	0	3,783
2015	2,682	496	731	3,909	0	0	0	3,909
2016	2,775	504	761	4,040	0	0	0	4,040
2017	2,873	508	792	4,173	0	0	0	4,173
2018	2,973	513	822	4,308	0	0	0	4,308
2019	3,077	517	853	4,447	0	0	0	4,447
2020	3,185	521	883	4,589	0	0	0	4,589
2021	3,297	529	914	4,740	0	0	0	4,740
2022	3,412	533	944	4,889	0	0	0	4,889
2023	3,531	537	975	5,043	0	0	0	5,043
2024	3,655	545	1,005	5,205	0	0	0	5,205
2025	3,783	549	1,036	5,368	0	0	0	5,368
2026	3,915	554	1,066	5,535	0	0	0	5,535
2027	4,052	562	1,096	5,710	0	0	0	5,710
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
			Total =	\$69,400			\$8,792	\$60,608
			NPV =	\$38,787			\$8,792	29,995

Total NPV = \$29,995
Benefit/Cost Ratio = 4.41

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: **2013**

Input Data	2013		
1) Retail Rate (\$/Dk) =	\$7.216	16) Utility Project Costs	
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$247
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.10340	16b) Incentive Costs =	2,100
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$2,347
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$620
3) Commodity Cost (\$/Dk) =	\$5.914	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$117.73	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 =	30.571
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	669
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.02005	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0
Escalation Rate =	3.50%	23) Number of Participants =	7
8) Non-Gas Fuel Loss Factor	7.48%	24) Total Annual Dk Saved =	214
9) Gas Environmental Damage Factor =	\$1.018	25) Incentive/Participant =	\$300
Escalation Rate =	2.30%	26) Distribution Delivery Charge	\$1.368
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 =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2012		
15) Project Analysis Year 1 =	2013		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$13,626	3.88
Utility Cost Test	\$16,001	7.82
Societal Test	\$26,305	6.73
Participant Test	\$21,423	5.94
Total Resource Cost Test	\$15,033	4.28

**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	2013	214	\$6,121	\$1,310	\$0.000	\$0	\$1,310	2.1	\$119	\$250	\$1,560	\$1,416	\$197	\$247	\$2,100	\$2,544	(\$984)
2	2014	214	6,335	1,356	0.000	0	1,356	2.1	120	252	1,608	1,465	204	0	0	204	1,404
3	2015	214	6,557	1,403	0.000	0	1,403	2.1	121	254	1,657	1,517	211	0	0	211	1,446
4	2016	214	6,786	1,452	0.000	0	1,452	2.1	123	258	1,710	1,570	218	0	0	218	1,492
5	2017	214	7,024	1,503	0.000	0	1,503	2.1	124	260	1,763	1,625	226	0	0	226	1,537
6	2018	214	7,270	1,556	0.000	0	1,556	2.1	125	263	1,819	1,682	234	0	0	234	1,585
7	2019	214	7,524	1,610	0.000	0	1,610	2.1	126	265	1,875	1,740	242	0	0	242	1,633
8	2020	214	7,788	1,667	0.000	0	1,667	2.1	127	267	1,934	1,801	251	0	0	251	1,683
9	2021	214	8,060	1,725	0.000	0	1,725	2.1	129	271	1,996	1,864	259	0	0	259	1,737
10	2022	214	8,342	1,785	0.000	0	1,785	2.1	130	273	2,058	1,930	268	0	0	268	1,790
11	2023	214	8,634	1,848	0.000	0	1,848	2.1	131	275	2,123	1,997	278	0	0	278	1,845
12	2024	214	8,936	1,912	0.000	0	1,912	2.1	133	279	2,191	2,067	288	0	0	288	1,903
13	2025	214	9,249	1,979	0.000	0	1,979	2.1	134	281	2,260	2,139	298	0	0	298	1,962
14	2026	214	9,573	2,049	0.000	0	2,049	2.1	135	284	2,333	2,214	308	0	0	308	2,025
15	2027	214	9,908	2,120	0.000	0	2,120	2.1	137	288	2,408	2,292	319	0	0	319	2,089
16	2028	214	10,255	2,195	0.000	0	2,195	2.1	138	290	2,485	2,372	330	0	0	330	2,155
17	2029	214	10,614	2,271	0.000	0	2,271	2.1	139	292	2,563	2,455	341	0	0	341	2,222
18	2030	214	10,985	2,351	0.000	0	2,351	2.1	141	296	2,647	2,541	353	0	0	353	2,294
19	2031	0	11,370	0	0.000	0	0	0.0	142	0	0	2,630	0	0	0	0	0
20	2032	0	11,768	0	0.000	0	0	0.0	144	0	0	2,722	0	0	0	0	0
21	2033	0	12,179	0	0.000	0	0	0.0	145	0	0	2,817	0	0	0	0	0
Total =		3,852									\$36,990					\$7,172	\$29,818
																\$4,723	\$13,626
Total NPV =			\$13,626														
Benefit/Cost Ratio =			3.88														

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)	
2013	\$1,310	\$250	\$1,560	\$247	\$2,100	\$2,347	(\$787)
2014	1,356	252	1,608	0	0	0	1,608
2015	1,403	254	1,657	0	0	0	1,657
2016	1,452	258	1,710	0	0	0	1,710
2017	1,503	260	1,763	0	0	0	1,763
2018	1,556	263	1,819	0	0	0	1,819
2019	1,610	265	1,875	0	0	0	1,875
2020	1,667	267	1,934	0	0	0	1,934
2021	1,725	271	1,996	0	0	0	1,996
2022	1,785	273	2,058	0	0	0	2,058
2023	1,848	275	2,123	0	0	0	2,123
2024	1,912	279	2,191	0	0	0	2,191
2025	1,979	281	2,260	0	0	0	2,260
2026	2,049	284	2,333	0	0	0	2,333
2027	2,120	288	2,408	0	0	0	2,408
2028	2,195	290	2,485	0	0	0	2,485
2029	2,271	292	2,563	0	0	0	2,563
2030	2,351	296	2,647	0	0	0	2,647
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
Total =			\$36,990			\$2,347	\$34,643
NPV =			\$18,348			\$2,347	\$16,001
Total NPV =			\$16,001				
Benefit/Cost Ratio =			<u>7.82</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)	
2013	\$1,310	\$250	\$0.022	\$103	\$1.041	\$223	\$1,886	\$2,347	\$2,240	\$4,587	(\$2,701)
2014	1,356	252	0.023	108	1.065	228	1,944	0	0	0	1,944
2015	1,403	254	0.024	112	1.090	233	2,002	0	0	0	2,002
2016	1,452	258	0.025	117	1.115	239	2,066	0	0	0	2,066
2017	1,503	260	0.026	122	1.141	244	2,129	0	0	0	2,129
2018	1,556	263	0.027	126	1.167	250	2,195	0	0	0	2,195
2019	1,610	265	0.028	131	1.194	256	2,262	0	0	0	2,262
2020	1,667	267	0.029	136	1.221	261	2,331	0	0	0	2,331
2021	1,725	271	0.030	140	1.249	267	2,403	0	0	0	2,403
2022	1,785	273	0.031	145	1.278	273	2,476	0	0	0	2,476
2023	1,848	275	0.032	150	1.307	280	2,553	0	0	0	2,553
2024	1,912	279	0.033	155	1.337	286	2,632	0	0	0	2,632
2025	1,979	281	0.034	159	1.368	293	2,712	0	0	0	2,712
2026	2,049	284	0.035	164	1.400	300	2,797	0	0	0	2,797
2027	2,120	288	0.036	169	1.432	306	2,883	0	0	0	2,883
2028	2,195	290	0.038	178	1.465	314	2,977	0	0	0	2,977
2029	2,271	292	0.039	183	1.498	321	3,067	0	0	0	3,067
2030	2,351	296	0.040	187	1.533	328	3,162	0	0	0	3,162
2031	0	0	0.042	0	1.568	0	0	0	0	0	0
2032	0	0	0.043	0	1.604	0	0	0	0	0	0
2033	0	0	0.045	0	1.641	0	0	0	0	0	0

Total = \$44,477 NPV = \$30,892 \$4,587 \$39,890
\$4,587 \$26,305

Total NPV = \$26,305
Benefit/Cost Ratio = 6.73

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						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)			
2013	\$2,100	214	\$7.469	\$1,598	\$0.107	\$501	\$4,199	\$4,340	(\$141)
2014	0	214	7.730	1,654	0.111	520	2,174	0	2,174
2015	0	214	8.001	1,712	0.115	539	2,251	0	2,251
2016	0	214	8.281	1,772	0.119	557	2,329	0	2,329
2017	0	214	8.570	1,834	0.123	576	2,410	0	2,410
2018	0	214	8.870	1,898	0.127	595	2,493	0	2,493
2019	0	214	9.181	1,965	0.132	618	2,583	0	2,583
2020	0	214	9.502	2,033	0.136	637	2,670	0	2,670
2021	0	214	9.835	2,105	0.141	660	2,765	0	2,765
2022	0	214	10.179	2,178	0.146	684	2,862	0	2,862
2023	0	214	10.535	2,254	0.151	707	2,961	0	2,961
2024	0	214	10.904	2,333	0.156	731	3,064	0	3,064
2025	0	214	11.286	2,415	0.162	759	3,174	0	3,174
2026	0	214	11.680	2,500	0.167	782	3,282	0	3,282
2027	0	214	12.089	2,587	0.173	810	3,397	0	3,397
2028	0	214	12.512	2,678	0.179	838	3,516	0	3,516
2029	0	214	12.950	2,771	0.186	871	3,642	0	3,642
2030	0	214	13.404	2,868	0.192	899	3,767	0	3,767
2031	0	0	13.873	0	0.199	0	0	0	0
2032	0	0	14.358	0	0.206	0	0	0	0
2033	0	0	14.861	0	0.213	0	0	0	0

Total = 3,852 NPV = \$53,539 \$4,340 \$49,199

NPV = \$25,763 \$4,340 21,423

Total NPV = \$21,423
Benefit/Cost Ratio = 5.94

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)	
2013	\$1,310	\$250	\$103	\$1,663	\$2,347	\$2,240	\$4,587	(\$2,924)
2014	1,356	252	108	1,716	0	0	0	1,716
2015	1,403	254	112	1,769	0	0	0	1,769
2016	1,452	258	117	1,827	0	0	0	1,827
2017	1,503	260	122	1,885	0	0	0	1,885
2018	1,556	263	126	1,945	0	0	0	1,945
2019	1,610	265	131	2,006	0	0	0	2,006
2020	1,667	267	136	2,070	0	0	0	2,070
2021	1,725	271	140	2,136	0	0	0	2,136
2022	1,785	273	145	2,203	0	0	0	2,203
2023	1,848	275	150	2,273	0	0	0	2,273
2024	1,912	279	155	2,346	0	0	0	2,346
2025	1,979	281	159	2,419	0	0	0	2,419
2026	2,049	284	164	2,497	0	0	0	2,497
2027	2,120	288	169	2,577	0	0	0	2,577
2028	2,195	290	178	2,663	0	0	0	2,663
2029	2,271	292	183	2,746	0	0	0	2,746
2030	2,351	296	187	2,834	0	0	0	2,834
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
			Total =	\$39,575			\$4,587	\$34,988
			NPV =	\$19,620			\$4,587	15,033

Total NPV = \$15,033
Benefit/Cost Ratio = 4.28

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)