

**Montana-Dakota Utilities Co.
Gas Utility - South Dakota
Conservation Portfolio Summary
2015 - 2017 Program Years**

<u>Programs</u>	<u>Total Participants</u>	<u>Total Energy Reduction</u>	<u>Total Cost</u>	<u>Lifetime Cost/Dk</u>
Conservation Programs				
Residential Program				
Furnaces - 95+% AFUE - New	510	47,940	176,858	3.69
Furnaces - 95+% AFUE - Replacement	750	213,000	260,071	1.22
Programmable Thermostats	600	12,600	13,870	1.10
	<u>1,860</u>	<u>273,540</u>	<u>\$450,799</u>	1.65
Commercial Program				
Furnaces - 95+% AFUE - New	5	479	1,734	3.62
Furnaces - 95+% AFUE - Replacement	36	10,220	12,486	1.22
Custom Efficiency	3	4,500	2,081	0.46
	<u>44</u>	<u>15,199</u>	<u>\$16,301</u>	1.07
Energy Audit Program Costs			\$75,000	
Total Programs	<u><u>1,904</u></u>	<u><u>288,739</u></u>	<u><u>\$542,100</u></u>	\$1.88

**Montana-Dakota Utilities Co.
Gas Utility - South Dakota
Conservation Portfolio Summary
2015 - 2017 Program Years**

Programs	2015			2016			2017			Lifetime
	Participants	Cost	Dk Savings	Participants	Cost	Dk Savings	Participants	Cost	Dk Savings	Dk Savings
Residential Program										
Furnaces - 95+% AFUE - New	150	51,750	705	170	58,945	799	190	66,163	893	47,940
Furnaces - 95+% AFUE - Repl.	225	77,625	3,195	250	86,684	3,550	275	95,762	3,905	213,000
Programmable Thermostats	180	4,140	378	200	4,623	420	220	5,107	462	12,600
Total Residential	555	133,515	4,278	620	150,252	4,769	685	167,032	5,260	273,540
Commercial Program										
Furnaces - 95+% AFUE - New	1	345	5	2	693	9	2	696	9	479
Furnaces - 95+% AFUE - Repl.	10	3,450	142	12	4,161	170	14	4,875	199	10,220
Custom Efficiency	1	690	100	1	694	100	1	697	100	4,500
Total Commercial	12	\$4,485	247	15	\$5,548	279	17	\$6,268	308	15,199
Energy Audit Program Costs		\$25,000			\$25,000			\$25,000		
Total Programs	567	\$163,000	4,525	635	\$180,800	5,048	702	\$198,300	5,568	288,739

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

Benefit/Cost Ratios

Program	Customer Class	RIM	Utility	Societal	Participant	Total Resource Cost
Total Portfolio		1.66	2.54	2.79	4.75	1.92
Furnace (95+%) - New	Residential	0.89	1.10	2.56	6.44	1.77
Furnace (95+%) - Replacement	Residential	1.95	3.32	2.91	4.43	1.99
Programmable Thermostats	Residential	2.32	4.48	2.05	2.56	1.64
Furnace (95+%) - New	Commercial	0.93	1.09	2.55	6.49	1.76
Furnace (95+%) - Replacement	Commercial	2.18	3.32	2.91	4.35	1.99
Custom Efficiency	Commercial	3.83	9.64	2.94	2.82	2.16

**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: **2015 - 2017**

Input Data		First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =				
Escalation Rate =				
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =				
Escalation Rate =				
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =				
3) Commodity Cost (\$/Dk) =				
Escalation Rate =				
4) Demand Cost (\$/Unit/Yr) =				
Escalation Rate =				
5) Peak Reduction Factor =				
6) Variable O&M (\$/Dk) =				
Escalation Rate =				
7) Non-Gas Fuel Cost (\$/Fuel Unit) =				
Escalation Rate =				
8) Non-Gas Fuel Loss Factor				
9) Gas Environmental Damage Factor =				
Escalation Rate =				
10) Non Gas Fuel Environmental Damage Factor =				
Escalation Rate =				
11) Participant Discount Rate =	10.00%			
12) Utility Discount Rate =	7.60%			
13) Societal Discount Rate =	3.56%			
14) General Input Data Year =	2014			
15) Project Analysis Year 1 =	2015			
Project Analysis Year 2 =	2016			
Project Analysis Year 3 =	2017			
16) Utility Project Costs				
16a) Administrative & Operating Costs = 1/		\$43,000	\$46,000	\$49,000
16b) Incentive Costs =		120,000	134,800	149,300
16c) Total Utility Project Costs =		\$163,000	\$180,800	\$198,300
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 =		567	635	702
24) Total Annual Dk Saved =		4,525	5,048	5,568
25) Incentive/Participant =				
26) Distribution Delivery Charge				
27) Effective Income Tax Rate =				
(Federal & State Taxes)				
Test Results		NPV	B/C	
Ratepayer Impact Measure Test		\$434,819	1.66	
Utility Cost Test		\$664,402	2.54	
Societal Test		\$1,334,197	2.79	
Participant Test		\$2,414,685	4.75	
Total Resource Cost Test		\$661,860	1.92	

1/ Energy Audit program costs of \$25,000 per year included with Total Program tests only.

Table 1
Ratepayer Impact Measure Test

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

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)
1	2015	4,525		\$19,610		\$0	\$19,610	45.0	\$6,719	\$26,329		\$5,235	\$18,000	\$120,000	\$143,235	(\$116,906)
2	2016	9,573		42,934	0	42,934	96.0	14,260	57,194		11,462	21,000	134,800	167,262	(110,068)	
3	2017	15,142		70,289	0	70,289	151.0	22,862	93,151		18,770	24,000	149,300	192,070	(98,919)	
4	2018	15,142		72,757	0	72,757	151.0	23,012	95,769		19,419	0	0	19,419	76,350	
5	2019	15,142		75,300	0	75,300	151.0	23,315	98,615		20,098	0	0	20,098	78,517	
6	2020	15,142		77,936	0	77,936	151.0	23,468	101,404		20,806	0	0	20,806	80,598	
7	2021	15,142		80,662	0	80,662	151.0	23,770	104,432		21,534	0	0	21,534	82,898	
8	2022	15,142		83,477	0	83,477	151.0	23,922	107,399		22,291	0	0	22,291	85,108	
9	2023	15,142		86,401	0	86,401	151.0	24,224	110,625		23,068	0	0	23,068	87,557	
10	2024	15,142		89,430	0	89,430	151.0	24,526	113,956		23,874	0	0	23,874	90,082	
11	2025	14,764		90,253	0	90,253	148.0	24,059	114,312		24,084	0	0	24,084	90,228	
12	2026	14,344		90,755	0	90,755	143.0	23,662	114,417		24,205	0	0	24,205	90,212	
13	2027	13,882		90,899	0	90,899	139.0	23,041	113,940		24,240	0	0	24,240	89,700	
14	2028	13,882		94,078	0	94,078	139.0	23,319	117,397		25,084	0	0	25,084	92,313	
15	2029	13,882		97,383	0	97,383	139.0	23,596	120,979		25,964	0	0	25,964	95,015	
16	2030	13,782		100,057	0	100,057	138.0	23,701	123,758		26,725	0	0	26,725	97,033	
17	2031	13,682		102,806	0	102,806	137.0	23,667	126,473		27,508	0	0	27,508	98,965	
18	2032	13,582		105,627	0	105,627	136.0	23,766	129,393		28,310	0	0	28,310	101,083	
19	2033	13,582		109,336	0	109,336	136.0	24,037	133,373		29,305	0	0	29,305	104,068	
20	2034	13,582		113,151	0	113,151	136.0	24,173	137,324		30,328	0	0	30,328	106,996	
21	2035	9,535		82,220	0	82,220	95.0	17,172	99,392		22,032	0	0	22,032	77,360	
22	2036	5,006		44,678	0	44,678	50.0	9,118	53,796		11,968	0	0	11,968	41,828	
23	2037	0		0	0	0	0.0	0	0		0	0	0	0	0	
Total =		288,739								\$2,293,428				\$953,410	\$1,340,018	
NPV =										\$1,096,881				\$662,061	\$434,819	
Total NPV =															\$434,819	
Benefit/Cost Ratio =															1.66	

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)	
2015	\$19,610	\$6,719	\$26,329	\$18,000	\$120,000	\$138,000	(\$111,671)
2016	42,934	14,260	57,194	21,000	134,800	155,800	(98,606)
2017	70,289	22,862	93,151	24,000	149,300	173,300	(80,149)
2018	72,757	23,012	95,769	0	0	0	95,769
2019	75,300	23,315	98,615	0	0	0	98,615
2020	77,936	23,468	101,404	0	0	0	101,404
2021	80,662	23,770	104,432	0	0	0	104,432
2022	83,477	23,922	107,399	0	0	0	107,399
2023	86,401	24,224	110,625	0	0	0	110,625
2024	89,430	24,526	113,956	0	0	0	113,956
2025	90,253	24,059	114,312	0	0	0	114,312
2026	90,755	23,662	114,417	0	0	0	114,417
2027	90,899	23,041	113,940	0	0	0	113,940
2028	94,078	23,319	117,397	0	0	0	117,397
2029	97,383	23,596	120,979	0	0	0	120,979
2030	100,057	23,701	123,758	0	0	0	123,758
2031	102,806	23,667	126,473	0	0	0	126,473
2032	105,627	23,766	129,393	0	0	0	129,393
2033	109,336	24,037	133,373	0	0	0	133,373
2034	113,151	24,173	137,324	0	0	0	137,324
2035	82,220	17,172	99,392	0	0	0	99,392
2036	44,678	9,118	53,796	0	0	0	53,796
2037	0	0	0	0	0	0	0

Total = \$2,293,428 \$467,100 \$1,826,328
 NPV = \$1,096,881 \$432,479 \$664,402

Total NPV = \$664,402
 Benefit/Cost Ratio = 2.54

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)
2015	\$19,610	\$6,719		\$6,216		\$1,620	\$34,165	\$138,000	\$92,152	\$230,152	(\$195,987)
2016	42,934	14,260		13,204		3,503	73,901	155,800	102,444	258,244	(184,343)
2017	70,289	22,862		21,903		5,680	120,734	173,300	112,734	286,034	(165,300)
2018	72,757	23,012		22,856		5,800	124,425	0	0	0	124,425
2019	75,300	23,315		23,809		5,936	128,360	0	0	0	128,360
2020	77,936	23,468		24,760		6,072	132,236	0	0	0	132,236
2021	80,662	23,770		25,714		6,210	136,356	0	0	0	136,356
2022	83,477	23,922		26,665		6,360	140,424	0	0	0	140,424
2023	86,401	24,224		27,617		6,496	144,738	0	0	0	144,738
2024	89,430	24,526		28,571		6,647	149,174	0	0	0	149,174
2025	90,253	24,059		29,522		6,629	150,463	0	0	0	150,463
2026	90,755	23,662		30,474		6,599	151,490	0	0	0	151,490
2027	90,899	23,041		31,428		6,525	151,893	0	0	0	151,893
2028	94,078	23,319		32,379		6,678	156,454	0	0	0	156,454
2029	97,383	23,596		33,331		6,830	161,140	0	0	0	161,140
2030	100,057	23,701		34,285		6,947	164,990	0	0	0	164,990
2031	102,806	23,667		36,188		7,046	169,707	0	0	0	169,707
2032	105,627	23,766		37,141		7,158	173,692	0	0	0	173,692
2033	109,336	24,037		38,093		7,320	178,786	0	0	0	178,786
2034	113,151	24,173		39,998		7,497	184,819	0	0	0	184,819
2035	82,220	17,172		28,800		5,378	133,570	0	0	0	133,570
2036	44,678	9,118		15,845		2,888	72,529	0	0	0	72,529
2037	0	0		0		0	0	0	0	0	0

Total = \$3,034,046 \$774,430 \$2,259,616
 NPV = \$2,080,422 \$746,225 \$1,334,197

Total NPV = \$1,334,197
 Benefit/Cost Ratio = 2.79

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)
2015	\$120,000	4,525		\$35,906		\$37,039	\$192,945	\$212,152	(\$19,207)
2016	134,800	9,573		78,623		81,105	294,528	237,244	57,284
2017	149,300	15,142		128,707		133,416	411,423	262,034	149,389
2018	0	15,142		133,219		138,178	271,397	0	271,397
2019	0	15,142		137,870		142,970	280,840	0	280,840
2020	0	15,142		142,699		147,732	290,431	0	290,431
2021	0	15,142		147,695		153,446	301,141	0	301,141
2022	0	15,142		152,872		158,207	311,079	0	311,079
2023	0	15,142		158,215		163,921	322,136	0	322,136
2024	0	15,142		163,755		169,635	333,390	0	333,390
2025	0	14,764		165,246		176,302	341,548	0	341,548
2026	0	14,344		166,147		182,016	348,163	0	348,163
2027	0	13,882		166,395		188,681	355,076	0	355,076
2028	0	13,882		172,220		195,349	367,569	0	367,569
2029	0	13,882		178,251		202,044	380,295	0	380,295
2030	0	13,782		183,233		208,711	391,944	0	391,944
2031	0	13,682		188,349		216,330	404,679	0	404,679
2032	0	13,582		193,594		223,947	417,541	0	417,541
2033	0	13,582		200,368		231,597	431,965	0	431,965
2034	0	13,582		207,375		240,138	447,513	0	447,513
2035	0	9,535		150,673		174,275	324,948	0	324,948
2036	0	5,006		81,868		94,795	176,663	0	176,663
2037	0	0		0		0	0	0	0

Total =	288,739				\$7,397,214	\$711,430	\$6,685,784
				NPV =	\$3,059,070	\$644,385	2,414,685
Total NPV =	\$2,414,685						
Benefit/Cost Ratio =	4.75						

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)	
2015	\$19,610	\$6,719	\$6,216	\$32,545	\$138,000	\$92,152	\$230,152	(\$197,607)
2016	42,934	14,260	13,204	70,398	155,800	102,444	258,244	(187,846)
2017	70,289	22,862	21,903	115,054	173,300	112,734	286,034	(170,980)
2018	72,757	23,012	22,856	118,625	0	0	0	118,625
2019	75,300	23,315	23,809	122,424	0	0	0	122,424
2020	77,936	23,468	24,760	126,164	0	0	0	126,164
2021	80,662	23,770	25,714	130,146	0	0	0	130,146
2022	83,477	23,922	26,665	134,064	0	0	0	134,064
2023	86,401	24,224	27,617	138,242	0	0	0	138,242
2024	89,430	24,526	28,571	142,527	0	0	0	142,527
2025	90,253	24,059	29,522	143,834	0	0	0	143,834
2026	90,755	23,662	30,474	144,891	0	0	0	144,891
2027	90,899	23,041	31,428	145,368	0	0	0	145,368
2028	94,078	23,319	32,379	149,776	0	0	0	149,776
2029	97,383	23,596	33,331	154,310	0	0	0	154,310
2030	100,057	23,701	34,285	158,043	0	0	0	158,043
2031	102,806	23,667	36,188	162,661	0	0	0	162,661
2032	105,627	23,766	37,141	166,534	0	0	0	166,534
2033	109,336	24,037	38,093	171,466	0	0	0	171,466
2034	113,151	24,173	39,998	177,322	0	0	0	177,322
2035	82,220	17,172	28,800	128,192	0	0	0	128,192
2036	44,678	9,118	15,845	69,641	0	0	0	69,641
2037	0	0	0	0	0	0	0	0
				Total =	\$2,902,227		\$774,430	\$2,127,797
				NPV =	\$1,379,070		\$717,210	661,860

Total NPV = \$661,860
Benefit/Cost Ratio = 1.92

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: **2015 - 2017**

Input Data			First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.691	16) Utility Project Costs			
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$6,750	\$7,945	\$9,163
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.12640	16b) Incentive Costs =	45,000	51,000	57,000
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$51,750	\$58,945	\$66,163
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$302	\$302	\$302
3) Commodity Cost (\$/Dk) =	\$4.187	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$146.26	19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	20	20	20
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	4.700	4.700	4.700
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	732	732	732
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01990	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
Escalation Rate =	3.50%	23) Number of Participants =	150	170	190
8) Non-Gas Fuel Loss Factor	5.10%	24) Total Annual Dk Saved =	705	799	893
9) Gas Environmental Damage Factor =	\$0.350	25) Incentive/Participant =	\$300	\$300	\$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 =	3.56%				
14) General Input Data Year =	2014				
15) Project Analysis Year 1 =	2015				
Project Analysis Year 2 =	2016				
Project Analysis Year 3 =	2017				

Test Results	NPV	B/C
Ratepayer Impact Measure Test	(\$21,827)	0.89
Utility Cost Test	\$16,427	1.10
Societal Test	\$266,862	2.56
Participant Test	\$757,806	6.44
Total Resource Cost Test	\$126,080	1.77

Table 1
Ratepayer Impact Measure Test

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

Year	Benefits										Costs					Annual Benefits Less Costs (P)	
	Total Energy Reduction (A)	Gas Commodity Cost/Dk (B)	Gas Commodity Savings (C)	Variable O & M Cost/Dk (D)	Variable O & M Savings (E)	Total Energy Savings (F)	Peak 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	2015	705	\$4,334	\$3,055	\$0.000	\$0	\$3,055	7.1	\$148	\$1,051	\$4,106	\$1,805	\$827	\$6,750	\$45,000	\$52,577	(\$48,471)
2	2016	1,504	4,485	6,745	0.000	0	6,745	15.0	149	2,235	8,980	1,868	1,826	7,945	51,000	60,771	(51,791)
3	2017	2,397	4,642	11,127	0.000	0	11,127	24.0	151	3,624	14,751	1,934	3,013	9,163	57,000	69,176	(54,425)
4	2018	2,397	4,805	11,518	0.000	0	11,518	24.0	152	3,648	15,166	2,001	3,118	0	0	3,118	12,048
5	2019	2,397	4,973	11,920	0.000	0	11,920	24.0	154	3,696	15,616	2,071	3,227	0	0	3,227	12,389
6	2020	2,397	5,147	12,337	0.000	0	12,337	24.0	155	3,720	16,057	2,144	3,340	0	0	3,340	12,717
7	2021	2,397	5,327	12,769	0.000	0	12,769	24.0	157	3,768	16,537	2,219	3,457	0	0	3,457	13,080
8	2022	2,397	5,513	13,215	0.000	0	13,215	24.0	158	3,792	17,007	2,297	3,579	0	0	3,579	13,428
9	2023	2,397	5,706	13,677	0.000	0	13,677	24.0	160	3,840	17,517	2,377	3,703	0	0	3,703	13,814
10	2024	2,397	5,906	14,157	0.000	0	14,157	24.0	162	3,888	18,045	2,460	3,833	0	0	3,833	14,212
11	2025	2,397	6,113	14,653	0.000	0	14,653	24.0	163	3,912	18,565	2,546	3,967	0	0	3,967	14,598
12	2026	2,397	6,327	15,166	0.000	0	15,166	24.0	165	3,960	19,126	2,635	4,105	0	0	4,105	15,021
13	2027	2,397	6,548	15,696	0.000	0	15,696	24.0	166	3,984	19,680	2,728	4,250	0	0	4,250	15,430
14	2028	2,397	6,777	16,244	0.000	0	16,244	24.0	168	4,032	20,276	2,823	4,398	0	0	4,398	15,878
15	2029	2,397	7,015	16,815	0.000	0	16,815	24.0	170	4,080	20,895	2,922	4,553	0	0	4,553	16,342
16	2030	2,397	7,260	17,402	0.000	0	17,402	24.0	172	4,128	21,530	3,024	4,712	0	0	4,712	16,818
17	2031	2,397	7,514	18,011	0.000	0	18,011	24.0	173	4,152	22,163	3,130	4,877	0	0	4,877	17,286
18	2032	2,397	7,777	18,641	0.000	0	18,641	24.0	175	4,200	22,841	3,239	5,047	0	0	5,047	17,794
19	2033	2,397	8,050	19,296	0.000	0	19,296	24.0	177	4,248	23,544	3,353	5,224	0	0	5,224	18,320
20	2034	2,397	8,331	19,969	0.000	0	19,969	24.0	178	4,272	24,241	3,470	5,406	0	0	5,406	18,835
21	2035	1,692	8,623	14,590	0.000	0	14,590	16.9	180	3,042	17,632	3,592	3,950	0	0	3,950	13,682
22	2036	893	8,925	7,970	0.000	0	7,970	8.9	182	1,620	9,590	3,717	2,158	0	0	2,158	7,432
23	2037	0	9,237	0	0.000	0	0	0.0	184	0	0	3,847	0	0	0	0	0
Total =		47,940								\$383,865						\$259,428	\$124,437
										NPV =						\$201,932	(\$21,827)
Total NPV =																	(\$21,827)
Benefit/Cost Ratio =																	0.89

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)	
2015	\$3,055	\$1,051	\$4,106	\$6,750	\$45,000	\$51,750	(\$47,644)
2016	6,745	2,235	8,980	7,945	51,000	58,945	(49,965)
2017	11,127	3,624	14,751	9,163	57,000	66,163	(51,412)
2018	11,518	3,648	15,166	0	0	0	15,166
2019	11,920	3,696	15,616	0	0	0	15,616
2020	12,337	3,720	16,057	0	0	0	16,057
2021	12,769	3,768	16,537	0	0	0	16,537
2022	13,215	3,792	17,007	0	0	0	17,007
2023	13,677	3,840	17,517	0	0	0	17,517
2024	14,157	3,888	18,045	0	0	0	18,045
2025	14,653	3,912	18,565	0	0	0	18,565
2026	15,166	3,960	19,126	0	0	0	19,126
2027	15,696	3,984	19,680	0	0	0	19,680
2028	16,244	4,032	20,276	0	0	0	20,276
2029	16,815	4,080	20,895	0	0	0	20,895
2030	17,402	4,128	21,530	0	0	0	21,530
2031	18,011	4,152	22,163	0	0	0	22,163
2032	18,641	4,200	22,841	0	0	0	22,841
2033	19,296	4,248	23,544	0	0	0	23,544
2034	19,969	4,272	24,241	0	0	0	24,241
2035	14,590	3,042	17,632	0	0	0	17,632
2036	7,970	1,620	9,590	0	0	0	9,590
2037	0	0	0	0	0	0	0
Total =			\$383,865			\$176,858	\$207,007
NPV =			\$180,105			\$163,678	\$16,427
Total NPV =			\$16,427				
Benefit/Cost Ratio =			<u>1.10</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)
2015	\$3,055	\$1,051	\$0.022	\$2,416	\$0.358	\$252	\$6,774	\$51,750	\$300	\$52,050	(\$45,276)
2016	6,745	2,235	0.022	5,153	0.366	550	14,683	58,945	340	59,285	(44,602)
2017	11,127	3,624	0.023	8,586	0.375	899	24,236	66,163	380	66,543	(42,307)
2018	11,518	3,648	0.024	8,960	0.383	918	25,044	0	0	0	25,044
2019	11,920	3,696	0.025	9,333	0.392	940	25,889	0	0	0	25,889
2020	12,337	3,720	0.026	9,706	0.401	961	26,724	0	0	0	26,724
2021	12,769	3,768	0.027	10,080	0.410	983	27,600	0	0	0	27,600
2022	13,215	3,792	0.028	10,453	0.420	1,007	28,467	0	0	0	28,467
2023	13,677	3,840	0.029	10,826	0.429	1,028	29,371	0	0	0	29,371
2024	14,157	3,888	0.030	11,200	0.439	1,052	30,297	0	0	0	30,297
2025	14,653	3,912	0.031	11,573	0.449	1,076	31,214	0	0	0	31,214
2026	15,166	3,960	0.032	11,946	0.460	1,103	32,175	0	0	0	32,175
2027	15,696	3,984	0.033	12,320	0.470	1,127	33,127	0	0	0	33,127
2028	16,244	4,032	0.034	12,693	0.481	1,153	34,122	0	0	0	34,122
2029	16,815	4,080	0.035	13,066	0.492	1,179	35,140	0	0	0	35,140
2030	17,402	4,128	0.036	13,440	0.504	1,208	36,178	0	0	0	36,178
2031	18,011	4,152	0.038	14,186	0.515	1,234	37,583	0	0	0	37,583
2032	18,641	4,200	0.039	14,559	0.527	1,263	38,663	0	0	0	38,663
2033	19,296	4,248	0.040	14,933	0.539	1,292	39,769	0	0	0	39,769
2034	19,969	4,272	0.042	15,679	0.552	1,323	41,243	0	0	0	41,243
2035	14,590	3,042	0.043	11,331	0.564	954	29,917	0	0	0	29,917
2036	7,970	1,620	0.045	6,259	0.577	515	16,364	0	0	0	16,364
2037	0	0	0.046	0	0.590	0	0	0	0	0	0
Total =							\$644,580			\$177,878	\$466,702
NPV =							\$438,206			\$171,344	\$266,862

Total NPV = \$266,862
Benefit/Cost Ratio = 2.56

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)	
2015	\$45,000	705	\$7.960	\$5,612	\$0.131	\$14,384	\$64,996	\$45,300	\$19,696
2016	51,000	1,504	8.239	12,391	0.135	31,622	95,013	51,340	43,673
2017	57,000	2,397	8.527	20,439	0.140	52,265	129,704	57,380	72,324
2018	0	2,397	8.826	21,156	0.145	54,131	75,287	0	75,287
2019	0	2,397	9.134	21,894	0.150	55,998	77,892	0	77,892
2020	0	2,397	9.454	22,661	0.155	57,865	80,526	0	80,526
2021	0	2,397	9.785	23,455	0.161	60,105	83,560	0	83,560
2022	0	2,397	10.128	24,277	0.166	61,971	86,248	0	86,248
2023	0	2,397	10.482	25,125	0.172	64,211	89,336	0	89,336
2024	0	2,397	10.849	26,005	0.178	66,451	92,456	0	92,456
2025	0	2,397	11.229	26,916	0.185	69,064	95,980	0	95,980
2026	0	2,397	11.622	27,858	0.191	71,304	99,162	0	99,162
2027	0	2,397	12.028	28,831	0.198	73,917	102,748	0	102,748
2028	0	2,397	12.449	29,840	0.205	76,531	106,371	0	106,371
2029	0	2,397	12.885	30,885	0.212	79,144	110,029	0	110,029
2030	0	2,397	13.336	31,966	0.219	81,757	113,723	0	113,723
2031	0	2,397	13.803	33,086	0.227	84,744	117,830	0	117,830
2032	0	2,397	14.286	34,244	0.235	87,730	121,974	0	121,974
2033	0	2,397	14.786	35,442	0.243	90,717	126,159	0	126,159
2034	0	2,397	15.303	36,681	0.252	94,077	130,758	0	130,758
2035	0	1,692	15.839	26,800	0.260	68,515	95,315	0	95,315
2036	0	893	16.393	14,639	0.269	37,413	52,052	0	52,052
2037	0	0	16.967	0	0.279	0	0	0	0
Total =		47,940					\$2,147,119	\$154,020	\$1,993,099
							NPV = \$897,200	\$139,394	757,806
Total NPV =		\$757,806							
Benefit/Cost Ratio =		6.44							

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)	
2015	\$3,055	\$1,051	\$2,416	\$6,522	\$51,750	\$300	\$52,050	(\$45,528)
2016	6,745	2,235	5,153	14,133	58,945	340	59,285	(45,152)
2017	11,127	3,624	8,586	23,337	66,163	380	66,543	(43,206)
2018	11,518	3,648	8,960	24,126	0	0	0	24,126
2019	11,920	3,696	9,333	24,949	0	0	0	24,949
2020	12,337	3,720	9,706	25,763	0	0	0	25,763
2021	12,769	3,768	10,080	26,617	0	0	0	26,617
2022	13,215	3,792	10,453	27,460	0	0	0	27,460
2023	13,677	3,840	10,826	28,343	0	0	0	28,343
2024	14,157	3,888	11,200	29,245	0	0	0	29,245
2025	14,653	3,912	11,573	30,138	0	0	0	30,138
2026	15,166	3,960	11,946	31,072	0	0	0	31,072
2027	15,696	3,984	12,320	32,000	0	0	0	32,000
2028	16,244	4,032	12,693	32,969	0	0	0	32,969
2029	16,815	4,080	13,066	33,961	0	0	0	33,961
2030	17,402	4,128	13,440	34,970	0	0	0	34,970
2031	18,011	4,152	14,186	36,349	0	0	0	36,349
2032	18,641	4,200	14,559	37,400	0	0	0	37,400
2033	19,296	4,248	14,933	38,477	0	0	0	38,477
2034	19,969	4,272	15,679	39,920	0	0	0	39,920
2035	14,590	3,042	11,331	28,963	0	0	0	28,963
2036	7,970	1,620	6,259	15,849	0	0	0	15,849
2037	0	0	0	0	0	0	0	0
Total =				\$622,563			\$177,878	\$444,685
NPV =				\$290,702			\$164,622	126,080

Total NPV = \$126,080
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: **2015 - 2017**

Input Data			First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.691	16) Utility Project Costs			
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$540	\$623	\$707
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.12640	16b) Incentive Costs =	3,600	4,000	4,400
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	<u>\$4,140</u>	<u>\$4,623</u>	<u>\$5,107</u>
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$60	\$60	\$60
3) Commodity Cost (\$/Dk) =	\$4.187	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$146.26	19) Participant Non-Energy Savings (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	10	10	10
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	2.100	2.100	2.100
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	0	0	0
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01990	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
Escalation Rate =	3.50%	23) Number of Participants =	180	200	220
8) Non-Gas Fuel Loss Factor	5.10%	24) Total Annual Dk Saved =	378	420	462
9) Gas Environmental Damage Factor =	\$0.350	25) Incentive/Participant =	\$20	\$20	\$20
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 =	3.56%				
14) General Input Data Year =	2014				
15) Project Analysis Year 1 =	2015				
Project Analysis Year 2 =	2016				
Project Analysis Year 3 =	2017				

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$32,769	2.32
Utility Cost Test	\$44,757	4.48
Societal Test	\$38,387	2.05
Participant Test	\$50,899	2.56
Total Resource Cost Test	\$22,521	1.64

**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)	
2015	\$1,638	\$562	\$2,200	\$540	\$3,600	\$4,140	(\$1,940)
2016	3,579	1,192	4,771	623	4,000	4,623	148
2017	5,849	1,903	7,752	707	4,400	5,107	2,645
2018	6,054	1,915	7,969	0	0	0	7,969
2019	6,266	1,940	8,206	0	0	0	8,206
2020	6,485	1,953	8,438	0	0	0	8,438
2021	6,712	1,978	8,690	0	0	0	8,690
2022	6,946	1,991	8,937	0	0	0	8,937
2023	7,190	2,016	9,206	0	0	0	9,206
2024	7,442	2,041	9,483	0	0	0	9,483
2025	5,392	1,434	6,826	0	0	0	6,826
2026	2,923	759	3,682	0	0	0	3,682
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
2035	0	0	0	0	0	0	0
Total =			\$86,160			\$13,870	\$72,290
		NPV =	\$57,605			\$12,848	\$44,757
Total NPV =			\$44,757				
Benefit/Cost Ratio =			<u>4.48</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)
2015	\$1,638	\$562	\$0.022	\$0	\$0.358	\$135	\$2,335	\$4,140	\$7,200	\$11,340	(\$9,005)
2016	3,579	1,192	0.022	0	0.366	292	5,063	4,623	8,000	12,623	(7,560)
2017	5,849	1,903	0.023	0	0.375	473	8,225	5,107	8,800	13,907	(5,682)
2018	6,054	1,915	0.024	0	0.383	483	8,452	0	0	0	8,452
2019	6,266	1,940	0.025	0	0.392	494	8,700	0	0	0	8,700
2020	6,485	1,953	0.026	0	0.401	505	8,943	0	0	0	8,943
2021	6,712	1,978	0.027	0	0.410	517	9,207	0	0	0	9,207
2022	6,946	1,991	0.028	0	0.420	529	9,466	0	0	0	9,466
2023	7,190	2,016	0.029	0	0.429	541	9,747	0	0	0	9,747
2024	7,442	2,041	0.030	0	0.439	553	10,036	0	0	0	10,036
2025	5,392	1,434	0.031	0	0.449	396	7,222	0	0	0	7,222
2026	2,923	759	0.032	0	0.460	213	3,895	0	0	0	3,895
2027	0	0	0.033	0	0.470	0	0	0	0	0	0
2028	0	0	0.034	0	0.481	0	0	0	0	0	0
2029	0	0	0.035	0	0.492	0	0	0	0	0	0
2030	0	0	0.036	0	0.504	0	0	0	0	0	0
2031	0	0	0.038	0	0.515	0	0	0	0	0	0
2032	0	0	0.039	0	0.527	0	0	0	0	0	0
2033	0	0	0.040	0	0.539	0	0	0	0	0	0
2034	0	0	0.042	0	0.552	0	0	0	0	0	0
2035	0	0	0.043	0	0.564	0	0	0	0	0	0

Total = \$91,291
NPV = \$74,883
\$37,870 \$53,421
\$36,496 \$38,387

Total NPV = \$38,387
Benefit/Cost Ratio = 2.05

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)	
2015	\$3,600	378	\$7.960	\$3,009	\$0.131	\$0	\$6,609	\$10,800	(\$4,191)
2016	4,000	798	8.239	6,575	0.135	0	10,575	12,000	(1,425)
2017	4,400	1,260	8.527	10,744	0.140	0	15,144	13,200	1,944
2018	0	1,260	8.826	11,121	0.145	0	11,121	0	11,121
2019	0	1,260	9.134	11,509	0.150	0	11,509	0	11,509
2020	0	1,260	9.454	11,912	0.155	0	11,912	0	11,912
2021	0	1,260	9.785	12,329	0.161	0	12,329	0	12,329
2022	0	1,260	10.128	12,761	0.166	0	12,761	0	12,761
2023	0	1,260	10.482	13,207	0.172	0	13,207	0	13,207
2024	0	1,260	10.849	13,670	0.178	0	13,670	0	13,670
2025	0	882	11.229	9,904	0.185	0	9,904	0	9,904
2026	0	462	11.622	5,369	0.191	0	5,369	0	5,369
2027	0	0	12.028	0	0.198	0	0	0	0
2028	0	0	12.449	0	0.205	0	0	0	0
2029	0	0	12.885	0	0.212	0	0	0	0
2030	0	0	13.336	0	0.219	0	0	0	0
2031	0	0	13.803	0	0.227	0	0	0	0
2032	0	0	14.286	0	0.235	0	0	0	0
2033	0	0	14.786	0	0.243	0	0	0	0
2034	0	0	15.303	0	0.252	0	0	0	0
2035	0	0	15.839	0	0.260	0	0	0	0
Total =		12,600					\$134,110	\$36,000	\$98,110
							NPV = \$83,518	\$32,618	50,899
Total NPV =		\$50,899							
Benefit/Cost Ratio =		2.56							

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)	
2015	\$1,638	\$562	\$0	\$2,200	\$4,140	\$7,200	\$11,340	(\$9,140)
2016	3,579	1,192	0	4,771	4,623	8,000	12,623	(7,852)
2017	5,849	1,903	0	7,752	5,107	8,800	13,907	(6,155)
2018	6,054	1,915	0	7,969	0	0	0	7,969
2019	6,266	1,940	0	8,206	0	0	0	8,206
2020	6,485	1,953	0	8,438	0	0	0	8,438
2021	6,712	1,978	0	8,690	0	0	0	8,690
2022	6,946	1,991	0	8,937	0	0	0	8,937
2023	7,190	2,016	0	9,206	0	0	0	9,206
2024	7,442	2,041	0	9,483	0	0	0	9,483
2025	5,392	1,434	0	6,826	0	0	0	6,826
2026	2,923	759	0	3,682	0	0	0	3,682
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
2035	0	0	0	0	0	0	0	0
			Total =	\$86,160			\$37,870	\$48,290
			NPV =	\$57,605			\$35,083	22,521

Total NPV = \$22,521
Benefit/Cost Ratio = 1.64

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 - New**
 Program Years: **2015 - 2017**

Input Data			First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.249	16) Utility Project Costs			
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$45	\$93	\$96
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.12930	16b) Incentive Costs =	300	600	600
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$345	\$693	\$696
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$302	\$302	\$302
3) Commodity Cost (\$/Dk) =	\$4.187	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$146.26	19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	20	20	20
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	4.700	4.700	4.700
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	732	732	732
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01990	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
Escalation Rate =	3.50%	23) Number of Participants =	1	2	2
8) Non-Gas Fuel Loss Factor	5.10%	24) Total Annual Dk Saved =	5	9	9
9) Gas Environmental Damage Factor =	\$0.350	25) Incentive/Participant =	\$300	\$300	\$300
Escalation Rate =	2.30%	26) Distribution Delivery Charge			\$1.302
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 =	3.56%				
14) General Input Data Year =	2014				
15) Project Analysis Year 1 =	2015				
Project Analysis Year 2 =	2016				
Project Analysis Year 3 =	2017				

Test Results	NPV	B/C
Ratepayer Impact Measure Test	(\$140)	0.93
Utility Cost Test	\$145	1.09
Societal Test	\$2,593	2.55
Participant Test	\$7,416	6.49
Total Resource Cost Test	\$1,214	1.76

Table 1
Ratepayer Impact Measure Test

Company: **Montana-Dakota Utilities Co.**
Project: **Commercial 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	2015	5	\$4.334	\$22	\$0.000	\$0	\$22	0.1	\$148	\$15	\$37	\$1.348	\$4	\$45	\$300	\$349	(\$312)
2	2016	14	4.485	63	0.000	0	63	0.1	149	15	78	1.395	13	93	600	706	(628)
3	2017	24	4.642	111	0.000	0	111	0.2	151	30	141	1.444	23	96	600	719	(578)
4	2018	24	4.805	115	0.000	0	115	0.2	152	30	145	1.494	23	0	0	23	122
5	2019	24	4.973	119	0.000	0	119	0.2	154	31	150	1.546	24	0	0	24	126
6	2020	24	5.147	124	0.000	0	124	0.2	155	31	155	1.600	25	0	0	25	130
7	2021	24	5.327	128	0.000	0	128	0.2	157	31	159	1.657	26	0	0	26	133
8	2022	24	5.513	132	0.000	0	132	0.2	158	32	164	1.714	27	0	0	27	137
9	2023	24	5.706	137	0.000	0	137	0.2	160	32	169	1.774	28	0	0	28	141
10	2024	24	5.906	142	0.000	0	142	0.2	162	32	174	1.837	29	0	0	29	145
11	2025	24	6.113	147	0.000	0	147	0.2	163	33	180	1.901	30	0	0	30	150
12	2026	24	6.327	152	0.000	0	152	0.2	165	33	185	1.967	31	0	0	31	154
13	2027	24	6.548	157	0.000	0	157	0.2	166	33	190	2.036	32	0	0	32	158
14	2028	24	6.777	163	0.000	0	163	0.2	168	34	197	2.108	33	0	0	33	164
15	2029	24	7.015	168	0.000	0	168	0.2	170	34	202	2.181	34	0	0	34	168
16	2030	24	7.260	174	0.000	0	174	0.2	172	34	208	2.258	35	0	0	35	173
17	2031	24	7.514	180	0.000	0	180	0.2	173	35	215	2.337	36	0	0	36	179
18	2032	24	7.777	187	0.000	0	187	0.2	175	35	222	2.418	38	0	0	38	184
19	2033	24	8.050	193	0.000	0	193	0.2	177	35	228	2.503	39	0	0	39	189
20	2034	24	8.331	200	0.000	0	200	0.2	178	36	236	2.591	40	0	0	40	196
21	2035	19	8.623	164	0.000	0	164	0.2	180	36	200	2.681	33	0	0	33	167
22	2036	9	8.925	80	0.000	0	80	0.1	182	18	98	2.775	16	0	0	16	82
23	2037	0	9.237	0	0.000	0	0	0.0	184	0	0	2.872	0	0	0	0	0
Total =		479									\$3,733					\$2,353	\$1,380
											NPV =	\$1,735				\$1,875	(\$140)
Total NPV =																(\$140)	
Benefit/Cost Ratio =																0.93	

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 - 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)	
2015	\$22	\$15	\$37	\$45	\$300	\$345	(\$308)
2016	63	15	78	93	600	693	(615)
2017	111	30	141	96	600	696	(555)
2018	115	30	145	0	0	0	145
2019	119	31	150	0	0	0	150
2020	124	31	155	0	0	0	155
2021	128	31	159	0	0	0	159
2022	132	32	164	0	0	0	164
2023	137	32	169	0	0	0	169
2024	142	32	174	0	0	0	174
2025	147	33	180	0	0	0	180
2026	152	33	185	0	0	0	185
2027	157	33	190	0	0	0	190
2028	163	34	197	0	0	0	197
2029	168	34	202	0	0	0	202
2030	174	34	208	0	0	0	208
2031	180	35	215	0	0	0	215
2032	187	35	222	0	0	0	222
2033	193	35	228	0	0	0	228
2034	200	36	236	0	0	0	236
2035	164	36	200	0	0	0	200
2036	80	18	98	0	0	0	98
2037	0	0	0	0	0	0	0
Total =			\$3,733			\$1,734	\$1,999
NPV =			\$1,735			\$1,590	\$145
Total NPV =			\$145				
Benefit/Cost Ratio =			<u>1.09</u>				

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

Table 3
Societal Test

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

Year	Benefits							Costs			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)	
2015	\$22	\$15	\$0.022	\$16	\$0.358	\$2	\$55	\$345	\$2	\$347	(\$292)
2016	63	15	0.022	48	0.366	5	131	693	4	697	(566)
2017	111	30	0.023	84	0.375	9	234	696	4	700	(466)
2018	115	30	0.024	88	0.383	9	242	0	0	0	242
2019	119	31	0.025	92	0.392	9	251	0	0	0	251
2020	124	31	0.026	95	0.401	10	260	0	0	0	260
2021	128	31	0.027	99	0.410	10	268	0	0	0	268
2022	132	32	0.028	102	0.420	10	276	0	0	0	276
2023	137	32	0.029	106	0.429	10	285	0	0	0	285
2024	142	32	0.030	110	0.439	11	295	0	0	0	295
2025	147	33	0.031	113	0.449	11	304	0	0	0	304
2026	152	33	0.032	117	0.460	11	313	0	0	0	313
2027	157	33	0.033	121	0.470	11	322	0	0	0	322
2028	163	34	0.034	124	0.481	12	333	0	0	0	333
2029	168	34	0.035	128	0.492	12	342	0	0	0	342
2030	174	34	0.036	132	0.504	12	352	0	0	0	352
2031	180	35	0.038	139	0.515	12	366	0	0	0	366
2032	187	35	0.039	143	0.527	13	378	0	0	0	378
2033	193	35	0.040	146	0.539	13	387	0	0	0	387
2034	200	36	0.042	154	0.552	13	403	0	0	0	403
2035	164	36	0.043	126	0.564	11	337	0	0	0	337
2036	80	18	0.045	66	0.577	5	169	0	0	0	169
2037	0	0	0.046	0	0.590	0	0	0	0	0	0
Total =							\$6,303			\$1,744	\$4,559
							NPV = \$4,266			\$1,673	\$2,593
Total NPV =			\$2,593								
Benefit/Cost Ratio =			<u>2.55</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: **Commercial 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)
2015	\$300	5	\$7.503	\$38	\$0.134	\$98	\$436	\$302	\$134
2016	600	14	7.765	109	0.139	305	1,014	604	410
2017	600	24	8.037	193	0.143	523	1,316	604	712
2018	0	24	8.318	200	0.148	542	742	0	742
2019	0	24	8.610	207	0.154	564	771	0	771
2020	0	24	8.911	214	0.159	582	796	0	796
2021	0	24	9.223	221	0.165	604	825	0	825
2022	0	24	9.546	229	0.170	622	851	0	851
2023	0	24	9.880	237	0.176	644	881	0	881
2024	0	24	10.225	245	0.182	666	911	0	911
2025	0	24	10.583	254	0.189	692	946	0	946
2026	0	24	10.954	263	0.195	714	977	0	977
2027	0	24	11.337	272	0.202	739	1,011	0	1,011
2028	0	24	11.734	282	0.209	765	1,047	0	1,047
2029	0	24	12.145	291	0.217	794	1,085	0	1,085
2030	0	24	12.570	302	0.224	820	1,122	0	1,122
2031	0	24	13.010	312	0.232	849	1,161	0	1,161
2032	0	24	13.465	323	0.240	878	1,201	0	1,201
2033	0	24	13.936	334	0.249	911	1,245	0	1,245
2034	0	24	14.424	346	0.257	941	1,287	0	1,287
2035	0	19	14.929	284	0.266	779	1,063	0	1,063
2036	0	9	15.451	139	0.276	404	543	0	543
2037	0	0	15.992	0	0.285	0	0	0	0
Total =		479					\$21,231	\$1,510	\$19,721
							NPV = \$8,766	\$1,350	7,416
Total NPV =		\$7,416							
Benefit/Cost Ratio =		<u>6.49</u>							

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

Table 5
Total Resource Cost Test

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

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2015	\$22	\$15	\$16	\$53	\$345	\$2	\$347	(\$294)
2016	63	15	48	126	693	4	697	(571)
2017	111	30	84	225	696	4	700	(475)
2018	115	30	88	233	0	0	0	233
2019	119	31	92	242	0	0	0	242
2020	124	31	95	250	0	0	0	250
2021	128	31	99	258	0	0	0	258
2022	132	32	102	266	0	0	0	266
2023	137	32	106	275	0	0	0	275
2024	142	32	110	284	0	0	0	284
2025	147	33	113	293	0	0	0	293
2026	152	33	117	302	0	0	0	302
2027	157	33	121	311	0	0	0	311
2028	163	34	124	321	0	0	0	321
2029	168	34	128	330	0	0	0	330
2030	174	34	132	340	0	0	0	340
2031	180	35	139	354	0	0	0	354
2032	187	35	143	365	0	0	0	365
2033	193	35	146	374	0	0	0	374
2034	200	36	154	390	0	0	0	390
2035	164	36	126	326	0	0	0	326
2036	80	18	66	164	0	0	0	164
2037	0	0	0	0	0	0	0	0
			Total =	\$6,082			\$1,744	\$4,338
			NPV =	\$2,814			\$1,599	1,214
			Total NPV =	\$1,214				
			Benefit/Cost Ratio =	1.76				

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: **2015 - 2017**

Input Data			First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.691	16) Utility Project Costs			
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$10,125	\$11,684	\$13,262
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.12640	16b) Incentive Costs =	67,500	75,000	82,500
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$77,625	\$86,684	\$95,762
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$650	\$650	\$650
3) Commodity Cost (\$/Dk) =	\$4.187	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$146.26	19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	20	20	20
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	14.200	14.200	14.200
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	732	732	732
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01990	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
Escalation Rate =	3.50%	23) Number of Participants =	225	250	275
8) Non-Gas Fuel Loss Factor	5.10%	24) Total Annual Dk Saved =	3,195	3,550	3,905
9) Gas Environmental Damage Factor =	\$0.350	25) Incentive/Participant =	\$300	\$300	\$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 =	3.56%				
14) General Input Data Year =	2014				
15) Project Analysis Year 1 =	2015				
Project Analysis Year 2 =	2016				
Project Analysis Year 3 =	2017				

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$389,517	1.95
Utility Cost Test	\$559,563	3.32
Societal Test	\$962,786	2.91
Participant Test	\$1,512,932	4.43
Total Resource Cost Test	\$479,076	1.99

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	2015	3,195	\$4,334	\$13,847	\$0.000	\$0	\$13,847	32.0	\$148	\$4,736	\$18,583	\$1,805	\$3,749	\$10,125	\$67,500	\$81,374	(\$62,791)
2	2016	6,745	4,485	30,251	0.000	0	30,251	67.5	149	10,058	40,309	1,868	8,190	11,684	75,000	94,874	(54,565)
3	2017	10,650	4,642	49,437	0.000	0	49,437	106.5	151	16,082	65,519	1,934	13,388	13,262	82,500	109,150	(43,631)
4	2018	10,650	4,805	51,173	0.000	0	51,173	106.5	152	16,188	67,361	2,001	13,852	0	0	13,852	53,509
5	2019	10,650	4,973	52,962	0.000	0	52,962	106.5	154	16,401	69,363	2,071	14,336	0	0	14,336	55,027
6	2020	10,650	5,147	54,816	0.000	0	54,816	106.5	155	16,508	71,324	2,144	14,842	0	0	14,842	56,482
7	2021	10,650	5,327	56,733	0.000	0	56,733	106.5	157	16,721	73,454	2,219	15,361	0	0	15,361	58,093
8	2022	10,650	5,513	58,713	0.000	0	58,713	106.5	158	16,827	75,540	2,297	15,901	0	0	15,901	59,639
9	2023	10,650	5,706	60,769	0.000	0	60,769	106.5	160	17,040	77,809	2,377	16,455	0	0	16,455	61,354
10	2024	10,650	5,906	62,899	0.000	0	62,899	106.5	162	17,253	80,152	2,460	17,029	0	0	17,029	63,123
11	2025	10,650	6,113	65,103	0.000	0	65,103	106.5	163	17,360	82,463	2,546	17,625	0	0	17,625	64,838
12	2026	10,650	6,327	67,383	0.000	0	67,383	106.5	165	17,573	84,956	2,635	18,241	0	0	18,241	66,715
13	2027	10,650	6,548	69,736	0.000	0	69,736	106.5	166	17,679	87,415	2,728	18,885	0	0	18,885	68,530
14	2028	10,650	6,777	72,175	0.000	0	72,175	106.5	168	17,892	90,067	2,823	19,542	0	0	19,542	70,525
15	2029	10,650	7,015	74,710	0.000	0	74,710	106.5	170	18,105	92,815	2,922	20,228	0	0	20,228	72,587
16	2030	10,650	7,260	77,319	0.000	0	77,319	106.5	172	18,318	95,637	3,024	20,934	0	0	20,934	74,703
17	2031	10,650	7,514	80,024	0.000	0	80,024	106.5	173	18,425	98,449	3,130	21,667	0	0	21,667	76,782
18	2032	10,650	7,777	82,825	0.000	0	82,825	106.5	175	18,638	101,463	3,239	22,422	0	0	22,422	79,041
19	2033	10,650	8,050	85,733	0.000	0	85,733	106.5	177	18,851	104,584	3,353	23,211	0	0	23,211	81,373
20	2034	10,650	8,331	88,725	0.000	0	88,725	106.5	178	18,957	107,682	3,470	24,021	0	0	24,021	83,661
21	2035	7,455	8,623	64,284	0.000	0	64,284	74.6	180	13,428	77,712	3,592	17,406	0	0	17,406	60,306
22	2036	3,905	8,925	34,852	0.000	0	34,852	39.1	182	7,116	41,968	3,717	9,435	0	0	9,435	32,533
23	2037	0	9,237	0	0.000	0	0	0.0	184	0	0	3,847	0	0	0	0	0
Total =		213,000									\$1,704,625					\$626,791	\$1,077,834
																\$410,944	\$389,517
Total NPV =			\$389,517														
Benefit/Cost Ratio =			1.95														

NPV = \$800,461

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)	
2015	\$13,847	\$4,736	\$18,583	\$10,125	\$67,500	\$77,625	(\$59,042)
2016	30,251	10,058	40,309	11,684	75,000	86,684	(46,375)
2017	49,437	16,082	65,519	13,262	82,500	95,762	(30,243)
2018	51,173	16,188	67,361	0	0	0	67,361
2019	52,962	16,401	69,363	0	0	0	69,363
2020	54,816	16,508	71,324	0	0	0	71,324
2021	56,733	16,721	73,454	0	0	0	73,454
2022	58,713	16,827	75,540	0	0	0	75,540
2023	60,769	17,040	77,809	0	0	0	77,809
2024	62,899	17,253	80,152	0	0	0	80,152
2025	65,103	17,360	82,463	0	0	0	82,463
2026	67,383	17,573	84,956	0	0	0	84,956
2027	69,736	17,679	87,415	0	0	0	87,415
2028	72,175	17,892	90,067	0	0	0	90,067
2029	74,710	18,105	92,815	0	0	0	92,815
2030	77,319	18,318	95,637	0	0	0	95,637
2031	80,024	18,425	98,449	0	0	0	98,449
2032	82,825	18,638	101,463	0	0	0	101,463
2033	85,733	18,851	104,584	0	0	0	104,584
2034	88,725	18,957	107,682	0	0	0	107,682
2035	64,284	13,428	77,712	0	0	0	77,712
2036	34,852	7,116	41,968	0	0	0	41,968
2037	0	0	0	0	0	0	0
Total =			\$1,704,625		\$260,071	\$1,444,554	
NPV =			\$800,461		\$240,898	\$559,563	
Total NPV =			\$559,563				
Benefit/Cost Ratio =			<u>3.32</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)	
2015	\$13,847	\$4,736	\$0.022	\$3,623	\$0.358	\$1,144	\$23,350	\$77,625	\$78,750	\$156,375	(\$133,025)
2016	30,251	10,058	0.022	7,649	0.366	2,469	50,427	86,684	87,500	174,184	(123,757)
2017	49,437	16,082	0.023	12,627	0.375	3,994	82,140	95,762	96,250	192,012	(109,872)
2018	51,173	16,188	0.024	13,176	0.383	4,079	84,616	0	0	0	84,616
2019	52,962	16,401	0.025	13,725	0.392	4,175	87,263	0	0	0	87,263
2020	54,816	16,508	0.026	14,274	0.401	4,271	89,869	0	0	0	89,869
2021	56,733	16,721	0.027	14,823	0.410	4,367	92,644	0	0	0	92,644
2022	58,713	16,827	0.028	15,372	0.420	4,473	95,385	0	0	0	95,385
2023	60,769	17,040	0.029	15,921	0.429	4,569	98,299	0	0	0	98,299
2024	62,899	17,253	0.030	16,470	0.439	4,675	101,297	0	0	0	101,297
2025	65,103	17,360	0.031	17,019	0.449	4,782	104,264	0	0	0	104,264
2026	67,383	17,573	0.032	17,568	0.460	4,899	107,423	0	0	0	107,423
2027	69,736	17,679	0.033	18,117	0.470	5,006	110,538	0	0	0	110,538
2028	72,175	17,892	0.034	18,666	0.481	5,123	113,856	0	0	0	113,856
2029	74,710	18,105	0.035	19,215	0.492	5,240	117,270	0	0	0	117,270
2030	77,319	18,318	0.036	19,764	0.504	5,368	120,769	0	0	0	120,769
2031	80,024	18,425	0.038	20,862	0.515	5,485	124,796	0	0	0	124,796
2032	82,825	18,638	0.039	21,411	0.527	5,613	128,487	0	0	0	128,487
2033	85,733	18,851	0.040	21,960	0.539	5,740	132,284	0	0	0	132,284
2034	88,725	18,957	0.042	23,058	0.552	5,879	136,619	0	0	0	136,619
2035	64,284	13,428	0.043	16,525	0.564	4,205	98,442	0	0	0	98,442
2036	34,852	7,116	0.045	9,059	0.577	2,253	53,280	0	0	0	53,280
2037	0	0	0.046	0	0.590	0	0	0	0	0	0
Total =							\$2,153,318		\$522,571	\$1,630,747	
NPV =							\$1,466,395		\$503,609	\$962,786	
Total NPV =		\$962,786									
Benefit/Cost Ratio =		<u>2.91</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	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)	
2015	\$67,500	3,195	\$7.960	\$25,432	\$0.131	\$21,576	\$114,508	\$146,250	(\$31,742)
2016	75,000	6,745	8.239	55,572	0.135	46,940	177,512	162,500	15,012
2017	82,500	10,650	8.527	90,813	0.140	76,860	250,173	178,750	71,423
2018	0	10,650	8.826	93,997	0.145	79,605	173,602	0	173,602
2019	0	10,650	9.134	97,277	0.150	82,350	179,627	0	179,627
2020	0	10,650	9.454	100,685	0.155	85,095	185,780	0	185,780
2021	0	10,650	9.785	104,210	0.161	88,389	192,599	0	192,599
2022	0	10,650	10.128	107,863	0.166	91,134	198,997	0	198,997
2023	0	10,650	10.482	111,633	0.172	94,428	206,061	0	206,061
2024	0	10,650	10.849	115,542	0.178	97,722	213,264	0	213,264
2025	0	10,650	11.229	119,589	0.185	101,565	221,154	0	221,154
2026	0	10,650	11.622	123,774	0.191	104,859	228,633	0	228,633
2027	0	10,650	12.028	128,098	0.198	108,702	236,800	0	236,800
2028	0	10,650	12.449	132,582	0.205	112,545	245,127	0	245,127
2029	0	10,650	12.885	137,225	0.212	116,388	253,613	0	253,613
2030	0	10,650	13.336	142,028	0.219	120,231	262,259	0	262,259
2031	0	10,650	13.803	147,002	0.227	124,623	271,625	0	271,625
2032	0	10,650	14.286	152,146	0.235	129,015	281,161	0	281,161
2033	0	10,650	14.786	157,471	0.243	133,407	290,878	0	290,878
2034	0	10,650	15.303	162,977	0.252	138,348	301,325	0	301,325
2035	0	7,455	15.839	118,080	0.260	99,918	217,998	0	217,998
2036	0	3,905	16.393	64,015	0.269	54,150	118,165	0	118,165
2037	0	0	16.967	0	0.279	0	0	0	0
Total =		213,000					\$4,820,861	\$487,500	\$4,333,361
Total NPV =		\$1,512,932					\$1,954,637	\$441,705	1,512,932
Benefit/Cost Ratio =		4.43							

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)	
2015	\$13,847	\$4,736	\$3,623	\$22,206	\$77,625	\$78,750	\$156,375	(\$134,169)
2016	30,251	10,058	7,649	47,958	86,684	87,500	174,184	(126,226)
2017	49,437	16,082	12,627	78,146	95,762	96,250	192,012	(113,866)
2018	51,173	16,188	13,176	80,537	0	0	0	80,537
2019	52,962	16,401	13,725	83,088	0	0	0	83,088
2020	54,816	16,508	14,274	85,598	0	0	0	85,598
2021	56,733	16,721	14,823	88,277	0	0	0	88,277
2022	58,713	16,827	15,372	90,912	0	0	0	90,912
2023	60,769	17,040	15,921	93,730	0	0	0	93,730
2024	62,899	17,253	16,470	96,622	0	0	0	96,622
2025	65,103	17,360	17,019	99,482	0	0	0	99,482
2026	67,383	17,573	17,568	102,524	0	0	0	102,524
2027	69,736	17,679	18,117	105,532	0	0	0	105,532
2028	72,175	17,892	18,666	108,733	0	0	0	108,733
2029	74,710	18,105	19,215	112,030	0	0	0	112,030
2030	77,319	18,318	19,764	115,401	0	0	0	115,401
2031	80,024	18,425	20,862	119,311	0	0	0	119,311
2032	82,825	18,638	21,411	122,874	0	0	0	122,874
2033	85,733	18,851	21,960	126,544	0	0	0	126,544
2034	88,725	18,957	23,058	130,740	0	0	0	130,740
2035	64,284	13,428	16,525	94,237	0	0	0	94,237
2036	34,852	7,116	9,059	51,027	0	0	0	51,027
2037	0	0	0	0	0	0	0	0
			Total =	\$2,055,509			\$522,571	\$1,532,938
			NPV =	\$963,178			\$484,102	479,076

Total NPV = \$479,076
Benefit/Cost Ratio = 1.99

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: **2015 - 2017**

Input Data			First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.249	16) Utility Project Costs			
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$450	\$561	\$675
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.12930	16b) Incentive Costs =	3,000	3,600	4,200
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	\$3,450	\$4,161	\$4,875
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$650	\$650	\$650
3) Commodity Cost (\$/Dk) =	\$4.187	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$146.26	19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	20	20	20
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	14.200	14.200	14.200
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	732	732	732
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01990	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
Escalation Rate =	3.50%	23) Number of Participants =	10	12	14
8) Non-Gas Fuel Loss Factor	5.10%	24) Total Annual Dk Saved =	142	170	199
9) Gas Environmental Damage Factor =	\$0.350	25) Incentive/Participant =	\$300	\$300	\$300
Escalation Rate =	2.30%	26) Distribution Delivery Charge			\$1.302
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 =	3.56%				
14) General Input Data Year =	2014				
15) Project Analysis Year 1 =	2015				
Project Analysis Year 2 =	2016				
Project Analysis Year 3 =	2017				

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$20,703	2.18
Utility Cost Test	\$26,782	3.32
Societal Test	\$46,183	2.91
Participant Test	\$70,705	4.35
Total Resource Cost Test	\$22,943	1.99

Table 1
Ratepayer Impact Measure Test

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

		Benefits										Costs					Annual
		Total Energy Reduction	Gas Commodity Cost/Dk	Gas Commodity Savings	Variable O & M Cost/Dk	Variable O & M Savings	Total Energy Savings	Peak Dk Demand Reduction	Demand Savings Per Unit	Total Demand Savings	Total Savings	Distribution Delivery Charge	Lost Margin	Program Admin Costs	Incentive Costs	Total Program Costs	Less Costs
Year		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
1	2015	142	\$4,334	\$615	\$0.000	\$0	\$615	1.4	\$148	\$207	\$822	\$1,348	\$124	\$450	\$3,000	\$3,574	(\$2,752)
2	2016	312	4,485	1,399	0.000	0	1,399	3.1	149	462	1,861	1,395	283	561	3,600	4,444	(2,583)
3	2017	511	4,642	2,372	0.000	0	2,372	5.1	151	770	3,142	1,444	480	675	4,200	5,355	(2,213)
4	2018	511	4,805	2,455	0.000	0	2,455	5.1	152	775	3,230	1,494	496	0	0	496	2,734
5	2019	511	4,973	2,541	0.000	0	2,541	5.1	154	785	3,326	1,546	514	0	0	514	2,812
6	2020	511	5,147	2,630	0.000	0	2,630	5.1	155	791	3,421	1,600	531	0	0	531	2,890
7	2021	511	5,327	2,722	0.000	0	2,722	5.1	157	801	3,523	1,657	550	0	0	550	2,973
8	2022	511	5,513	2,817	0.000	0	2,817	5.1	158	806	3,623	1,714	569	0	0	569	3,054
9	2023	511	5,706	2,916	0.000	0	2,916	5.1	160	816	3,732	1,774	589	0	0	589	3,143
10	2024	511	5,906	3,018	0.000	0	3,018	5.1	162	826	3,844	1,837	610	0	0	610	3,234
11	2025	511	6,113	3,124	0.000	0	3,124	5.1	163	831	3,955	1,901	631	0	0	631	3,324
12	2026	511	6,327	3,233	0.000	0	3,233	5.1	165	842	4,075	1,967	653	0	0	653	3,422
13	2027	511	6,548	3,346	0.000	0	3,346	5.1	166	847	4,193	2,036	676	0	0	676	3,517
14	2028	511	6,777	3,463	0.000	0	3,463	5.1	168	857	4,320	2,108	700	0	0	700	3,620
15	2029	511	7,015	3,585	0.000	0	3,585	5.1	170	867	4,452	2,181	724	0	0	724	3,728
16	2030	511	7,260	3,710	0.000	0	3,710	5.1	172	877	4,587	2,258	750	0	0	750	3,837
17	2031	511	7,514	3,840	0.000	0	3,840	5.1	173	882	4,722	2,337	776	0	0	776	3,946
18	2032	511	7,777	3,974	0.000	0	3,974	5.1	175	893	4,867	2,418	803	0	0	803	4,064
19	2033	511	8,050	4,114	0.000	0	4,114	5.1	177	903	5,017	2,503	831	0	0	831	4,186
20	2034	511	8,331	4,257	0.000	0	4,257	5.1	178	908	5,165	2,591	861	0	0	861	4,304
21	2035	369	8,623	3,182	0.000	0	3,182	3.7	180	666	3,848	2,681	643	0	0	643	3,205
22	2036	199	8,925	1,776	0.000	0	1,776	2.0	182	364	2,140	2,775	359	0	0	359	1,781
23	2037	0	9,237	0	0.000	0	0	0.0	184	0	0	2,872	0	0	0	0	0
Total =		10,220									\$81,865				\$25,639	\$56,226	
											NPV =	\$38,310			\$17,607	\$20,703	
Total NPV =			\$20,703														
Benefit/Cost Ratio =			2.18														

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: **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)	
2015	\$615	\$207	\$822	\$450	\$3,000	\$3,450	(\$2,628)
2016	1,399	462	1,861	561	3,600	4,161	(2,300)
2017	2,372	770	3,142	675	4,200	4,875	(1,733)
2018	2,455	775	3,230	0	0	0	3,230
2019	2,541	785	3,326	0	0	0	3,326
2020	2,630	791	3,421	0	0	0	3,421
2021	2,722	801	3,523	0	0	0	3,523
2022	2,817	806	3,623	0	0	0	3,623
2023	2,916	816	3,732	0	0	0	3,732
2024	3,018	826	3,844	0	0	0	3,844
2025	3,124	831	3,955	0	0	0	3,955
2026	3,233	842	4,075	0	0	0	4,075
2027	3,346	847	4,193	0	0	0	4,193
2028	3,463	857	4,320	0	0	0	4,320
2029	3,585	867	4,452	0	0	0	4,452
2030	3,710	877	4,587	0	0	0	4,587
2031	3,840	882	4,722	0	0	0	4,722
2032	3,974	893	4,867	0	0	0	4,867
2033	4,114	903	5,017	0	0	0	5,017
2034	4,257	908	5,165	0	0	0	5,165
2035	3,182	666	3,848	0	0	0	3,848
2036	1,776	364	2,140	0	0	0	2,140
2037	0	0	0	0	0	0	0
Total =			\$81,865			\$12,486	\$69,379
NPV =			\$38,310			\$11,528	\$26,782
Total NPV =			\$26,782				
Benefit/Cost Ratio =			<u>3.32</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)	
2015	\$615	\$207	\$0.022	\$161	\$0.358	\$51	\$1,034	\$3,450	\$3,500	\$6,950	(\$5,916)
2016	1,399	462	0.022	354	0.366	114	2,329	4,161	4,200	8,361	(6,032)
2017	2,372	770	0.023	606	0.375	192	3,940	4,875	4,900	9,775	(5,835)
2018	2,455	775	0.024	632	0.383	196	4,058	0	0	0	4,058
2019	2,541	785	0.025	659	0.392	200	4,185	0	0	0	4,185
2020	2,630	791	0.026	685	0.401	205	4,311	0	0	0	4,311
2021	2,722	801	0.027	712	0.410	210	4,445	0	0	0	4,445
2022	2,817	806	0.028	738	0.420	215	4,576	0	0	0	4,576
2023	2,916	816	0.029	764	0.429	219	4,715	0	0	0	4,715
2024	3,018	826	0.030	791	0.439	224	4,859	0	0	0	4,859
2025	3,124	831	0.031	817	0.449	229	5,001	0	0	0	5,001
2026	3,233	842	0.032	843	0.460	235	5,153	0	0	0	5,153
2027	3,346	847	0.033	870	0.470	240	5,303	0	0	0	5,303
2028	3,463	857	0.034	896	0.481	246	5,462	0	0	0	5,462
2029	3,585	867	0.035	922	0.492	251	5,625	0	0	0	5,625
2030	3,710	877	0.036	949	0.504	258	5,794	0	0	0	5,794
2031	3,840	882	0.038	1,001	0.515	263	5,986	0	0	0	5,986
2032	3,974	893	0.039	1,028	0.527	269	6,164	0	0	0	6,164
2033	4,114	903	0.040	1,054	0.539	275	6,346	0	0	0	6,346
2034	4,257	908	0.042	1,107	0.552	282	6,554	0	0	0	6,554
2035	3,182	666	0.043	818	0.564	208	4,874	0	0	0	4,874
2036	1,776	364	0.045	461	0.577	115	2,716	0	0	0	2,716
2037	0	0	0.046	0	0.590	0	0	0	0	0	0
Total =							\$103,430		\$25,086	\$78,344	
NPV =							\$70,321		\$24,138	\$46,183	

Total NPV = \$46,183
Benefit/Cost Ratio = 2.91

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	
	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)
2015	\$3,000	142	\$7.503	\$1,065	\$0.134	\$981	\$5,046	\$6,500	(\$1,454)
2016	3,600	312	7.765	2,423	0.139	2,238	8,261	7,800	461
2017	4,200	511	8.037	4,107	0.143	3,768	12,075	9,100	2,975
2018	0	511	8.318	4,250	0.148	3,900	8,150	0	8,150
2019	0	511	8.610	4,400	0.154	4,058	8,458	0	8,458
2020	0	511	8.911	4,554	0.159	4,190	8,744	0	8,744
2021	0	511	9.223	4,713	0.165	4,348	9,061	0	9,061
2022	0	511	9.546	4,878	0.170	4,480	9,358	0	9,358
2023	0	511	9.880	5,049	0.176	4,638	9,687	0	9,687
2024	0	511	10.225	5,225	0.182	4,796	10,021	0	10,021
2025	0	511	10.583	5,408	0.189	4,981	10,389	0	10,389
2026	0	511	10.954	5,597	0.195	5,139	10,736	0	10,736
2027	0	511	11.337	5,793	0.202	5,323	11,116	0	11,116
2028	0	511	11.734	5,996	0.209	5,508	11,504	0	11,504
2029	0	511	12.145	6,206	0.217	5,718	11,924	0	11,924
2030	0	511	12.570	6,423	0.224	5,903	12,326	0	12,326
2031	0	511	13.010	6,648	0.232	6,114	12,762	0	12,762
2032	0	511	13.465	6,881	0.240	6,324	13,205	0	13,205
2033	0	511	13.936	7,121	0.249	6,562	13,683	0	13,683
2034	0	511	14.424	7,371	0.257	6,772	14,143	0	14,143
2035	0	369	14.929	5,509	0.266	5,063	10,572	0	10,572
2036	0	199	15.451	3,075	0.276	2,828	5,903	0	5,903
2037	0	0	15.992	0	0.285	0	0	0	0
Total =		10,220					\$227,124	\$23,400	\$203,724
Total NPV =		\$70,705					\$91,816	\$21,112	70,705
Benefit/Cost Ratio =		4.35							

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 **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)	
2015	\$615	\$207	\$161	\$983	\$3,450	\$3,500	\$6,950	(\$5,967)
2016	1,399	462	354	2,215	4,161	4,200	8,361	(6,146)
2017	2,372	770	606	3,748	4,875	4,900	9,775	(6,027)
2018	2,455	775	632	3,862	0	0	0	3,862
2019	2,541	785	659	3,985	0	0	0	3,985
2020	2,630	791	685	4,106	0	0	0	4,106
2021	2,722	801	712	4,235	0	0	0	4,235
2022	2,817	806	738	4,361	0	0	0	4,361
2023	2,916	816	764	4,496	0	0	0	4,496
2024	3,018	826	791	4,635	0	0	0	4,635
2025	3,124	831	817	4,772	0	0	0	4,772
2026	3,233	842	843	4,918	0	0	0	4,918
2027	3,346	847	870	5,063	0	0	0	5,063
2028	3,463	857	896	5,216	0	0	0	5,216
2029	3,585	867	922	5,374	0	0	0	5,374
2030	3,710	877	949	5,536	0	0	0	5,536
2031	3,840	882	1,001	5,723	0	0	0	5,723
2032	3,974	893	1,028	5,895	0	0	0	5,895
2033	4,114	903	1,054	6,071	0	0	0	6,071
2034	4,257	908	1,107	6,272	0	0	0	6,272
2035	3,182	666	818	4,666	0	0	0	4,666
2036	1,776	364	461	2,601	0	0	0	2,601
2037	0	0	0	0	0	0	0	0
			Total =	\$98,733			\$25,086	\$73,647
			NPV =	\$46,107			\$23,163	22,943

Total NPV = \$22,943
Benefit/Cost Ratio = 1.99

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

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

Company: **Montana-Dakota Utilities Co.**
 Project: **Commercial Custom Efficiency**
 Program Years: **2015 - 2017**

Input Data			First Year	Second Year	Third Year
1) Retail Rate (\$/Dk) =	\$7.249	16) Utility Project Costs			
Escalation Rate =	3.50%	16a) Administrative & Operating Costs =	\$90	\$94	\$97
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =	\$0.12930	16b) Incentive Costs =	600	600	600
Escalation Rate =	3.50%	16c) Total Utility Project Costs =	<u>\$690</u>	<u>\$694</u>	<u>\$697</u>
Non-Gas Fuel Units (ie. kWh, Gallons, etc) =	Kwh	17) Direct Participant Costs (\$/Part.) =	\$3,000	\$3,000	\$3,000
3) Commodity Cost (\$/Dk) =	\$4.187	18) Participant Non-Energy Costs (Annual \$/Part.) =	\$0	\$0	\$0
Escalation Rate =	3.50%	Escalation Rate =	0.00%	0.00%	0.00%
4) Demand Cost (\$/Unit/Yr) =	\$146.26	19) Participant Non-Energy Savings (Annual \$/Part) =	\$0	\$0	\$0
Escalation Rate =	1.00%	Escalation Rate =	0.00%	0.00%	1.40%
5) Peak Reduction Factor =	1.000%	20) Project Life (Years) =	15	15	15
6) Variable O&M (\$/Dk) =	\$0.000	21) Avg. Dk/Part. Saved =	100.000	100.000	100.000
Escalation Rate =	0.00%	22) Avg Non-Gas Fuel Units/Part. Saved =	0	0	0
7) Non-Gas Fuel Cost (\$/Fuel Unit) =	\$0.01990	22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	0	0	0
Escalation Rate =	3.50%	23) Number of Participants =	1	1	1
8) Non-Gas Fuel Loss Factor	5.10%	24) Total Annual Dk Saved =	100	100	100
9) Gas Environmental Damage Factor =	\$0.350	25) Incentive/Participant =	\$600	\$600	\$600
Escalation Rate =	2.30%	26) Distribution Delivery Charge			\$1.302
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 =	3.56%				
14) General Input Data Year =	2014				
15) Project Analysis Year 1 =	2015				
Project Analysis Year 2 =	2016				
Project Analysis Year 3 =	2017				

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$13,797	3.83
Utility Cost Test	\$16,728	9.64
Societal Test	\$17,385	2.94
Participant Test	\$14,927	2.82
Total Resource Cost Test	\$13,115	2.16

Table 1
Ratepayer Impact Measure Test

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

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	2015	100	\$4.334	\$433	\$0.000	\$0	\$433	1.0	\$148	\$148	\$581	\$1.348	\$88	\$90	\$600	\$778	(\$197)
2	2016	200	4.485	897	0.000	0	897	2.0	149	298	1,195	1.395	181	94	600	875	320
3	2017	300	4.642	1,393	0.000	0	1,393	3.0	151	453	1,846	1.444	282	97	600	979	867
4	2018	300	4.805	1,442	0.000	0	1,442	3.0	152	456	1,898	1.494	291	0	0	291	1,607
5	2019	300	4.973	1,492	0.000	0	1,492	3.0	154	462	1,954	1.546	301	0	0	301	1,653
6	2020	300	5.147	1,544	0.000	0	1,544	3.0	155	465	2,009	1.600	312	0	0	312	1,697
7	2021	300	5.327	1,598	0.000	0	1,598	3.0	157	471	2,069	1.657	323	0	0	323	1,746
8	2022	300	5.513	1,654	0.000	0	1,654	3.0	158	474	2,128	1.714	334	0	0	334	1,794
9	2023	300	5.706	1,712	0.000	0	1,712	3.0	160	480	2,192	1.774	346	0	0	346	1,846
10	2024	300	5.906	1,772	0.000	0	1,772	3.0	162	486	2,258	1.837	358	0	0	358	1,900
11	2025	300	6.113	1,834	0.000	0	1,834	3.0	163	489	2,323	1.901	371	0	0	371	1,952
12	2026	300	6.327	1,898	0.000	0	1,898	3.0	165	495	2,393	1.967	384	0	0	384	2,009
13	2027	300	6.548	1,964	0.000	0	1,964	3.0	166	498	2,462	2.036	397	0	0	397	2,065
14	2028	300	6.777	2,033	0.000	0	2,033	3.0	168	504	2,537	2.108	411	0	0	411	2,126
15	2029	300	7.015	2,105	0.000	0	2,105	3.0	170	510	2,615	2.181	425	0	0	425	2,190
16	2030	200	7.260	1,452	0.000	0	1,452	2.0	172	344	1,796	2.258	294	0	0	294	1,502
17	2031	100	7.514	751	0.000	0	751	1.0	173	173	924	2.337	152	0	0	152	772
18	2032	0	7.777	0	0.000	0	0	0.0	175	0	0	2.418	0	0	0	0	0
19	2033	0	8.050	0	0.000	0	0	0.0	177	0	0	2.503	0	0	0	0	0
20	2034	0	8.331	0	0.000	0	0	0.0	178	0	0	2.591	0	0	0	0	0
21	2035	0	8.623	0	0.000	0	0	0.0	180	0	0	2.681	0	0	0	0	0

Total = 4,500
NPV = \$33,180 / \$18,665
\$7,331 / \$4,868
\$25,849 / \$13,797

Total NPV = \$13,797
Benefit/Cost Ratio = 3.83

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 Custom Efficiency**

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2015	\$433	\$148	\$581	\$90	\$600	\$690	(\$109)
2016	897	298	1,195	94	600	694	501
2017	1,393	453	1,846	97	600	697	1,149
2018	1,442	456	1,898	0	0	0	1,898
2019	1,492	462	1,954	0	0	0	1,954
2020	1,544	465	2,009	0	0	0	2,009
2021	1,598	471	2,069	0	0	0	2,069
2022	1,654	474	2,128	0	0	0	2,128
2023	1,712	480	2,192	0	0	0	2,192
2024	1,772	486	2,258	0	0	0	2,258
2025	1,834	489	2,323	0	0	0	2,323
2026	1,898	495	2,393	0	0	0	2,393
2027	1,964	498	2,462	0	0	0	2,462
2028	2,033	504	2,537	0	0	0	2,537
2029	2,105	510	2,615	0	0	0	2,615
2030	1,452	344	1,796	0	0	0	1,796
2031	751	173	924	0	0	0	924
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 =			\$33,180			\$2,081	\$31,099
		NPV =	\$18,665			\$1,937	\$16,728
Total NPV =			\$16,728				
Benefit/Cost Ratio =			9.64				

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

**Table 3
Societal Test**

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

Year	Benefits						Costs			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)
2015	\$433	\$148	\$0.022	\$0	\$0.358	\$36	\$617	\$690	\$2,400	\$3,090	(\$2,473)
2016	897	298	0.022	0	0.366	73	1,268	694	2,400	3,094	(1,826)
2017	1,393	453	0.023	0	0.375	113	1,959	697	2,400	3,097	(1,138)
2018	1,442	456	0.024	0	0.383	115	2,013	0	0	0	2,013
2019	1,492	462	0.025	0	0.392	118	2,072	0	0	0	2,072
2020	1,544	465	0.026	0	0.401	120	2,129	0	0	0	2,129
2021	1,598	471	0.027	0	0.410	123	2,192	0	0	0	2,192
2022	1,654	474	0.028	0	0.420	126	2,254	0	0	0	2,254
2023	1,712	480	0.029	0	0.429	129	2,321	0	0	0	2,321
2024	1,772	486	0.030	0	0.439	132	2,390	0	0	0	2,390
2025	1,834	489	0.031	0	0.449	135	2,458	0	0	0	2,458
2026	1,898	495	0.032	0	0.460	138	2,531	0	0	0	2,531
2027	1,964	498	0.033	0	0.470	141	2,603	0	0	0	2,603
2028	2,033	504	0.034	0	0.481	144	2,681	0	0	0	2,681
2029	2,105	510	0.035	0	0.492	148	2,763	0	0	0	2,763
2030	1,452	344	0.036	0	0.504	101	1,897	0	0	0	1,897
2031	751	173	0.038	0	0.515	52	976	0	0	0	976
2032	0	0	0.039	0	0.527	0	0	0	0	0	0
2033	0	0	0.040	0	0.539	0	0	0	0	0	0
2034	0	0	0.042	0	0.552	0	0	0	0	0	0
2035	0	0	0.043	0	0.564	0	0	0	0	0	0

Total = \$35,124
NPV = \$26,350
\$9,281 \$25,843
\$8,965 \$17,385

Total NPV = \$17,385
Benefit/Cost Ratio = 2.94

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 Custom Efficiency**

Year	Benefits						Total Annual Benefits (G)	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)		Direct Participant Costs (H)	Annual Benefits Less Costs (I)
2015	\$600	100	\$7.503	\$750	\$0.134	\$0	\$1,350	\$3,000	(\$1,650)
2016	600	200	7.765	1,553	0.139	0	2,153	3,000	(847)
2017	600	300	8.037	2,411	0.143	0	3,011	3,000	11
2018	0	300	8.318	2,495	0.148	0	2,495	0	2,495
2019	0	300	8.610	2,583	0.154	0	2,583	0	2,583
2020	0	300	8.911	2,673	0.159	0	2,673	0	2,673
2021	0	300	9.223	2,767	0.165	0	2,767	0	2,767
2022	0	300	9.546	2,864	0.170	0	2,864	0	2,864
2023	0	300	9.880	2,964	0.176	0	2,964	0	2,964
2024	0	300	10.225	3,068	0.182	0	3,068	0	3,068
2025	0	300	10.583	3,175	0.189	0	3,175	0	3,175
2026	0	300	10.954	3,286	0.195	0	3,286	0	3,286
2027	0	300	11.337	3,401	0.202	0	3,401	0	3,401
2028	0	300	11.734	3,520	0.209	0	3,520	0	3,520
2029	0	300	12.145	3,644	0.217	0	3,644	0	3,644
2030	0	200	12.570	2,514	0.224	0	2,514	0	2,514
2031	0	100	13.010	1,301	0.232	0	1,301	0	1,301
2032	0	0	13.465	0	0.240	0	0	0	0
2033	0	0	13.936	0	0.249	0	0	0	0
2034	0	0	14.424	0	0.257	0	0	0	0
2035	0	0	14.929	0	0.266	0	0	0	0

Total = 4,500 NPV = \$46,769 \$9,000 \$37,769
\$23,133 \$8,207 14,927

Total NPV = \$14,927
Benefit/Cost Ratio = 2.82

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

Table 5
Total Resource Cost Test

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

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2015	\$433	\$148	\$0	\$581	\$690	\$2,400	\$3,090	\$581
2016	897	298	0	1,195	694	2,400	3,094	(1,899)
2017	1,393	453	0	1,846	697	2,400	3,097	(1,251)
2018	1,442	456	0	1,898	0	0	0	1,898
2019	1,492	462	0	1,954	0	0	0	1,954
2020	1,544	465	0	2,009	0	0	0	2,009
2021	1,598	471	0	2,069	0	0	0	2,069
2022	1,654	474	0	2,128	0	0	0	2,128
2023	1,712	480	0	2,192	0	0	0	2,192
2024	1,772	486	0	2,258	0	0	0	2,258
2025	1,834	489	0	2,323	0	0	0	2,323
2026	1,898	495	0	2,393	0	0	0	2,393
2027	1,964	498	0	2,462	0	0	0	2,462
2028	2,033	504	0	2,537	0	0	0	2,537
2029	2,105	510	0	2,615	0	0	0	2,615
2030	1,452	344	0	1,796	0	0	0	1,796
2031	751	173	0	924	0	0	0	924
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 =	\$33,180			\$9,281	\$26,989
			NPV =	\$18,665			\$8,640	13,115

Total NPV = \$13,115
Benefit/Cost Ratio = 2.16

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

**Montana-Dakota Utilities Co.
2014 Input Data Summary
South Dakota Natural Gas Conservation Model**

Input No.	Input Data Description	Information Source	SD Res.	SD Comm.
1	Retail Rate (\$/dk)	Weighted Average of SD retail rate using projected 2014-2015 winter gas costs & October 2014 pipeline and distribution rates	7.691	7.249
	Escalation Rate		3.50%	3.50%
2	Non-Gas Fuel Retail (\$/fuel/unit)	Average retail cost of non gas fuel if measures also saves kWh, gallons of water, etc. (for analysis purposes, used electric as Non-Gas Fuel Retail Rate)	0.1264	0.1293
	Escalation Rate		3.50%	3.50%
	Non-Gas Fuel Units (ie. kWh, Gallons, etc)		Kwh	Kwh
3	Commodity Cost (\$/dk)	Estimated gas costs using projected 2014-15 winter gas costs October 2014 pipeline commodity	4.187	4.187
	Escalation Rate		3.50%	3.50%
4	Demand Cost (\$/dk/Yr)	Annual cost of firm capacity on pipeline	\$146.26	\$146.26
	Escalation Rate		1.00%	1.00%
5	Peak Reduction Factor	Estimated average peak day reduction factor caused by implementing the measure (s)	1.000%	1.000%
6	Variable O&M (\$/dk)	Estimated variable O&M that will be avoided due the implementing the measure	\$0	\$0
	Escalation Rate		0.00%	0.00%
7	Non-Gas Fuel Cost (\$/Fuel Unit)	Average commodity cost of non gas fuel if measures also saves kWh, gallons of water, etc. (for analysis purposes, used electric as Non-Gas Fuel Cost)	\$0.01990	\$0.01990
	Escalation Rate		3.50%	3.50%
8	Non-Gas Fuel Loss Factor	Non-Gas fuel loss factor (for analysis purposes, used Montana-Dakota Utilities 12 month ending July 2014 line loss factor)	5.10%	5.10%
9	Gas Environmental Damage Factor	Per the 2013-2015 CIP triennium from Minnesota approved by the Minnesota Division of Energy Resources Staff	0.35	0.35
	Escalation Rate		2.30%	2.30%
10	Non Gas Fuel Environmental Damage Factor	Not Applicable	\$0	\$0
	Escalation Rate		0.00%	0.00%
11	Participant Discount Rate		10.00%	10.00%
12	Utility Discount Rate	Montana-Dakota's authorized average cost of capital	7.60%	7.60%
13	Societal Discount Rate	Equal to the 30 year T-Bill rate average for Twelve Months Ending September 16, 2014	3.56%	3.56%
14	General Input Data Year =	Year data was input	2014	2014

**Montana-Dakota Utilities Co.
2014 Input Data Summary
South Dakota Natural Gas Conservation Model**

Input No.	Input Data Description	Information Source	SD Res.	SD Comm.
15	Project Analysis Year	Year(s) program will be implemented	2015	2015
			2016	2016
			2017	2017
16	Utility Project Costs	Total direct cost to the utility caused by implementing the program(s)		
17	Direct Participant Costs (\$/Part.)	Direct costs that the participant would have to participate in the program		
18	Participant Non-Energy Costs (Annual \$/Part.)	Annual participant non-energy costs if applicable caused by implementing the measure (Not Applicable)	\$0	\$0
	Yr. 1		\$0	\$0
	Yr. 2		\$0	\$0
	Yr. 3		\$0	\$0
	Escalation Rate Yr. 1		0.00%	0.00%
	Escalation Rate Yr. 2		0.00%	0.00%
	Escalation Rate Yr. 3		0.00%	0.00%
19	Participant Non-Energy Savings (Annual \$/Part) Yr. 1	Participant non energy savings if applicable caused by implementing the measure (Not Applicable)	\$0	\$0
	Yr. 2		\$0	\$0
	Yr. 3		\$0	\$0
	Escalation Rate Yr. 1		0.00%	0.00%
	Escalation Rate Yr. 2		0.00%	0.00%
	Escalation Rate Yr. 3		1.40%	1.40%
20	Project Life (Years)	Based on the estimated useful life of the energy saving equipment (20 years maximum)		
21	Avg. Dk/Part. Saved	Avg energy reduction (Dk) caused by the program(s)		
22	Avg Non-Gas Fuel Units/Part. Saved Yr. 1	Average non-gas fuel units saved or added due to implementing the measure (for analysis purposes, used Kwh)		
	Yr. 2		0	0
	Yr. 3		0	0
22a	Avg Additional Non-Gas Fuel Units/ Part. Used Yr. 1		0	0
	Yr. 2		0	0
	Yr. 3		0	0
23	Number of Participants	Total number of expected participants is the program(s)		
24	Total Annual Dk Saved	Total Dk saved from the program in the year implemented		
25	Incentive/Participant	Incentive provided to the participant		
26	Distribution Delivery Charge	Weighted Average of Montana-Dakota's Distribution Delivery Charge	1.744	1.302
27	Effective Fed & State Income Tax Rate	Montana-Dakota's effective tax rate	35%	35%

South Dakota Natural Gas DSM Programs
 Technical Assumptions

<u>2015 - 2017 Program Years</u>	<u>Customer Class</u>	<u># of Particip Year 1</u>	<u>Number of Particip Year 2</u>	<u>Number of Particip Year 3</u>	<u>Project Life</u>	<u>Baseline Efficiency</u>	<u>Average High Efficiency</u>	<u>Average dk Saved / part</u>	<u>Average Non-Energy Benefits / Part</u>	<u>Increm Cost</u>	<u>Avg Incentive / Part</u>
Residential											
Furnace Tier 2 - 95%+ AFUE - New	Res	150	170	190	20	90	95	4.7	732.0	302	300
Furnace Tier 2 - 95%+ AFUE - Replacement	Res	225	250	275	20	80	95	14.2	732.0	650	300
Programmable Thermostats	Res	180	200	220	10	NA	NA	2.1	0.0	60	20
Commercial											
Furnace Tier 2 - 95%+ AFUE - New	Comm	1	2	2	20	90	95	4.7	732.0	302	300
Furnace Tier 2 - 95%+ AFUE - Replacement	Comm	10	12	14	20	80	95	14.2	732.0	650	300
Custom Efficiency	Comm	1	1	1	15	NA	NA	100.0	0.0	3,000	600
Totals		1,904	567	635							