

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

Company: **Montana-Dakota Utilities Co.**
Project: **Total South Dakota Program**
Program Years: **2013**

<u>Input Data</u>		<u>2013</u>	
1) Retail Rate (\$/Dk) =		16) Utility Project Costs	
Escalation Rate =		16a) Administrative & Operating Costs = 1/	\$17,655
2) Non-Gas Fuel Retail Rate (\$/Fuel Unit) =		16b) Incentive Costs =	153,170
Escalation Rate =		16c) Total Utility Project Costs =	<u>\$170,825</u>
Non-Gas Fuel Units (ie. kWh,Gallons, etc) =		17) Direct Participant Costs (\$/Part.) =	
3) Commodity Cost (\$/Dk) =		18) Participant Non-Energy Costs (Annual \$/Part.) =	
Escalation Rate =		Escalation Rate =	
4) Demand Cost (\$/Unit/Yr) =		19) Participant Non-Energy Savings (Annual \$/Part) =	
Escalation Rate =		Escalation Rate =	
5) Peak Reduction Factor =		20) Project Life (Years) =	
6) Variable O&M (\$/Dk) =		21) Avg. Dk/Part. Saved =	
Escalation Rate =		22) Avg Non-Gas Fuel Units/Part. Saved =	
7) Non-Gas Fuel Cost (\$/Fuel Unit) =		22a) Avg Additional Non-Gas Fuel Units/ Part. Used =	
Escalation Rate =		23) Number of Participants =	639
8) Non-Gas Fuel Loss Factor		24) Total Annual Dk Saved =	4,613
9) Gas Environmental Damage Factor =		25) Incentive/Participant =	
Escalation Rate =		26) Distribution Delivery Charge	
10) Non Gas Fuel Environmental Damage Factor =		27) Effective Income Tax Rate =	
Escalation Rate =		(Federal & State Taxes)	
11) Participant Discount Rate =	10.00%		
12) Utility Discount Rate =	8.94%		
13) Societal Discount Rate =	4.25%		
14) General Input Data Year =	2012		
15) Project Analysis Year 1 =	2013		
Project Analysis Year 2 =	2013		
Project Analysis Year 3 =	2014		

Test Results	NPV	B/C
Ratepayer Impact Measure Test	\$181,742	1.88
Utility Cost Test	\$245,296	2.71
Societal Test	\$445,648	2.59
Participant Test	\$623,633	3.35
Total Resource Cost Test	\$190,298	1.68

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

Excludes Energy Audit Reimbursement

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	2013	4,613	\$31,000	28,236	0	0	28,236	46	595	5,498	\$33,734	5,383	14,791	128,320	\$148,494	(\$114,760)
2	2014	4,613	\$32,000	29,223	0	0	29,223	46	600	5,544	34,767	5,573	0	0	\$5,573	\$29,194
3	2015	4,613	\$33,000	30,247	0	0	30,247	46	605	5,591	35,838	5,770	0	0	\$5,770	\$30,068
4	2016	4,613	\$34,000	31,304	0	0	31,304	46	615	5,683	36,987	5,971	0	0	\$5,971	\$31,016
5	2017	4,613	\$35,000	32,402	0	0	32,402	46	620	5,728	38,130	6,179	0	0	\$6,179	\$31,951
6	2018	4,613	\$36,000	33,536	0	0	33,536	46	625	5,777	39,313	6,396	0	0	\$6,396	\$32,917
7	2019	4,613	\$38,000	34,708	0	0	34,708	46	630	5,822	40,530	6,618	0	0	\$6,618	\$33,912
8	2020	4,613	\$39,000	35,925	0	0	35,925	46	635	5,868	41,793	6,851	0	0	\$6,851	\$34,942
9	2021	4,613	\$40,000	37,182	0	0	37,182	46	645	5,960	43,142	7,090	0	0	\$7,090	\$36,052
10	2022	4,613	\$42,000	38,482	0	0	38,482	46	650	6,006	44,488	7,339	0	0	\$7,339	\$37,149
11	2023	4,454	\$43,000	38,456	0	0	38,456	45	655	5,843	44,299	7,330	0	0	\$7,330	\$36,969
12	2024	4,454	\$45,000	39,800	0	0	39,800	45	665	5,932	45,732	7,589	0	0	\$7,589	\$38,143
13	2025	4,454	\$46,000	41,195	0	0	41,195	45	670	5,976	47,171	7,855	0	0	\$7,855	\$39,316
14	2026	4,454	\$48,000	42,639	0	0	42,639	45	675	6,023	48,662	8,129	0	0	\$8,129	\$40,533
15	2027	4,454	\$50,000	44,130	0	0	44,130	45	685	6,111	50,241	8,413	0	0	\$8,413	\$41,828
16	2028	4,045	\$51,000	41,482	0	0	41,482	41	690	5,589	47,071	7,900	0	0	\$7,900	\$39,171
17	2029	4,045	\$53,000	42,933	0	0	42,933	41	695	5,630	48,563	8,175	0	0	\$8,175	\$40,388
18	2030	4,045	\$55,000	44,434	0	0	44,434	41	705	5,711	50,145	8,461	0	0	\$8,461	\$41,684
19	2031	0	\$57,000	0	0	0	0	0	710	0	0	0	0	0	\$0	\$0
20	2032	0	\$59,000	0	0	0	0	0	720	0	0	0	0	0	\$0	\$0
21	2033	0	\$61,000	0	0	0	0	0	725	0	0	0	0	0	\$0	\$0
22	2034	0	\$0.000	0	0	0	0	0	0	0	0	0	0	0	\$0	\$0
Total =		80,535									\$770,606				\$270,133	\$500,473
															\$206,665	\$181,742
Total NPV =			\$181,742													
Benefit/Cost Ratio =			1.88													

NPV =

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

Excludes Energy Audit Reimbursement

**Table 2
Utility Cost Test**

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

Year	Benefits			Costs			Annual Benefits Less Costs (G)
	Total Energy Savings (A)	Total Demand Savings (B)	Annual Total Savings (C)	Program Admin Costs (D)	Incentive Costs (E)	Utility Program Costs (F)	
2013	\$28,236	\$5,498	\$33,734	\$14,791	\$128,320	\$143,111	(\$109,377)
2014	29,223	5,544	34,767	0	0	0	34,767
2015	30,247	5,591	35,838	0	0	0	35,838
2016	31,304	5,683	36,987	0	0	0	36,987
2017	32,402	5,728	38,130	0	0	0	38,130
2018	33,536	5,777	39,313	0	0	0	39,313
2019	34,708	5,822	40,530	0	0	0	40,530
2020	35,925	5,868	41,793	0	0	0	41,793
2021	37,182	5,960	43,142	0	0	0	43,142
2022	38,482	6,006	44,488	0	0	0	44,488
2023	38,456	5,843	44,299	0	0	0	44,299
2024	39,800	5,932	45,732	0	0	0	45,732
2025	41,195	5,976	47,171	0	0	0	47,171
2026	42,639	6,023	48,662	0	0	0	48,662
2027	44,130	6,111	50,241	0	0	0	50,241
2028	41,482	5,589	47,071	0	0	0	47,071
2029	42,933	5,630	48,563	0	0	0	48,563
2030	44,434	5,711	50,145	0	0	0	50,145
2031	0	0	0	0	0	0	0
2032	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	0
2034	0	0	0	0	0	0	0
Total =			\$770,606			\$143,111	\$627,495
NPV =			\$388,407			\$143,111	\$245,296
Total NPV =			\$245,296				
Benefit/Cost Ratio =			<u>2.71</u>				

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

Excludes Energy Audit Reimbursement

**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)	
2013	\$28,236	\$5,498	\$33,734	6,674	5	4,803	\$45,211	143,111	136,500	\$279,611	(\$234,400)
2014	29,223	5,544	\$34,767	6,979	5	4,913	46,659	0	0	0	46,659
2015	30,247	5,591	\$35,838	7,282	5	5,028	48,148	0	0	0	48,148
2016	31,304	5,683	\$36,987	7,585	6	5,143	49,715	0	0	0	49,715
2017	32,402	5,728	\$38,130	7,889	6	5,263	51,282	0	0	0	51,282
2018	33,536	5,777	\$39,313	8,191	6	5,383	52,887	0	0	0	52,887
2019	34,708	5,822	\$40,530	8,495	6	5,509	54,534	0	0	0	54,534
2020	35,925	5,868	\$41,793	8,799	6	5,632	56,224	0	0	0	56,224
2021	37,182	5,960	\$43,142	9,102	6	5,762	58,006	0	0	0	58,006
2022	38,482	6,006	\$44,488	9,405	6	5,895	59,788	0	0	0	59,788
2023	38,456	5,843	\$44,299	9,710	7	5,822	59,831	0	0	0	59,831
2024	39,800	5,932	\$45,732	10,013	7	5,955	61,700	0	0	0	61,700
2025	41,195	5,976	\$47,171	10,316	7	6,094	63,581	0	0	0	63,581
2026	42,639	6,023	\$48,662	10,620	7	6,236	65,518	0	0	0	65,518
2027	44,130	6,111	\$50,241	10,923	7	6,378	67,542	0	0	0	67,542
2028	41,482	5,589	\$47,071	10,372	7	5,926	63,369	0	0	0	63,369
2029	42,933	5,630	\$48,563	10,645	7	6,060	65,268	0	0	0	65,268
2030	44,434	5,711	\$50,145	10,917	8	6,201	67,263	0	0	0	67,263
2031	0	0	\$0	0	8	0	0	0	0	0	0
2032	0	0	\$0	0	8	0	0	0	0	0	0
2033	0	0	\$0	0	8	0	0	0	0	0	0
2034	0	0	\$0	0	0	0	0	0	0	0	0
Total =							\$1,036,526			\$279,611	\$756,915
NPV =							\$725,259			\$279,611	\$445,648
Total NPV =		\$445,648									
Benefit/Cost Ratio =		<u>2.59</u>									

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

Excludes Energy Audit Reimbursement

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

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

Excludes Energy Audit Reimbursement

Table 5
Total Resource Cost Test

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

Year	Benefits				Costs			Annual Benefits Less Costs (H)
	Total Energy Savings (A)	Total Demand Savings (B)	Non-Gas Energy Savings (C)	Total Annual Benefits (D)	Utility Program Costs (E)	Participants' Costs Net of Rebate (F)	Total Costs (G)	
2013	\$28,236	\$5,498	\$6,674	\$40,408	\$143,111	\$136,500	\$279,611	(\$239,203)
2014	29,223	5,544	6,979	41,746	0	0	0	\$41,746
2015	30,247	5,591	7,282	43,120	0	0	0	\$43,120
2016	31,304	5,683	7,585	44,572	0	0	0	\$44,572
2017	32,402	5,728	7,889	46,019	0	0	0	\$46,019
2018	33,536	5,777	8,191	47,504	0	0	0	\$47,504
2019	34,708	5,822	8,495	49,025	0	0	0	\$49,025
2020	35,925	5,868	8,799	50,592	0	0	0	\$50,592
2021	37,182	5,960	9,102	52,244	0	0	0	\$52,244
2022	38,482	6,006	9,405	53,893	0	0	0	\$53,893
2023	38,456	5,843	9,710	54,009	0	0	0	\$54,009
2024	39,800	5,932	10,013	55,745	0	0	0	\$55,745
2025	41,195	5,976	10,316	57,487	0	0	0	\$57,487
2026	42,639	6,023	10,620	59,282	0	0	0	\$59,282
2027	44,130	6,111	10,923	61,164	0	0	0	\$61,164
2028	41,482	5,589	10,372	57,443	0	0	0	\$57,443
2029	42,933	5,630	10,645	59,208	0	0	0	\$59,208
2030	44,434	5,711	10,917	61,062	0	0	0	\$61,062
2031	0	0	0	0	0	0	0	\$0
2032	0	0	0	0	0	0	0	\$0
2033	0	0	0	0	0	0	0	\$0
2034	0	0	0	0	0	0	0	\$0
			Total =	\$934,523			\$279,611	\$654,912
			NPV =	\$469,909			\$279,611	190,298

Total NPV = \$190,298
Benefit/Cost Ratio = 1.68

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