



**MONTANA-DAKOTA**  
**UTILITIES CO.**

A Division of MDU Resources Group, Inc.

400 North Fourth Street  
Bismarck, ND 58501  
(701) 222-7900

July 1, 2009

Executive Secretary  
North Dakota Public Service Commission  
State Capitol  
600 East Boulevard  
Bismarck, ND 58505-0480

Re: Electric Demand-Side Management  
Programs and Conservation  
Case No. PU-09-\_\_\_\_\_

Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc. (Montana-Dakota) herewith submits for the North Dakota Public Service Commission's (Commission) consideration and approval a portfolio of electric demand-side management (DSM) and conservation programs in compliance with Order Paragraph 2 of the Findings of Fact, Conclusions of Law and Order issued by the Commission in Case Nos. PU-06-481 and PU-06-482, dated August 27, 2008. The Company is also proposing an associated Load Management Tracking Adjustment Rate 54 tariff to recover the costs of the proposed programs. On January 20, 2009, Montana-Dakota requested Commission approval to extend the deadline to file a proposed DSM and conservation portfolio to July 1, 2009 to coincide with the submission of the Company's 2009 Integrated Resource Plan (IRP). The Company's request was granted on February 11, 2009. On July 1, 2009, Montana-Dakota filed its 2009 IRP with the Commission.

Montana-Dakota is proposing an electric DSM and conservation portfolio consisting of nine programs to be offered to North Dakota customers over the course of the next two years. The DSM portfolio includes incentives for residential high efficiency air conditioners, Energy Star appliances, commercial lighting, Refrigerator Round-Up, commercial motors, commercial high efficiency air conditioning, a residential air conditioning cycling program, a residential new construction bundle and a residential lighting program. A biennial review of the Company's portfolio is being proposed to allow for the continued coordination between the filing of the Company's IRP and the Commission's review of the Company's portfolio of electric energy efficiency programs.

The Company focused on three primary objectives in developing the proposed portfolio of electric energy conservation and demand-side management programs:

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Electric Demand-Side Management Programs and Conservation  
Montana-Dakota Utilities Co., a Division of MDU Resources Group, Inc.  
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Electric Demand-Side Management Programs and  
Conservation  
Montana-Dakota Utilities Co., a Division of MDU  
Resources Group, Inc.  
Donald Ball

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Electric Demand-Side Management Programs  
and Conservation  
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Donald Ball

- (1) Develop a portfolio of programs that are determined to be cost effective based on industry standard benefit/cost ratios,
- (2) Develop a portfolio of programs that can be implemented in the near-term and
- (3) Develop a portfolio of programs that are consistent with the integration analysis performed as part of the IRP.

All programs will be promoted through local advertising, the Company's web site, home shows, bill inserts and community meetings. The programs are briefly outlined below with additional details regarding each program provided in Attachment A.

1. *Energy Star Appliances.* The program provides residential customers a rebate of \$15 for the purchase and installation of qualifying Energy Star appliances.
2. *Residential High Efficiency Air Conditioning.* This program provides residential customers a \$175/ton rebate for the replacement of central air conditioners with new qualifying higher efficiency central air conditioners.
3. *Refrigerator Round-Up.* The program offers residential customers a \$35 incentive for the removal of an older, less efficient refrigerator in a customer's home.
4. *Residential Air Conditioning Cycling.* Customers are provided a free controllable thermostat that allows the Company to control the participating customer's air conditioner during Company peak operating hours.
5. *Commercial Lighting Retrofits.* The program provides a \$0.20 per watt incentive for the replacement of existing T-12 lighting with new, higher efficiency lighting.
6. *Commercial Motors.* The program provides customers an incentive of \$0.15/Kwh saved for the replacement of existing motors with higher efficiency motors.
7. *Commercial High Efficiency Air Conditioning.* This program provides commercial customers a \$100/ton rebate for the replacement of central air conditioners with new qualifying higher efficiency central air conditioners.
8. *Residential New Construction Bundle.* Under this program, customers will be offered two levels of rebates. (1) Customers will receive a \$500 rebate for the installation of a qualifying air conditioner and a minimum level of qualifying lighting. (2) Customers would receive an additional \$100 rebate for the installation of at least two of three identified Energy Star appliances.

9. *Residential Lighting Program.* Customers are offered free compact fluorescent light bulbs under this program.

The Company also offers an Interruptible Large Power Demand Response Rate 38 tariff to qualifying North Dakota customers whereby customers pay a reduced demand charge in exchange for the Company's ability to interrupt electric service during peak operating times. While this tariff is included as a Demand Response Program in Montana-Dakota's 2009 IRP as a demand-side resource, the Company is not including any of the costs or savings herein as the tariff is an existing Commission approved rate and costs are recovered accordingly.

Montana-Dakota performed four tests (Ratepayer, Utility, Societal and Participant) on each of the programs to measure the cost effectiveness based on the benefit/cost ratios produced. Each of the four tests determines the cost effectiveness of the program from a different perspective.

- The *Ratepayer Test* includes all of the quantifiable benefits and costs of a program and its impact on all ratepayers. The total costs saved are compared to the total increase in the revenue requirement caused by the costs of the program. A ratio greater than one indicates the program will reduce overall rates, while a ratio less than one implies the program will cause rates to increase.
- The *Utility Test* compares the cost of energy saved to the total cost of saving that amount of energy. The total cost of energy saved is compared to the costs associated with reaching those savings, i.e. incentives, administrative costs, lost margins. A benefit/cost ratio greater than one indicates the cost of energy saved is greater than the cost of saving the energy.
- The *Societal Test* measures the net costs of a conservation/DSM program based on its total costs, including the participant's and utility's costs as well as the avoided environmental externalities. The total savings are compared to the total cost of the program. A benefit/cost ratio greater than one indicates that society as a whole will benefit from the program.
- The *Participant Test* considers the economic impact of a program that accrues directly to the participating customers. The total cost to the participants is compared to the total annual benefits received in the form of rebates and bill savings resulting from implementing the program. A ratio of one indicates the program will result in savings to the participant.

Montana-Dakota evaluated each program's feasibility based on the results of the Ratepayer Test. If the resulting benefit /cost ratio was greater than one, the program was considered feasible and evaluated further. The results of the tests are summarized in Attachment B by program and the benefit/cost worksheets are provided in Attachment D.

Montana-Dakota is also proposing to implement an education and outreach effort. This effort will include newspaper inserts on conservation, an online energy tool where customers can evaluate their energy consumption and perform energy conservation scenarios, dealer and builder meetings, and a kindergarten through eighth grade outreach program. While these are indirect conservation programs that do not produce measureable savings, the programs do promote and educate customers about the benefits associated with conserving energy.

The total cost of the Company's DSM/conservation portfolio is estimated to be approximately \$1,021,000 in the first year while producing an annual energy savings of 2.6 MWH and avoiding 2.0 MW of capacity requirements. A summary of the anticipated participants in each program, Kwh saved and annual KW avoided is included in Attachment C. Based on estimated participation rates in North Dakota, the Company's portfolio is expected to produce Kwh savings of 5.7 MWH and avoided capacity requirements of 7.7 MW over the two year period 2010 - 2011.

Montana-Dakota is proposing a Load Management Tracking Adjustment (LMTA) Rate 54 tariff, included herein as Exhibit 1. The recovery of the proposed program costs is integral to a utility offering its customers DSM and conservation programs. Additionally, to the extent a customer uses less energy due to an efficiency measure installed; a utility is not recovering the fixed costs associated with providing that service. Costs to be recovered through the proposed LMTA would be the actual costs incurred by Montana-Dakota and the associated lost margin due to implemented measures. The billing of the LMTA would be on a per Kwh applicable to all retail sales schedules for energy sold.

While the Company's proposed Rate 54 tariff does not include a prescribed financial incentive at this time, Montana-Dakota strongly supports the inclusion of financial incentives as part of the cost recovery mechanism. Financial incentives, whether in the form of performance incentives or capitalization of programs, serve to reduce a utility's disincentive towards DSM/conservation and resulting reduced sales. Montana-Dakota is requesting consideration of a financial incentive mechanism as a provision of the proposed LMTA. Such a provision is appropriately considered here as part of this request and in conjunction with similar initiatives currently under review by the Commission including; the Commission's proposed rulemaking in Case No. PU-08-884

in which the Commission is exploring policies and methodologies for evaluating electric utility energy efficiency and load management programs and the Commission's ongoing review of the Energy Independence and Security Act of 2007 (EISA), in Case No. PU-09-20, whereby one of the provisions requires states to conduct an investigation into and issue a decision on whether to adopt new electric policy standards regarding rate design modifications to promote energy efficiency investments.

Montana-Dakota also notes that a potential may exist to leverage funding for proposed programs with dollars available under the American Recovery and Reinvestment Act of 2009. Montana-Dakota asks that the Commission and Staff consider this opportunity, as it develops, when assessing Montana-Dakota's proposed portfolio of programs.

Montana-Dakota looks forward to working with the Commission and Staff in developing an appropriate energy efficiency portfolio for Montana-Dakota's customers.

If you have any questions, please contact:

Ms. Tamie Aberle  
Pricing & Tariff Manager  
400 North Fourth Street  
Bismarck, ND 58501  
(701) 222-7856

Also, please send copies of all written inquiries, correspondence and pleadings to:

Daniel S. Kuntz  
Associate General Counsel  
MDU Resources Group, Inc.  
P.O. Box 5650  
Bismarck, ND 58506-5650

The original and seven (7) copies of this Letter of Transmittal proposed tariff and supporting workpapers have been provided to the Commission. The filing has also been electronically submitted to the Commission.

Montana-Dakota submitted a check for the amount of \$600.00 in accordance with North Dakota Century Code Section 49-05-05 on January 9, 2009. The \$50.00 filing fee can be deducted from this balance.

Montana-Dakota respectfully requests that this filing be accepted as being in full compliance with the filing requirements of this Commission.

Please acknowledge receipt by stamping or initialing the duplicate copy of this letter attached hereto and returning the same in the enclosed self-addressed, stamped envelope.

Sincerely,

A handwritten signature in black ink that reads "Donald R. Ball". The signature is written in a cursive style with a large, prominent "D" and "B".

Donald R. Ball  
Vice President – Regulatory Affairs

Attachments

**Exhibit 1**  
**Load Management Tracking**  
**Adjustment Rate 54 Tariff**



# Montana-Dakota Utilities Co.

A Division of MDU Resources Group, Inc.

400 N 4<sup>th</sup> Street  
Bismarck, ND 58501

## State of North Dakota Electric Rate Schedule

NDPSC Volume 4  
2<sup>nd</sup> Revised Sheet No. 1  
Canceling 1<sup>st</sup> Revised Sheet No. 1

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Issued By: Donald R. Ball  
Vice President -  
Regulatory Affairs

Case No.:



# Montana-Dakota Utilities Co.

A Division of MDU Resources Group, Inc.

400 N 4<sup>th</sup> Street  
Bismarck, ND 58501

## State of North Dakota Electric Rate Schedule

NDPSC Volume 4  
Original Sheet No. 38

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### LOAD MANAGEMENT TRACKING ADJUSTMENT Rate 54

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#### Applicability:

This rate schedule represents a Load Management Tracking Adjustment (LMTA) mechanism and specifies the procedure to be utilized to recover the costs of Montana-Dakota's Demand-Side Management (DSM) and Conservation programs, as authorized by the Commission, including the recovery of lost revenue attributable to reduced sales levels resulting from customer participation in the programs and any financial incentives awarded by the Commission. This adjustment shall be applicable to all retail customers for electric energy sold.

#### Load Management Tracking Adjustment:

1. An adjustment per Kwh will be determined for each rate schedule subject to the Load Management Tracking Adjustment mechanism. Monthly bills beginning with the first billing cycle each January 1 will be adjusted by the application of the LMTA rate indicated below, unless the Commission shall otherwise order.
2. The rate will reflect the amortization of the DSM and conservation program costs for each measure implemented in the preceding twelve month period, including the lost margin attributable to reduced sales resulting from customer participation in the program. The total program costs will be amortized over the projected Kwh sales to be sold over the next twelve month period. Following the initial one-year term and annually thereafter, the adjustment calculation shall include actual program expenditures and any over or under collection of revenue from the preceding twelve months plus any financial incentives awarded by the Commission.
3. Montana-Dakota shall file each adjustment at least 30 days prior to the proposed effective date.
4. Load Management Tracking Adjustment (LMTA):

LMTA per Kwh = 0.000¢

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Date Filed: July 1, 2009

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400 N 4<sup>th</sup> Street  
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## State of North Dakota Electric Rate Schedule

NDPSC Volume 4  
1<sup>st</sup> Revised Sheet No. 1  
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## State of North Dakota Electric Rate Schedule

NDPSC Volume 4  
Original Sheet No. 38

### LOAD MANAGEMENT TRACKING ADJUSTMENT Rate 54

Page 1 of 1

#### **Applicability:**

This rate schedule represents a Load Management Tracking Adjustment (LMTA) mechanism and specifies the procedure to be utilized to recover the costs of Montana-Dakota's Demand-Side Management (DSM) and Conservation programs, as authorized by the Commission, including the recovery of lost revenue attributable to reduced sales levels resulting from customer participation in the programs and any financial incentives awarded by the Commission. This adjustment shall be applicable to all retail customers for electric energy sold.

#### **Load Management Tracking Adjustment:**

1. An adjustment per Kwh will be determined for each rate schedule subject to the Load Management Tracking Adjustment mechanism. Monthly bills beginning with the first billing cycle each January 1 will be adjusted by the application of the LMTA rate indicated below, unless the Commission shall otherwise order.
2. The rate will reflect the amortization of the DSM and conservation program costs for each measure implemented in the preceding twelve month period, including the lost margin attributable to reduced sales resulting from customer participation in the program. The total program costs will be amortized over the projected Kwh sales to be sold over the next twelve month period. Following the initial one-year term and annually thereafter, the adjustment calculation shall include actual program expenditures and any over or under collection of revenue from the preceding twelve months plus any financial incentives awarded by the Commission.
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LMTA per Kwh = 0.000¢

Date Filed:

Effective Date:

Issued By: Donald R. Ball  
Vice President -  
Regulatory Affairs

Case No.:

## **Montana-Dakota Utilities Co. Electric DSM and Conservation Programs 2010 – 2011 Program Years**

Montana-Dakota is proposing an electric DSM and conservation portfolio consisting of nine programs. An analysis was performed on each program to determine the program's feasibility from a ratepayer, utility, societal and participant perspective. Montana-Dakota evaluated each program's feasibility based on the results of the Ratepayer Test. If the resulting benefit/cost ratio was greater than one, the program was considered feasible and evaluated further. The results are provided in Attachment B.

### **Education and Outreach**

Montana-Dakota's education and outreach efforts are designed to educate customers and HVAC dealers about the benefits of conservation, provide energy conservation resources for customers and dealers to use, and promote energy conservation. To accomplish this Montana-Dakota plans to focus its resources in three primary areas: 1) Newspaper Conservation Inserts 2) Dealer and Builder meetings 3) Customer education and promotion.

The newspaper inserts will be designed to provide the consumer resources and information on ways they can begin to reduce their energy use at home and about available conservation incentive programs. Although it is difficult to quantify the effects on a customer's consumption level of providing this resource to customers, the inserts are a valuable resource for providing an educational tool to customers who are interested in controlling their energy use and making customers aware of conservation incentives and programs.

In an effort to educate home builders and dealers on the benefits of conservation and its conservation programs, Montana-Dakota will host meetings in key locations across its service territory. To maximize attendance these meetings will be planned over the winter months as these are typically slower times for builders.

The Company's customer education and promotion efforts will include participation in trade shows, energy awareness events, developing kindergarten through eighth grade education using resources from Energy Hog, and media advertising such as billboards, flyers, and inserts.

## **Energy Star® Appliances**

Montana-Dakota will offer a \$15 incentive to participants for the purchase and installation of an ENERGY STAR® refrigerator or freezer. ENERGY STAR® refrigerators and freezers are more than 15 percent more efficient than current standards and will reduce energy consumption in the participant's home. The Company is planning to work with participating dealers to offer point-of-purchase incentives to the participants with reimbursement going to the dealers.

## **Residential High Efficiency A/C**

Montana-Dakota will offer a \$175 per ton incentive to residential customers for the purchase and installation of a central air conditioner with a 15 SEER or higher. The average tonnage of air conditioners is 2-3 tons so typical rebates are \$350 to \$525 per participant.

Central air conditioning is typically the largest electric energy usage appliance in the home and replacing a central air conditioning unit that is more than twelve years old, with an ENERGY STAR® qualified model could reduce the participant's cooling costs by 30 percent.

## **Refrigerator Round-Up**

Montana-Dakota will offer residential customers a \$35 incentive, free pickup, and recycling of a customer's older refrigerator in operation at their home. Montana-Dakota implemented this program in Montana in August 2008 during a specified week for collection. Participation was significantly lower than expected and operating costs per participant were almost twice as much as had been expected. While the program remains cost effective even with the higher operating cost, Montana-Dakota is planning to restructure the delivery of this program in 2010 by making the program available on a continual basis with pickup and delivery handled by a third-party vendor.

## **Residential Air Conditioning (A/C) Cycling**

The Residential A/C Cycling program is a voluntary offering to customers who agree to allow Montana-Dakota to cycle their central air conditioning unit during peak energy use days in a Company coordinated effort to reduce overall system load. Customers would receive a programmable thermostat and installation at no charge for successful participation in the program.

The primary purpose of the programmable thermostat is to allow the Company to remotely cycle the participating customer's air conditioner during peak energy use times. The Company would be allowed to exercise such control without notice, but only on weekdays during the period beginning June 1 and ending September 30 of each

year, excluding national holidays. The degree of cycling will depend on the current energy situation, though the Company may electronically cycle the customers air conditioner using various control strategies, including standard cycle, discrete shed and temperature profile that include pre-cooling and temperature ramping.

The thermostat can also be used throughout the year to reduce a customer's annual total energy consumption. Customers would be able to program the thermostat to increase or reduce the temperature in their home at determined times throughout the day all year.

As shown on Attachment C, this program represents the majority of the proposed total portfolio budget due the infrastructure necessary to implement the program. However, this investment provides a high level of certainty in regard to demand reduction over the long term. Montana-Dakota will submit a separate tariff detailing the specifics of the cycling program operation as the program is more fully developed.

### **Commercial Lighting Retrofits**

Montana-Dakota will offer a \$0.20 per watt incentive for replacing existing T-12 lighting with new, higher-efficiency lighting. This program offers incentives for retrofitting and replacing all types of commercial lighting on a per watt saved basis. The average rebate is \$8.00 for the most common type of fixture, which is a four foot, four lamp fluorescent fixtures. This is Montana-Dakota's most successful conservation program to date for the Company's integrated system.

### **Commercial Motors**

Montana-Dakota will offer a \$0.15 per kWh saved incentive. The incentive will be determined by the motor size and operating characteristics as modeled using Motor Master, which is motor analysis tool created by the U.S. Department of Energy (DOE) to determine the savings generated by replacing that motor with higher efficient one. Variable speed drives will also be covered under this program at the same \$0.15 per kWh saved rebate level.

### **Commercial High Efficiency A/C**

Montana-Dakota will offer a \$100 per ton incentive to commercial customers for the purchase and installation of qualifying commercial air conditioners. The program is applicable only to split systems, packaged terminal units and packaged rooftop units.

## **Residential New Construction Bundle**

Montana-Dakota is taking a bundle approach to increasing the efficiency of new construction homes. This bundled approach consists of two incentive levels with air conditioning and lighting addressed in the first incentive level and home appliances items such as refrigerators, dishwashers, and clothes washers addressed in the second incentive level.

In order to qualify for the first incentive level the new home would be required to have a minimum of a 15 SEER air conditioner installed and at least fifteen Compact Fluorescent light bulbs (CFL's) installed to qualify for a \$500 incentive. The second incentive level would be applicable if the new homeowner installs at least two of three approved ENERGY STAR appliances (Refrigerator, Dishwasher, and Clothes Washer) and would add another \$100 incentive. The total bundled incentive would be \$600 per home that achieves the equipment efficiencies and appliance requirements.

## **Residential Lighting Program**

Under the Residential Lighting Program, customers would be offered free compact fluorescent light bulbs. The program would be administered through various delivery mechanisms that would give the light bulbs to customers at home shows, trade shows and various other community events. Montana-Dakota would also plan other events as part of the Energy Star *Change a Light, Change a World* campaign.

# 2009 DSM Program Summary

## All Programs

DSM Program	Customer Segment	Program Objective	Utility B/C Ratio	Rate Payer B/C Ratio	Societal B/C Ratio	Participant B/C Ratio
Interruptible Rate - Demand Response Only	CI	PC	6.18	6.31	5.91	3.85
Residential A/C Cycling (No Incentive)	R	PC	1.71	1.80	3.37	INF
High Efficiency A/C Residential	R	SC	5.73	7.47	15.21	1.75
Residential Appliances (Refrigerators & Freezers)	R	SC	2.50	3.22	5.95	2.91
Refrigerator Round-Up	R	SC	4.10	7.80	20.56	INF
Residential Lighting (Various Delivery Methods)	R	SC	9.50	23.20	39.88	INF
Commercial Lighting	CI	SC	8.65	16.18	4.37	1.10
High Efficiency A/C Commercial	CI	SC	6.41	7.40	13.22	1.94
Commercial High Efficiency Motors	CI	SC	4.83	7.81	3.49	1.18
Residential New Construction Bundle	R	SC	7.15	10.69	16.79	2.07

PC = Peak Clipping

C= Commercial

INF= Infinity as participant has no cost participation amount

SLG = Strategic Load Growth

R= Residential

SC = Strategic Conservation

I = Industrial

**Montana-Dakota Utilities Co.  
Electric Utility - North Dakota  
Demand-Side Management and Conservation Portfolio  
2010 - 2011 Program Years**

<u>2010 Program</u>	<u>Participants</u>	<u>Kwh Saved</u>	<u>Annual KW Avoided</u>	<u>Total Cost</u>	<u>Cost/Kwh</u>	<u>Cost/KW</u>
<b>Demand Response Programs</b>						
Residential A/C Cycling	780	109,411	842	\$700,560	\$6.40	\$832.02
Total Demand Response	780	109,411	842	700,560	6.40	832.02
<b>Conservation Programs</b>						
Residential High Efficiency A/C	60	46,613	60	\$34,440	\$0.74	\$574.00
Residential Energy Star Appliances	200	15,538	9	12,800	0.82	1,422.22
Refrigerator Round-Up	75	67,799	29	17,625	0.26	607.76
Residential Lighting	3,600	132,732	121	15,120	0.11	124.96
Residential New Construction Bundle	40	50,795	60	24,460	0.48	407.67
Commercial Lighting	50	2,012,335	805	162,450	0.08	201.80
Commercial High Efficiency A/C	25	25,626	23	13,725	0.54	596.74
Commercial Motors	66	125,550	28	20,688	0.16	738.86
Total Conservation	4,116	2,476,988	1,135	301,308	0.12	265.47
<b>Education and Outreach</b>				\$18,785		
Total Programs - 2010	<u>4,896</u>	<u>2,586,399</u>	<u>1,977</u>	<u>1,020,653</u>	\$0.39	\$516.26

**Montana-Dakota Utilities Co.  
Electric Utility - North Dakota  
Demand-Side Management and Conservation Portfolio  
2010 - 2011 Program Years**

<u>2011 Program</u>	<u>Participants</u>	<u>Kwh Saved</u>	<u>Annual KW Avoided</u>	<u>Total Cost</u>	<u>Cost/Kwh</u>	<u>Cost/KW</u>
<b>Demand Response Programs</b>						
Residential A/C Cycling	4,225	592,640	4,558	\$2,277,186	\$3.84	\$499.60
Total Demand Response	4,225	592,640	4,558	2,277,186	3.84	499.60
<b>Conservation Programs</b>						
Residential High Efficiency A/C	80	62,150	79	\$44,940	\$0.72	\$568.86
Residential Energy Star Appliances	200	15,538	9	12,800	0.82	1,422.22
Refrigerator Round-Up	75	67,799	29	17,700	0.26	610.34
Residential Lighting	3,600	132,732	121	15,120	0.11	124.96
Residential New Construction Bundle	60	76,192	91	35,960	0.47	395.16
Commercial Lighting	50	2,012,335	805	162,450	0.08	201.80
Commercial High Efficiency A/C	25	25,626	24	13,725	0.54	571.88
Commercial Motors	66	125,550	29	20,688	0.16	713.38
Total Conservation	4,156	2,517,922	1,187	323,383	0.13	272.44
<b>Education and Outreach</b>				\$18,785		
Total Programs - 2011	<u>8,381</u>	<u>3,110,562</u>	<u>5,745</u>	<u>\$2,619,354</u>	\$0.84	\$455.94
Total Programs (2010 and 2011)	<u>13,277</u>	<u>5,696,961</u>	<u>7,722</u>	<u>\$3,640,007</u>	\$0.64	\$471.38

# **Program Analyses, Costs and Participants**

# Energy Star Appliances Program

Customer Class: Residential

Cost: MDU		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Operating Cost	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$ 15	\$ 15	\$ 3,000	\$ 3,000	\$ 3,000	\$ 9,000
Admin & Advertising	\$ 9,800	\$ 49	\$ 9,800	\$ 9,800	\$ 9,800	\$ 29,401
<b>Total Cost</b>		<b>\$ 64</b>	<b>\$ 12,800</b>	<b>\$ 12,800</b>	<b>\$ 12,800</b>	<b>\$ 38,401</b>

## Notes

Admin & Advertising Calculated  
 Operating Cost Calculated

## Participant Costs (Incremental Cost Basis)

Avg Cost of Standard Efficiency Model	\$ 1,070	Per Energy Star - DOE 2004
Avg Cost of Energy Star Model	\$ 1,100	Per Energy Star - DOE 2004
<b>Increased cost of Higher Eff Model</b>	<b>\$ 30</b>	Partial automatic defrost

## Participation Rate Calc

	% of Cust	Cust
Total Customers in Class	100.00%	62,068

Total Customers Available for program	62,068	
Total Estimated Saturation Percentage	1.0%	
<b>Total Participants</b>	<b>600</b>	0.97% Of total Customer Base
Participation Year 1	200	
Participation Year 2	200	
Participation Year 2	200	

## Energy Savings Calculation Fridge

Refrigerators Data	kw Conn	Annual kWh	Utilization Factor	
Conventional	0.8	479	35%	18 Cu Ft Top Freezer ice maker As per survey results 88% for FF Energy Star - DOE 2004
Energy Star	0.68	407	35%	
<b>Energy Savings</b>	<b>0.12</b>	<b>72</b>		

### Per Part

Summer Demand Reduction	0.014	Levelized for 4 months
Winter Demand Reduction	0.028	Levelized for 8 Months
<b>Total Demand Reduction</b>	<b>0.042</b>	<b>Total demand Reduction for Measure</b>
Summer Energy Reduction	24	
Winter Energy Reduction	48	

## Energy Savings Calculation Freezer (inputs not used)

Freezer Data	kw Conn	Annual kWh	Utilization Factor	
Conventional Freezer	0.9	520	35%	22 Cu ft Chest Manual DF Energy Star -DOE 2004
Energy Star Freezer	0.8	468	35%	
<b>Energy Savings</b>	<b>0.10</b>	<b>52</b>		

### Per Part

Summer Demand Reduction	0.012	Levelized for 4 months
Winter Demand Reduction	0.023	Levelized for 8 Months
<b>Total Demand Reduction</b>	<b>0.035</b>	<b>Total demand Reduction for Measure</b>
Summer Energy Reduction	17	
Winter Energy Reduction	35	

# Residential High Efficiency A/C (Energy Star Rated)

Customer Class: Residential

Cost MDU		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Operating Costs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$ 525	\$ 525	\$ 31,500	\$ 42,000	\$ 52,500	\$ 126,000
Admin & Advertising	\$ 2,940	\$ 37	\$ 2,940	\$ 2,940	\$ 2,940	\$ 8,820
<b>Total Cost</b>		<b>\$ 562</b>	<b>\$ 34,440</b>	<b>\$ 44,940</b>	<b>\$ 55,440</b>	<b>\$ 134,820</b>

## Notes

Admin & Advertising Calculated  
 Operating Cost Calculated  
 Incentive \$ 175 Per Ton

## Participant Costs (Incremental Cost Basis)

Cost of STD Eff Model (13 SEER)	\$ 1,400	Market Research with local HVAC Dealers
Cost of High Efficiency Model (15 SEER)	\$ 2,300	Market Research with local HVAC Dealers
<b>Increased cost of Higher Eff Model</b>	<b>\$ 900</b>	

## Participation Rate Calc

	% of Cust	Cust	
Total Customers in Class	100.00%	62,068	
Total Customers With Central AC	50.64%	31,431	Per 2004 Customer Survey
Total Customers with Evap or Swamp Coolers	0.81%	503	Per 2004 Customer Survey

Total Available for program	31,934
Total Estimated Saturation Percentage	0.8%
<b>Total Participants</b>	<b>240</b>
Participation Year 1	60
Participation Year 2	80
Participation Year 3	100

0.39% Of total Customer Base

## Energy Savings Calculation

Equipment	kw Conn	Annual kWh	Utilization Factor
10 SEER Unit	3.8	2,160	67%
15 SEER Unit	2.9	1,440	
<b>Energy Reduction</b>	<b>0.92</b>	<b>720</b>	

EPRI for Utilization Factor  
 BismarckWeather Data used for cooling hrs

## Per Part

Summer Demand Reduction	0.9
Winter Demand Reduction	0.0
Summer Energy Reduction	720
Winter Energy Reduction	0

# Refrigerator Round-Up Program

Customer Class: **Residential**

Cost MDU		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Transport & Recycling (Operating)	\$ 75	\$ 25	\$ 5,625	\$ 5,700	\$ 5,700	\$ 17,025
Incentive Costs	\$ 35	\$ 35	\$ 2,625	\$ 2,625	\$ 2,625	\$ 7,875
Admin & Advertising	\$ 125	\$ 125	\$ 9,375	\$ 9,375	\$ 9,375	\$ 28,125
<b>Total Cost</b>	<b>\$ 235</b>	<b>\$ 185</b>	<b>\$ 17,625</b>	<b>\$ 17,700</b>	<b>\$ 17,700</b>	<b>\$ 53,025</b>

**Notes**  
 Operating Costs Calculated  
 Pick up and Recycling is estimated at loaded rate for 1.5 hr plus mileage & \$20 recycling fee at Porter Bros

\$ 75

Participant Costs	
None	\$ -

Participation Rate Calc		% of Cust	Cust
Total Customers in Class		100.00%	62,068
Total Customers with 2 Refrigerators		34.03%	21,122
Total Customers with 3 or more Refrigerators		2.43%	1,508
Total Available for program	22,630		
Total Estimated Saturation Percentage	1.0%		
<b>Total Participation</b>	<b>225</b>		0.36% Of total Customer Base
Participation Year 1	75		
Participation Year 2	75		
Participation Year 2	75		

Energy Savings Calculation			
Refrigerators Data	kw Conn	Annual kWh	Utilization Factor
Frost Free	1.5	1200	35%
Standard	1	1000	35%
<b>Avg (WAC)</b>	<b>1.415</b>	<b>1166</b>	
Percentage of replacements		30%	
Replacement Savings	0.12	72	
Average Program Savings	1	838	
<b>Per Part</b>			
Summer Demand Reduction		0.120	Levelized for 4 months
Winter Demand Reduction		0.240	Levelized for 8 Months
<b>Total Demand Reduction</b>		<b>0.359</b>	<b>Total demand Reduction for Measure</b>
Summer Energy Reduction		279	
Winter Energy Reduction		559	
<b>Total Energy Reduction</b>		<b>838</b>	

As per WAPA DSM Pocket Guide 1992  
 Assumes 1987 vintage 17.3 cu ft  
 As per survey results 88% for FF  
 UPA 1992 Study - Older Fridges

**Honeywell - Demand Response 10 MW**  
Residential & Small Commercial

T-Stat no incentive

Project Cost	2009 Year 0	2010 Year 1	2011 Year 2	2012 Year 3	2013 Year 4	2014 Year 5	2015 Year 6	2016 Year 7	2017 Year 8	2018 Year 9	2019 Year 10	Total Cost
Residential Thermostat - Installed Cost	\$0	\$259,000	\$1,554,000	\$516,000	\$60,260	\$62,086	\$63,968	\$65,907	\$67,904	\$69,963	\$72,084	\$2,793,172
Residential DCU - Installed Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Commercial Thermostat Installed Cost	\$0	\$51,800	\$129,500	\$77,700	\$6,696	\$6,898	\$7,108	\$7,323	\$7,545	\$7,774	\$8,009	\$310,352
Commercial DCU - Installed Cost	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Replacements due to failure (no warranty)	\$0	\$0	\$0	\$1,800	\$5,347	\$5,517	\$5,693	\$5,875	\$6,063	\$6,257	\$6,457	\$43,008
Network Software License Fee	\$0	\$6,800	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$6,800
Network Setup Fee	\$0	\$39,286	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$39,286
Communication Fee (After implementation)	\$0	\$0	\$0	\$12,000	\$36,000	\$36,000	\$36,000	\$36,000	\$36,000	\$36,000	\$36,000	\$264,000
Program Administration & Network Fee	\$0	\$191,640	\$287,460	\$191,640	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$670,740
Marketing & Customer Outreach	\$0	\$129,405	\$253,492	\$174,762	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$977,660
Measurement & Verification	\$0	\$22,580	\$52,686	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$75,265
Customer Incentive	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Totals</b>	<b>\$0</b>	<b>\$700,511</b>	<b>\$2,277,137</b>	<b>\$975,902</b>	<b>\$168,302</b>	<b>\$170,502</b>	<b>\$172,769</b>	<b>\$175,105</b>	<b>\$177,512</b>	<b>\$179,993</b>	<b>\$182,550</b>	<b>\$5,180,283</b>
												<b>PV</b>
												<b>\$3,904,522</b>
												<b>\$/kW before Incentive</b>
												<b>\$518</b>
												<b>Total \$/kW</b>
												<b>\$518</b>

**Project Cost Data**

**Residential**

Total Points	9,000
Residential t-stat installed	\$384.53
Residential DCU	\$215.00
Percentage Residential	90%
Percentage T-Stat	100%
Percentage DCU	0%
Points year 1 (2010)	650
Points year 2 (2011)	3,900
Points Year 3 (2012)	1,300
Marketing Cost per unit installed year 1	\$63.34
Marketing Cost per Unit Installed Yr 2 (Budgetary)	\$103.52
Marketing Mobilization (one time Fee)	\$80,000
Program Admin & Network Communications Fee (per month)	\$23,955
Cancellation Rate (Starting in Year 3)	3.0%
New Install Rate (Starting in Year 3)	3.0%
Cancellation Costs T-Stat (implementation)	\$80.00
Cancellation Costs DCU (implementation)	\$50.00
Cost per turndown	\$0.00
Turndown Rate	0.0%
Service Call Rate	\$0.00
Material cost Escalation Rate	3.0%
Failure Rate	0.1%
MDU Labor cost per hour (loaded)	\$43.54
Labor escalation rate	4.0%
Hours to install T-Stat or DCU	2
Internal annual Marketing Cost after implementation period	\$60,000
Sales Tax Rate on Equipment (T-stats or DCU)	5.5%
Annual Incentive Cost per participant (DCU)	\$0
One-time Incentive Cost per participant (T-stat)	\$0
<b>M &amp; V Cost</b>	
Communications per site	\$0.00
Equipment & Installation Per site	\$0.00
Initial M&V Analysis & Report	\$75,265
Annual M&V Analysis & Report (Third Party)	30,000

**Sm Commercial**

Total Points	1,000
Commercial Thermostat - Installed Cost	\$407.26
Commercial DCU	\$240.00
Percentage Residential	10%
Percentage T-Stat	100%
Percentage DCU	0%
Points year 1	130
Points year 2	325
Points Year 3	195
Cancellation Rate (Starting in Year 3)	3.0%
New Install Rate (Starting in Year 3)	3.0%
Material cost Escalation Rate	3.0%
Failure Rate	0.1%

**Assumptions**

Cancellation Rate and New install rate are net zero  
 New Install /cancellation assumes only 50% of equipment will be new & 50% will be reinstalled equipment  
 No savings projection for Programmable t\_stat savings per customer  
 No savings projection for cycling kWh savings  
 1 point is equal to 1 kW  
 No MDU internal administrative costs (no added head count)  
 WACC 7.2%  
 Equipment life 10 yrs  
 Cancellation charge is only for installing the unit again somewhere else no removal charge  
 No additional charge for turndowns - Hwell's Cost  
 No service call charges - Included  
 M&V Cost based on quotes from Summit Blue  
 Advertising cost per Rena includes Radio, TV, & Direct Mail  
 Assumes sales tax on only T-stat or DCU at weighted average sales tax cost  
 Material cost escalation assumed at forecasted CPI

**Energy Savings Calculation**

Equipment	kW Conn	Annual kWh	Utilization Factor	
3 Ton 10 SEER Unit	3.6	2,340	28%	Av is 1 kW per participant (Honeywell)
Cycling Hours per Year		100 hrs		100 hrs of curtailment per year or 10% cycling rate
Peak kW Reduced	1.00			Utilization Factor is based on Honeywell realized kW reduction per participant

**Per Part**

Summer Demand Reduction	1.00
Winter Demand Reduction	0.000
Summer Energy Reduction	130
Winter Energy Reduction	

# T-8 Lighting Retrofit ( 4 Lamp fixture model)

Customer Class: **Comm & Ind**

Cost MDU		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$ Yr 4	Total \$ Yr 5	Total \$
Operating Costs (Non Incentive)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$ 3,200	\$ 3,200	\$ 160,000	\$ 160,000	\$ 160,000	\$ 160,000	\$ 160,000	\$ 800,000
Admin & Advertising	\$ 2,450	\$ 49	\$ 2,450	\$ 2,450	\$ 2,450	\$ 2,450	\$ 2,450	\$ 12,250
<b>Total Cost</b>		<b>\$ 3,249</b>	<b>\$ 162,450</b>	<b>\$ 162,450</b>	<b>\$ 162,450</b>	<b>\$ 162,450</b>	<b>\$ 162,450</b>	<b>\$ 812,250</b>

**Notes**  
 Admin & Advertising Calculated  
 Operating Cost Calculated  
 \$ 8.00 per fix

Participant Costs	
Avg Cost per Fixture	\$ 55.00 Average from existing rebates submitted
Fixtures per Participant	400
<b>Total Direct Cost per Part</b>	<b>\$ 22,000</b>

Participation Rate Calc	
Total Customers in Class	Cust 10,590
Estimated fixtures per Customer	23 Derived from xenergy survey
<b>Estimated fixtures on System</b>	<b>243,570</b>

Total fixtures Available for program	243,570
Estimated Conversion Percentage	2.4%
Part Rate of Light fixtures	5,750
<b>Total Participants</b>	<b>250</b>
Participation Year 1	50
Participation Year 2	50
Participation Year 3	50
Participation Year 4	50
Participation Year 5	50

Energy Savings Calculation				
Exit Light Data (per Fix)	Watts Conn	Annual kWh	Utilization Factor	hrs/yr
Existing T-12 4 lamp Fixture	144	360	100%	2500
T-8 4 Lamp Fixture	107	267	100%	2500
<b>Reduction Per fixture</b>	<b>37</b>	<b>93</b>	<b>100%</b>	

34 w bulbs energy saving magnetic ballast  
 electronic ballast

Average number of Fixtures per participant 400

Energy Reduced	Per Fixture	Per Part	
Summer Demand Reduction	0.0373	4.97	Levelized for 4 months
Winter Demand Reduction	0.0373	9.95	Levelized for 8 Months
<b>Total Demand Reduction</b>		<b>14.92</b>	<b>Total demand Reduction for Measure</b>
Summer Energy Reduction	31	12,433	
Winter Energy Reduction	62	24,867	

\*\*\* kWh calculation assumes 2,500 hrs per year of operation as is typically for M-F 8-5pm operation

\*\*\*\* Actual Lighting program will be more comprehensive and include CFL, LED Exit Sign, & MH, however incentive will follow the same \$ per watt of savings

# Commercial High Efficiency Motors

Customer Class: **Commercial & Industrial**

Cost MDU		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Operating Cost	\$0	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$264	\$ 264	\$ 17,454	\$ 17,454	\$ 17,454	\$ 52,361
Admin & Advertising	\$3,234	\$ 49	\$ 3,234	\$ 3,234	\$ 3,234	\$ 9,702
<b>Total Cost</b>		<b>\$ 313</b>	<b>\$ 20,688</b>	<b>\$ 20,688</b>	<b>\$ 20,688</b>	<b>\$ 62,063</b>

## Notes

Admin & Advertising Calculated  
 Operating Cost Calculated  
 Incentive \$ 0.150 Per kWh Saved

## Participant Costs (Incremental Cost Basis)

Avg Cost of Standard Motor	\$ 3,320	50HP 3600 rpm - Motor Master
Avg Cost of High Efficiency Motor	\$ 4,787	50 HP 3600 rpm - Motor Master
<b>Increased cost of Higher Eff Model</b>	<b>\$ 1,467</b>	

## Participation Rate Calc

	% of Cust	Cust
Total Customers in Class	100.00%	10,590
Customer with Standard Motors	75.00%	7,943
Estimated Motors per Customer		5

Total Motors Available for Program	39,713
Total Estimated Saturation Percentage	0.5%
<b>Total Motors</b>	<b>198</b>
Participation Year 1	66
Participation Year 2	66
Participation Year 3	66

1.87% Of total Customer Base

## Energy Savings Calculation

Electric Motor Data	kw Conn	Annual kWh	Utilization Factor
Standard Motor (50hp)	37.3	106,860	100%
High Efficiency Motor(50hp)	36.9	105,097	100%
<b>Energy Savings</b>	<b>0.4</b>	<b>1,763</b>	

4380 hrs per year operation @ 60 % Load Factor  
 4380 hrs per year operation @ 60% Load Factor  
 Energy Calculation based on Motor Master - DOE  
 Example is based on 50 hp - 3600 rpm - 460 v TEFC

Per Part	
Summer Demand Reduction	0.133 Levelized for 4 months
Winter Demand Reduction	0.267 Levelized for 8 Months
<b>Total Demand Reduction</b>	<b>0.400</b> Total demand Reduction for Measure
Summer Energy Reduction	588
Winter Energy Reduction	1175

## Notes:

TEFC = Total Enclosed Fan Cooled

# Commercial High Efficiency A/C

**Customer Class:** Commercial

Cost MDU		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Operating Costs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$ 500	\$ 500	\$ 12,500	\$ 12,500	\$ 12,500	\$ 37,500
Admin & Advertising	\$ 1,225	\$ 49	\$ 1,225	\$ 1,225	\$ 1,225	\$ 3,675
<b>Total Cost</b>		<b>\$ 549</b>	<b>\$ 13,725</b>	<b>\$ 13,725</b>	<b>\$ 13,725</b>	<b>\$ 41,175</b>

**Notes**  
 Admin & Advertising Calculated  
 Operating Cost Calculated  
 Incentive \$ 100.00 per ton

Participant Costs (Incremental Cost Basis)	
Cost of STD Eff Model (10 SEER)	\$ 2,000 Trane 5 Ton Packaged Unit (\$400 per ton Mike S)
Cost of High Efficiency Model (12 SEER)	\$ 3,000 Trane 5 Ton Packaged Unit (\$600 per ton Mike S)
<b>Increased cost of Higher Eff Model</b>	<b>\$ 1,000</b>

Participation Rate Calc		% of Cust	Cust
Total Customers in Class		100.00%	10,590
Total Customers With Central AC		50.00%	5,295 Estimated no survey data
Total Customers with Evap or Swamp Coolers		0.00%	-
Total Available for program	5,295		
Total Estimated Saturation Percentage	50.00%	1.4%	
<b>Total Participants</b>	<b>75</b>		0.71% Of total Customer Base
Participation Year 1	25		
Participation Year 2	25		
Participation Year 3	25		

Energy Savings Calculation			
Equipment	kw Conn	Annual kWh	Utilization Factor
10 SEER Unit	6.86	5,700	67%
12 Seer Unit	5.56	4,750	
<b>Energy Reduction</b>	<b>1.3</b>	<b>950</b>	

Trane 5 ton Unit  
Trane 5 ton Unit

	Per Part
Summer Demand Reduction	0.9
Winter Demand Reduction	0.0
Summer Energy Reduction	950
Winter Energy Reduction	0

# Residential New Construction Bundle AC, Lighting, & Energy Star Appliances

Customer Class: **Residential**

Program Cost	\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Operating Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$ 565	\$ 22,500	\$ 34,000	\$ 48,000	\$ 104,500
Administrative Costs	\$ 1,960	\$ 1,960	\$ 1,960	\$ 1,960	\$ 5,880
<b>Total Cost</b>	<b>\$ 597</b>	<b>\$ 24,460</b>	<b>\$ 35,960</b>	<b>\$ 49,960</b>	<b>\$ 110,380</b>

Incentive AC & Lighting \$ 500  
 Incentive full package (AC, Lighting, & 2 Appliances) \$ 600

## Participant Costs (Incremental Cost Basis)

Incremental Cost		
13 to 15 SEER Air Conditioner (Includes Heat Pump)	\$ 900	3 Ton Unit
Compact Fluorescent Lighting (15 Bulbs installed in home)	\$ 45	\$3 per Bulb Minimum of 15
<b>Base Package Total</b>	<b>\$ 945</b>	
Energy Star Refrigerator	\$ 30	Energy Star Calculator
Energy Dish Washer	\$ -	Energy Star Calculator
Energy Star Clothes Washer	\$ 200	Energy Star Calculator
<b>Full Package Total</b>	<b>\$ 1,175</b>	
<b>Participant Rate Ratio incremental cost</b>	<b>\$ 1,094</b>	

## Participation Rate Calc

	% of Cust	Cust	
3 Year Average number of new homes	100.00%	602	2006-2008 Avg New Services
Total Available for program		602	
Total Estimated Saturation Percentage	11%		
	<b>AC &amp; Lighting</b>	<b>Full Package</b>	<b>Total</b>
Participation Year 1	2010	15	25
Participation Year 2	2011	20	40
	2012	30	55
<b>Total Participants</b>	<b>65</b>	<b>120</b>	<b>185</b>
	35.1%	64.9%	

## Energy Savings Calculation

Equipment	Eff	kW	kWh
13 to 15 SEER Air Conditioner	15 SEER	0.55	222
Compact Fluorescent Lighting (15 Bulbs)	E-STAR	0.8	855
<b>Bases Package Total</b>		<b>1.33</b>	<b>1,077</b>
Energy Star Refrigerator	E-STAR	0.10	52
Energy Dish Washer	E-STAR	0.00	76
Energy Star Clothes Washer	E-STAR	0.00	26
<b>Full Package Total</b>		<b>1.43</b>	<b>1,231</b>

## Other Participant Savings

Gas dk	Gas \$	Water Gallons	Water \$
0	\$0.00	0	\$0.00
0	\$0.00	0	\$0.00
0	\$0.00	0	\$0.00
0	\$0.00	0	\$0.00
1.3	\$16.00	481	\$2.00
0.9	\$ 11.18	7,000	\$31.60
<b>2.2</b>	<b>\$27.18</b>	<b>7,481</b>	<b>\$33.60</b>

**Total Other Savings \$ 60.78**

## Participation Rate Ratio Savings

kW Total **1.39**  
 Summer 0.46  
 Winter 0.93  
 KWH **1,177**  
 Summer 392  
 Winter 785  
 Other Savings \$ **\$39.42**

## AC Savings Detail

Equipment	kw Conn	Annual kWh	UF
13 SEER Unit	3.43	1,662	67%
15 SEER Unit	2.88	1,440	
<b>Energy Reductio</b>	<b>0.55</b>	<b>222</b>	

# Residential Lighting - Various Delivery Methods

Customer Class: **Residential**

Cost MDU						
		\$/Part	Total \$ Yr 1	Total \$ Yr 2	Total \$ Yr 3	Total \$
Operating Costs	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Incentive Costs	\$ 1.75	\$ 2	\$ 6,300	\$ 6,300	\$ 6,300	\$ 18,900
Admin & Advertising	\$8,820	\$ 2	\$ 8,820	\$ 8,820	\$ 8,820	\$ 26,461
<b>Total Cost</b>	<b>\$ 8,821.99</b>	<b>\$ 4</b>	<b>\$ 15,120</b>	<b>\$ 15,120</b>	<b>\$ 15,120</b>	<b>\$ 45,361</b>

## Notes

Participant Costs	
None	\$ -

## Participation Rate Calc

	% of Cust	Cust
Total Customers in Class	100.00%	62,068

Total Available for program	62,068	
Total Estimated Saturation Percentage	17.4%	
<b>Total Participation</b>	<b>10,800</b>	17.40% Of total Customer Base
Participation Year 1	3,600	
Participation Year 2	3,600	
Participation Year 2	3,600	

## Energy Savings Calculation

Refrigerators Data	kw Conn	Annual kWh	Utilization Factor
Standard 60 Watt bulb	0.06	65.7	100%
13 w CFL	0.013	14.2	100%
<b>Savings</b>	<b>0.05201</b>	<b>57.0</b>	
Percentage of replacements		60%	
Average Program Savings	0.031	34.2	

Energy Star Runtime Assumptions

No customer installation factor

### Per Part

Summer Demand Reduction	0.010	Levelized for 4 months
Winter Demand Reduction	0.021	Levelized for 8 Months
<b>Total Demand Reduction</b>	<b>0.031</b>	<b>Total demand Reduction for Measure</b>
Summer Energy Reduction	11	
Winter Energy Reduction	23	
<b>Total Energy Reduction</b>	<b>34</b>	

**ENERGY STAR Appliances  
Benefit/Cost Analysis**

**Demand-Side Management Program - DSM**  
**Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Residential Energy Star Appliances**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.07212
1a) Retail Rate Winter (\$/kWh) =	\$0.06174
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$0.00
3a) Retail Winter Demand Rate (\$/kW/season) =	\$0.00
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	3.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	585,608,722
Growth Rate =	1.03%
8) Total Customers by class =	62,068
Growth Rate =	44.00%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

<b>15) Utility Project Costs (First Year)</b>	
Admin & Promotion Costs =	\$9,800
Direct Operating Costs =	\$0
Incentive Costs =	\$3,000
<b>Total Utility Project Costs Year 1 =</b>	<b>\$12,800</b>
<b>15a) Utility Project Costs (Second Year)</b>	
Admin & Promotion Costs =	\$9,800
Direct Operating Costs =	\$0
Incentive Costs =	\$3,000
<b>Total Utility Project Costs Year 2 =</b>	<b>\$12,800</b>
15b) Total Utility Cost Year 3 =	\$12,800
15c) Total Utility Cost Year 4 =	\$0
15d) Total Utility Cost Year 5 =	\$0
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$30
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	0.014
20a) Avg Winter kW/part Saved =	0.028
21) Avg. Summer kWh/Part. Saved =	24
21a) Avg. Winter kWh/Part. Saved =	48
22) Number of Participants (First Year) =	200
22a) Number of Participants (Second Year) =	200
22a) Number of Participants (Third Year) =	200
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ 15

## Demand-Side Management Program - DSM

Integrated Electric System Cost-Effectiveness Analysis

### Summary Information

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Energy Star Appliances**

### Cost Summary

---

Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$38,401
Total Program Participants	600
Utility Cost per Participant (First Year) =	\$64.00
Utility Cost per Participant (Program) =	\$64.00
Total kW Reduction	27
Total Energy Reduction (kWh)	652,579
Societal Cost per kWh	\$0.05

### Test Results

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	<u>NPV</u>	<u>B/C</u>
Utility Test	\$63,409	2.50
Ratepayer Test	\$72,777	3.22
Societal Cost Test	\$164,632	5.95
Participant Test	\$31,849	2.91

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Energy Star Appliances**

t	Year	Cost of Energy Saved				Project Cost					Cost of Energy Saved Less Project Cost
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	(J)
1	2010	15,538	\$0.0289	\$0	9	\$395.70	\$4,036	\$12,800	409	\$13,209	(\$9,173)
2	2011	31,075	\$0.0299	0	18	\$404.33	8,260	\$12,800	820	13,620	(5,360)
3	2012	46,613	\$0.0310	0	27	\$413.18	12,679	\$12,800	1,234	14,034	(1,355)
4	2013	46,613	\$0.0321	0	27	\$422.25	12,976	\$0	1,238	1,238	11,739
5	2014	46,613	\$0.0332	0	27	\$431.54	13,281	\$0	1,241	1,241	12,040
6	2015	46,613	\$0.0344	0	27	\$441.07	13,594	\$0	1,245	1,245	12,350
7	2016	46,613	\$0.0356	0	27	\$450.83	13,916	\$0	1,248	1,248	12,668
8	2017	46,613	\$0.0368	0	27	\$460.84	14,246	\$0	1,250	1,250	12,996
9	2018	46,613	\$0.0381	0	27	\$471.10	14,585	\$0	1,253	1,253	13,332
10	2019	46,613	\$0.0394	0	27	\$481.61	14,933	\$0	1,255	1,255	13,678
11	2020	46,613	\$0.0408	0	27	\$492.39	15,290	\$0	1,257	1,257	14,034
12	2021	46,613	\$0.0422	0	27	\$503.43	15,657	\$0	1,258	1,258	14,399
13	2022	46,613	\$0.0437	0	27	\$514.76	16,034	\$0	1,259	1,259	14,775
14	2023	46,613	\$0.0452	0	27	\$526.36	16,421	\$0	1,260	1,260	15,161
15	2024	46,613	\$0.0468	0	27	\$538.26	16,818	\$0	1,260	1,260	15,558
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 652,579 381 \$202,729 \$38,401 \$17,487 \$55,887 \$146,841  
NPV = 105,605 32,827 9,369 42,196 63,409

Total NPV = \$63,409  
Benefit/Cost Ratio = 2.50

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Energy Star Appliances**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$449	\$0	\$3,587	\$4,036	\$12,800	\$12,800	(\$8,764)
2011	930	0	7,329	8,260	\$12,800	12,800	(4,540)
2012	1,444	0	11,235	12,679	\$12,800	12,800	(121)
2013	1,495	0	11,481	12,976	\$0	0	12,976
2014	1,547	0	11,734	13,281	\$0	0	13,281
2015	1,602	0	11,993	13,594	\$0	0	13,594
2016	1,658	0	12,258	13,916	\$0	0	13,916
2017	1,716	0	12,531	14,246	\$0	0	14,246
2018	1,776	0	12,809	14,585	\$0	0	14,585
2019	1,838	0	13,095	14,933	\$0	0	14,933
2020	1,902	0	13,388	15,290	\$0	0	15,290
2021	1,969	0	13,689	15,657	\$0	0	15,657
2022	2,038	0	13,997	16,034	\$0	0	16,034
2023	2,109	0	14,312	16,421	\$0	0	16,421
2024	2,183	0	14,636	16,818	\$0	0	16,818
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$24,655</b>	<b>\$0</b>	<b>\$178,074</b>	<b>\$202,729</b>	<b>\$38,401</b>	<b>\$38,401</b>	<b>\$164,328</b>
<b>NPV =</b>	<b>12,661</b>	<b>0</b>	<b>92,944</b>	<b>105,605</b>	<b>32,827</b>	<b>32,827</b>	<b>72,777</b>
<b>Total NPV =</b>		<b>\$72,777</b>					
<b>Benefit/Cost Ratio =</b>		<b>3.22</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)  
 (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)  
 (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)  
 (D) = (A) + (B) + (C)  
 (E) = Total Utility Project Costs (15)  
 (F) = (E)  
 (G) = (D) - (F)

**Table 3**  
**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
Project: **Residential Energy Star Appliances**

Year	Decreases				Increases						Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)		
2010	\$449	\$0	\$3,587	\$2,058	\$6,094	\$12,800	\$6,000	\$3,000	\$15,800	(\$9,707)	
2011	\$930	\$0	\$7,329	\$4,338	12,597	\$12,800	6,000	\$6,000	12,800	(203)	
2012	\$1,444	\$0	\$11,235	\$6,858	19,537	\$12,800	6,000	\$9,000	9,800	9,737	
2013	\$1,495	\$0	\$11,481	\$7,229	20,206	\$0	0	\$0	0	20,206	
2014	\$1,547	\$0	\$11,734	\$7,621	20,903	\$0	0	\$0	0	20,903	
2015	\$1,602	\$0	\$11,993	\$8,035	21,629	\$0	0	\$0	0	21,629	
2016	\$1,658	\$0	\$12,258	\$8,472	22,388	\$0	0	\$0	0	22,388	
2017	\$1,716	\$0	\$12,531	\$8,933	23,179	\$0	0	\$0	0	23,179	
2018	\$1,776	\$0	\$12,809	\$9,420	24,005	\$0	0	\$0	0	24,005	
2019	\$1,838	\$0	\$13,095	\$9,934	24,867	\$0	0	\$0	0	24,867	
2020	\$1,902	\$0	\$13,388	\$10,477	25,767	\$0	0	\$0	0	25,767	
2021	\$1,969	\$0	\$13,689	\$11,050	26,708	\$0	0	\$0	0	26,708	
2022	\$2,038	\$0	\$13,997	\$11,656	27,690	\$0	0	\$0	0	27,690	
2023	\$2,109	\$0	\$14,312	\$12,295	28,716	\$0	0	\$0	0	28,716	
2024	\$2,183	\$0	\$14,636	\$12,970	29,789	\$0	0	\$0	0	29,789	
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0	
<b>Total =</b>	<b>\$24,655</b>	<b>\$0</b>	<b>\$178,074</b>	<b>\$131,346</b>	<b>\$334,075</b>	<b>\$38,401</b>	<b>\$18,000</b>	<b>\$18,000</b>	<b>\$38,401</b>	<b>\$295,674</b>	
<b>NPV =</b>	<b>12,661</b>	<b>0</b>	<b>92,944</b>	<b>92,262</b>	<b>197,866</b>	<b>32,827</b>	<b>15,388</b>	<b>14,980</b>	<b>33,235</b>	<b>164,632</b>	

Total NPV = \$164,632  
Benefit/Cost Ratio = 5.95

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)
- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4  
Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Energy Star Appliances**

Year	Ratio of Part. to Total Customers (A)	Benefits					Costs					Annual Benefits Less Costs (M)			
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)		Direct Part. Costs (H)	Other Part. Costs (I)	Total Annual Costs (L)
2010	0.0022	\$3,000	4,800	9,600	\$0.086	\$0.075	3	6	\$0.00	\$0.00	\$4,129	\$6,000	\$0	\$6,000	(\$1,871)
2011	0.0031	\$6,000	9,600	19,200	\$0.088	\$0.077	6	11	\$0.00	\$0.00	\$8,315	6,000	\$0	6,000	2,315
2012	0.0022	\$9,000	14,400	28,800	\$0.090	\$0.079	8	17	\$0.00	\$0.00	\$12,560	6,000	\$0	6,000	6,560
2013	0.0015	\$0	14,400	28,800	\$0.092	\$0.081	8	17	\$0.00	\$0.00	\$3,649	0	\$0	0	3,649
2014	0.0010	\$0	14,400	28,800	\$0.094	\$0.083	8	17	\$0.00	\$0.00	\$3,740	0	\$0	0	3,740
2015	0.0007	\$0	14,400	28,800	\$0.097	\$0.085	8	17	\$0.00	\$0.00	\$3,834	0	\$0	0	3,834
2016	0.0005	\$0	14,400	28,800	\$0.099	\$0.087	8	17	\$0.00	\$0.00	\$3,929	0	\$0	0	3,929
2017	0.0003	\$0	14,400	28,800	\$0.102	\$0.089	8	17	\$0.00	\$0.00	\$4,028	0	\$0	0	4,028
2018	0.0002	\$0	14,400	28,800	\$0.104	\$0.091	8	17	\$0.00	\$0.00	\$4,128	0	\$0	0	4,128
2019	0.0002	\$0	14,400	28,800	\$0.107	\$0.094	8	17	\$0.00	\$0.00	\$4,232	0	\$0	0	4,232
2020	0.0001	\$0	14,400	28,800	\$0.109	\$0.096	8	17	\$0.00	\$0.00	\$4,337	0	\$0	0	4,337
2021	0.0001	\$0	14,400	28,800	\$0.112	\$0.098	8	17	\$0.00	\$0.00	\$4,446	0	\$0	0	4,446
2022	0.0001	\$0	14,400	28,800	\$0.115	\$0.101	8	17	\$0.00	\$0.00	\$4,557	0	\$0	0	4,557
2023	0.0000	\$0	14,400	28,800	\$0.118	\$0.103	8	17	\$0.00	\$0.00	\$4,671	0	\$0	0	4,671
2024	0.0000	\$0	14,400	28,800	\$0.121	\$0.106	8	17	\$0.00	\$0.00	\$4,788	0	\$0	0	4,788
2025	0.0000	0	0	0	\$0.124	\$0.108	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
			201,600	403,200							\$75,342	\$18,000	\$0	\$18,000	\$57,342
											\$48,509	16,660	0	16,660	31,849

Total NPV = \$31,849  
Benefit/Cost Ratio = 2.91

- (A) = Total Participants (22) / Total Customers (8)
- (B) = Incentive Costs (15)
- (C1) = Energy Reduction/Part. (21) x Participants (22)
- (C2) = Energy Reduction/Part. (21a) x Participants (22)
- (D1) = Summer Retail Rate (1)
- (D2) = Winter Retail Rate (1a)
- (E1) = kW Demand Reduction/Part. (20) x Participants (22)

- (E2) = kW Demand Reduction/Part. (20a) x Participants (22)
- (F1) = Summer Retail Demand Rate (3)
- (F2) = Winter Retail Demand Rate (3a)
- (G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)
- (H) = Direct Participant Costs (16) x Participant (22)
- (I) = Other Participant Costs (17) x Participant (22)
- (L) = (H) + (I)
- (M) = (G) - (L)

**Residential**  
**High Efficiency Air Conditioning**  
**Benefit/Cost Analysis**

**Demand-Side Management Program - DSM  
Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Air Conditioning**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.07212
1a) Retail Rate Winter (\$/kWh) =	\$0.06174
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$0.00
3a) Retail Winter Demand Rate (\$/kW/season) =	\$0.00
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	3.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	585,608,722
Growth Rate =	1.03%
8) Total Customers by class =	62,068
Growth Rate =	44.00%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$2,940
Direct Operating Costs =	\$0
Incentive Costs =	\$31,500
<b>Total Utility Project Costs Year 1 =</b>	<b>\$34,440</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$2,940
Direct Operating Costs =	\$0
Incentive Costs =	\$42,000
<b>Total Utility Project Costs Year 2 =</b>	<b>\$44,940</b>
15b) Total Utility Cost Year 3 =	\$55,440
15c) Total Utility Cost Year 4 =	\$0
15d) Total Utility Cost Year 5 =	\$0
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$900
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	0.92
20a) Avg Winter kW/part Saved =	0.0
21) Avg. Summer kWh/Part. Saved =	720
21a) Avg. Winter kWh/Part. Saved =	0
22) Number of Participants (First Year) =	60
22a) Number of Participants (Second Year) =	80
22a) Number of Participants (Third Year) =	100
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ 525

## Demand-Side Management Program - DSM

Integrated Electric System Cost-Effectiveness Analysis

### Summary Information

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Air Conditioning**

### Cost Summary

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Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$134,820
Total Program Participants	240
Utility Cost per Participant (First Year) =	\$574.00
Utility Cost per Participant (Program) =	\$561.75
Total kW Reduction	238
Total Energy Reduction (kWh)	2,579,242
Societal Cost per kWh	\$0.04

### Test Results

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	<u>NPV</u>	<u>B/C</u>
Utility Test	\$701,825	5.73
Ratepayer Test	\$736,267	7.47
Societal Cost Test	\$1,491,982	15.21
Participant Test	\$148,040	1.75



**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Air Conditioning**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$1,348	\$0	\$23,568	\$24,917	\$34,440	\$34,440	(\$9,523)
2011	3,256	0	56,192	59,449	\$44,940	44,940	14,509
2012	5,778	0	98,437	104,215	\$55,440	55,440	48,775
2013	5,980	0	100,597	106,577	\$0	0	106,577
2014	6,189	0	102,811	109,001	\$0	0	109,001
2015	6,406	0	105,081	111,487	\$0	0	111,487
2016	6,630	0	107,407	114,037	\$0	0	114,037
2017	6,862	0	109,791	116,654	\$0	0	116,654
2018	7,102	0	112,235	119,338	\$0	0	119,338
2019	7,351	0	114,740	122,091	\$0	0	122,091
2020	7,608	0	117,308	124,916	\$0	0	124,916
2021	7,875	0	119,940	127,814	\$0	0	127,814
2022	8,150	0	122,637	130,788	\$0	0	130,788
2023	8,436	0	125,402	133,838	\$0	0	133,838
2024	8,731	0	128,237	136,967	\$0	0	136,967
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$97,704</b>	<b>\$0</b>	<b>\$1,544,385</b>	<b>\$1,642,089</b>	<b>\$134,820</b>	<b>\$134,820</b>	<b>\$1,507,269</b>
<b>NPV =</b>	<b>49,831</b>	<b>0</b>	<b>800,265</b>	<b>850,095</b>	<b>113,828</b>	<b>113,828</b>	<b>736,267</b>
<b>Total NPV =</b>		<b>\$736,267</b>					
<b>Benefit/Cost Ratio =</b>		<b>7.47</b>					

- (A) = Energy Red/Part. (21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (A) + (B) + (C)
- (E) = Total Utility Project Costs (15)
- (F) = (E)
- (G) = (D) - (F)

Table 3

Societal Cost Test



This test measures the net cost of the program based on total cost including both the participant's and utility's costs.

Compar Montana-Dakota Utilities Co.  
Project: Residential Air Conditioning

Year	Decreases				Increases					Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)	
2010	\$1,348	\$0	\$23,568	\$12,704	\$37,621	\$34,440	\$54,000	\$31,500	\$56,940	(\$19,319)
2011	\$3,256	\$0	\$56,192	\$31,219	90,668	\$44,940	72,000	\$73,500	43,440	47,228
2012	\$5,778	\$0	\$98,437	\$56,370	160,585	\$55,440	90,000	\$126,000	19,440	141,145
2013	\$5,980	\$0	\$100,597	\$59,377	165,955	\$0	0	\$0	0	165,955
2014	\$6,189	\$0	\$102,811	\$62,549	171,550	\$0	0	\$0	0	171,550
2015	\$6,406	\$0	\$105,081	\$65,895	177,382	\$0	0	\$0	0	177,382
2016	\$6,630	\$0	\$107,407	\$69,424	183,462	\$0	0	\$0	0	183,462
2017	\$6,862	\$0	\$109,791	\$73,148	189,801	\$0	0	\$0	0	189,801
2018	\$7,102	\$0	\$112,235	\$77,076	196,413	\$0	0	\$0	0	196,413
2019	\$7,351	\$0	\$114,740	\$81,220	203,311	\$0	0	\$0	0	203,311
2020	\$7,608	\$0	\$117,308	\$85,592	210,508	\$0	0	\$0	0	210,508
2021	\$7,875	\$0	\$119,940	\$90,205	218,019	\$0	0	\$0	0	218,019
2022	\$8,150	\$0	\$122,637	\$95,073	225,860	\$0	0	\$0	0	225,860
2023	\$8,436	\$0	\$125,402	\$100,209	234,047	\$0	0	\$0	0	234,047
2024	\$8,731	\$0	\$128,237	\$105,628	242,596	\$0	0	\$0	0	242,596
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0
<b>Total =</b>	<b>\$97,704</b>	<b>\$0</b>	<b>\$1,544,385</b>	<b>\$1,065,689</b>	<b>\$2,707,778</b>	<b>\$134,820</b>	<b>\$216,000</b>	<b>\$231,000</b>	<b>\$119,820</b>	<b>\$2,587,958</b>
<b>NPV =</b>	<b>49,831</b>	<b>0</b>	<b>800,265</b>	<b>746,852</b>	<b>1,596,947</b>	<b>113,828</b>	<b>182,208</b>	<b>191,071</b>	<b>104,965</b>	<b>1,491,982</b>
<b>Total NPV =</b>										<b>\$1,491,982</b>
<b>Benefit/Cost Ratio =</b>										<b>15.21</b>

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)
- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4**  
**Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Air Conditioning**

Year	Ratio of Part. to Total Customers (A)	Benefits						Costs						Annual Benefits Less Costs (M)	
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)		Total Annual Costs (L)
2010	0.0007	\$31,500	43,200	0	\$0.086	\$0.075	55	0	\$0.00	\$0.00	\$35,195	\$54,000	\$0	\$54,000	(\$18,805)
2011	0.0011	\$73,500	100,800	0	\$0.088	\$0.077	129	0	\$0.00	\$0.00	\$82,337	72,000	\$0	72,000	10,337
2012	0.0008	\$126,000	172,800	0	\$0.090	\$0.079	221	0	\$0.00	\$0.00	\$141,527	90,000	\$0	90,000	51,527
2013	0.0005	\$0	172,800	0	\$0.092	\$0.081	221	0	\$0.00	\$0.00	\$15,915	0	\$0	0	15,915
2014	0.0004	\$0	172,800	0	\$0.094	\$0.083	221	0	\$0.00	\$0.00	\$16,313	0	\$0	0	16,313
2015	0.0003	\$0	172,800	0	\$0.097	\$0.085	221	0	\$0.00	\$0.00	\$16,721	0	\$0	0	16,721
2016	0.0002	\$0	172,800	0	\$0.099	\$0.087	221	0	\$0.00	\$0.00	\$17,139	0	\$0	0	17,139
2017	0.0001	\$0	172,800	0	\$0.102	\$0.089	221	0	\$0.00	\$0.00	\$17,567	0	\$0	0	17,567
2018	0.0001	\$0	172,800	0	\$0.104	\$0.091	221	0	\$0.00	\$0.00	\$18,007	0	\$0	0	18,007
2019	0.0001	\$0	172,800	0	\$0.107	\$0.094	221	0	\$0.00	\$0.00	\$18,457	0	\$0	0	18,457
2020	0.0000	\$0	172,800	0	\$0.109	\$0.096	221	0	\$0.00	\$0.00	\$18,918	0	\$0	0	18,918
2021	0.0000	\$0	172,800	0	\$0.112	\$0.098	221	0	\$0.00	\$0.00	\$19,391	0	\$0	0	19,391
2022	0.0000	\$0	172,800	0	\$0.115	\$0.101	221	0	\$0.00	\$0.00	\$19,876	0	\$0	0	19,876
2023	0.0000	\$0	172,800	0	\$0.118	\$0.103	221	0	\$0.00	\$0.00	\$20,373	0	\$0	0	20,373
2024	0.0000	\$0	172,800	0	\$0.121	\$0.106	221	0	\$0.00	\$0.00	\$20,882	0	\$0	0	20,882
2025	0.0000	0	0	0	\$0.124	\$0.108	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
			2,390,400	0							\$478,618	\$216,000	\$0	\$216,000	\$262,618
											\$345,316	197,277	0	197,277	148,040

Total NPV = \$148,040  
Benefit/Cost Ratio = 1.75

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)

# **Refrigerator Round-Up Benefit/Cost Analysis**

**Demand-Side Management Program - DSM  
Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
Project: **Refrigerator Round-up**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.07212
1a) Retail Rate Winter (\$/kWh) =	\$0.06174
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$0.00
3a) Retail Winter Demand Rate (\$/kW/season) =	\$0.00
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	3.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	585,608,722
Growth Rate =	1.03%
8) Total Customers by class =	62,068
Growth Rate =	44.00%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$9,375
Direct Operating Costs =	\$5,625
Incentive Costs =	\$2,625
<b>Total Utility Project Costs Year 1 =</b>	<b>\$17,625</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$9,375
Direct Operating Costs =	\$5,700
Incentive Costs =	\$2,625
<b>Total Utility Project Costs Year 2 =</b>	<b>\$17,700</b>
15b) Total Utility Cost Year 3 =	\$17,700
15c) Total Utility Cost Year 4 =	\$0
15d) Total Utility Cost Year 5 =	\$0
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$0
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	0.120
20a) Avg Winter kW/part Saved =	0.240
21) Avg. Summer kWh/Part. Saved =	279
21a) Avg. Winter kWh/Part. Saved =	559
22) Number of Participants (First Year) =	75
22a) Number of Participants (Second Year) =	75
22a) Number of Participants (Third Year) =	75
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ 35

**Demand-Side Management Program - DSM**  
 Integrated Electric System Cost-Effectiveness Analysis

**Summary Information**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Refrigerator Round-up**

**Cost Summary**

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Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$53,025
Total Program Participants	225
Utility Cost per Participant (First Year) =	\$235.00
Utility Cost per Participant (Program) =	\$235.67
Total kW Reduction	87
Total Energy Reduction (kWh)	2,847,557
Societal Cost per kwh	\$0.01

**Test Results**

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	<b>NPV</b>	<b>B/C</b>
<b>Utility Test</b>	\$267,189	4.10
<b>Ratepayer Test</b>	\$308,069	7.80
<b>Societal Cost Test</b>	\$630,080	20.56
<b>Participant Test</b>	\$155,091	#DIV/0!

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Refrigerator Round-up**

t	Year	Cost of Energy Saved				Project Cost					Cost of Energy Saved Less Project Cost (J)
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	
1	2010	67,799	\$0.0289	\$0	29	\$395.70	\$13,466	\$17,625	1,783	\$19,408	(\$5,942)
2	2011	135,598	\$0.0299	0	58	\$404.33	27,571	\$17,700	3,578	21,278	6,293
3	2012	203,397	\$0.0310	0	87	\$413.18	42,342	\$17,700	5,385	23,085	19,257
4	2013	203,397	\$0.0321	0	87	\$422.25	43,353	\$0	5,401	5,401	37,952
5	2014	203,397	\$0.0332	0	87	\$431.54	44,392	\$0	5,416	5,416	38,976
6	2015	203,397	\$0.0344	0	87	\$441.07	45,459	\$0	5,430	5,430	40,029
7	2016	203,397	\$0.0356	0	87	\$450.83	46,556	\$0	5,444	5,444	41,112
8	2017	203,397	\$0.0368	0	87	\$460.84	47,682	\$0	5,456	5,456	42,226
9	2018	203,397	\$0.0381	0	87	\$471.10	48,838	\$0	5,466	5,466	43,372
10	2019	203,397	\$0.0394	0	87	\$481.61	50,027	\$0	5,476	5,476	44,551
11	2020	203,397	\$0.0408	0	87	\$492.39	51,247	\$0	5,484	5,484	45,763
12	2021	203,397	\$0.0422	0	87	\$503.43	52,501	\$0	5,490	5,490	47,011
13	2022	203,397	\$0.0437	0	87	\$514.76	53,790	\$0	5,495	5,495	48,294
14	2023	203,397	\$0.0452	0	87	\$526.36	55,113	\$0	5,498	5,498	49,615
15	2024	203,397	\$0.0468	0	87	\$538.26	56,473	\$0	5,500	5,500	50,973
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 2,847,557 1,221 \$678,810 \$53,025 \$76,303 \$129,328 \$549,482  
NPV = 353,393 45,324 40,880 86,204 267,189

Total NPV = \$267,189  
Benefit/Cost Ratio = 4.10

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2** *This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*  
**Ratepayer Impact Test**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Refrigerator Round-up**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$1,961	\$0	\$11,505	\$13,466	\$17,625	\$17,625	(\$4,159)
2011	4,060	0	23,512	27,571	\$17,700	17,700	9,871
2012	6,303	0	36,039	42,342	\$17,700	17,700	24,642
2013	6,524	0	36,830	43,353	\$0	0	43,353
2014	6,752	0	37,640	44,392	\$0	0	44,392
2015	6,988	0	38,471	45,459	\$0	0	45,459
2016	7,233	0	39,323	46,556	\$0	0	46,556
2017	7,486	0	40,196	47,682	\$0	0	47,682
2018	7,748	0	41,090	48,838	\$0	0	48,838
2019	8,019	0	42,007	50,027	\$0	0	50,027
2020	8,300	0	42,947	51,247	\$0	0	51,247
2021	8,590	0	43,911	52,501	\$0	0	52,501
2022	8,891	0	44,899	53,790	\$0	0	53,790
2023	9,202	0	45,911	55,113	\$0	0	55,113
2024	9,524	0	46,949	56,473	\$0	0	56,473
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$107,582</b>	<b>\$0</b>	<b>\$571,229</b>	<b>\$678,810</b>	<b>\$53,025</b>	<b>\$53,025</b>	<b>\$625,785</b>
<b>NPV =</b>	<b>55,245</b>	<b>0</b>	<b>298,148</b>	<b>353,393</b>	<b>45,324</b>	<b>45,324</b>	<b>308,069</b>
<b>Total NPV =</b>		<b>\$308,069</b>					
<b>Benefit/Cost Ratio =</b>		<b>7.80</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (A) + (B) + (C)
- (E) = Total Utility Project Costs (15)
- (F) = (E)
- (G) = (D) - (F)

Table 3

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

**Societal Cost Test**

Compar **Montana-Dakota Utilities Co.**  
Project: **Refrigerator Round-up**

Year	Decreases				Increases					Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)	
2010	\$1,961	\$0	\$11,505	\$6,866	\$20,332	\$17,625	\$0	\$2,625	\$15,000	\$5,332
2011	\$4,060	\$0	\$23,512	\$14,479	\$42,050	\$17,700	0	\$5,250	12,450	29,600
2012	\$6,303	\$0	\$36,039	\$22,903	\$65,244	\$17,700	0	\$7,875	9,825	55,419
2013	\$6,524	\$0	\$36,830	\$24,153	\$67,506	\$0	0	\$0	0	67,506
2014	\$6,752	\$0	\$37,640	\$25,474	\$69,866	\$0	0	\$0	0	69,866
2015	\$6,988	\$0	\$38,471	\$26,869	\$72,328	\$0	0	\$0	0	72,328
2016	\$7,233	\$0	\$39,323	\$28,342	\$74,898	\$0	0	\$0	0	74,898
2017	\$7,486	\$0	\$40,196	\$29,899	\$77,580	\$0	0	\$0	0	77,580
2018	\$7,748	\$0	\$41,090	\$31,543	\$80,381	\$0	0	\$0	0	80,381
2019	\$8,019	\$0	\$42,007	\$33,280	\$83,306	\$0	0	\$0	0	83,306
2020	\$8,300	\$0	\$42,947	\$35,114	\$86,362	\$0	0	\$0	0	86,362
2021	\$8,590	\$0	\$43,911	\$37,053	\$89,554	\$0	0	\$0	0	89,554
2022	\$8,891	\$0	\$44,899	\$39,101	\$92,891	\$0	0	\$0	0	92,891
2023	\$9,202	\$0	\$45,911	\$41,265	\$96,378	\$0	0	\$0	0	96,378
2024	\$9,524	\$0	\$46,949	\$43,551	\$100,024	\$0	0	\$0	0	100,024
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0
<b>Total =</b>	<b>\$107,582</b>	<b>\$0</b>	<b>\$571,229</b>	<b>\$439,892</b>	<b>\$1,118,702</b>	<b>\$53,025</b>	<b>\$0</b>	<b>\$15,750</b>	<b>\$37,275</b>	<b>\$1,081,427</b>
<b>NPV =</b>	<b>55,245</b>	<b>0</b>	<b>298,148</b>	<b>308,903</b>	<b>662,296</b>	<b>45,324</b>	<b>0</b>	<b>13,108</b>	<b>32,216</b>	<b>630,080</b>

Total NPV = \$630,080  
Benefit/Cost Ratio = 20.56

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)
- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4**  
**Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Refrigerator Round-up**

Year	Ratio of Part. to Total Customers (A)	Benefits									Costs			Annual Benefits Less Costs (M)	
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)		Total Annual Costs (L)
2010	0.0008	\$2,625	20,945	41,890	\$0.086	\$0.075	9	18	\$0.00	\$0.00	\$7,553	\$0	\$0	\$0	\$7,553
2011	0.0012	\$5,250	41,890	83,780	\$0.088	\$0.077	18	36	\$0.00	\$0.00	\$15,353	0	\$0	0	15,353
2012	0.0008	\$7,875	62,835	125,670	\$0.090	\$0.079	27	54	\$0.00	\$0.00	\$23,409	0	\$0	0	23,409
2013	0.0006	\$0	62,835	125,670	\$0.092	\$0.081	27	54	\$0.00	\$0.00	\$15,922	0	\$0	0	15,922
2014	0.0004	\$0	62,835	125,670	\$0.094	\$0.083	27	54	\$0.00	\$0.00	\$16,320	0	\$0	0	16,320
2015	0.0003	\$0	62,835	125,670	\$0.097	\$0.085	27	54	\$0.00	\$0.00	\$16,728	0	\$0	0	16,728
2016	0.0002	\$0	62,835	125,670	\$0.099	\$0.087	27	54	\$0.00	\$0.00	\$17,146	0	\$0	0	17,146
2017	0.0001	\$0	62,835	125,670	\$0.102	\$0.089	27	54	\$0.00	\$0.00	\$17,575	0	\$0	0	17,575
2018	0.0001	\$0	62,835	125,670	\$0.104	\$0.091	27	54	\$0.00	\$0.00	\$18,014	0	\$0	0	18,014
2019	0.0001	\$0	62,835	125,670	\$0.107	\$0.094	27	54	\$0.00	\$0.00	\$18,464	0	\$0	0	18,464
2020	0.0000	\$0	62,835	125,670	\$0.109	\$0.096	27	54	\$0.00	\$0.00	\$18,926	0	\$0	0	18,926
2021	0.0000	\$0	62,835	125,670	\$0.112	\$0.098	27	54	\$0.00	\$0.00	\$19,399	0	\$0	0	19,399
2022	0.0000	\$0	62,835	125,670	\$0.115	\$0.101	27	54	\$0.00	\$0.00	\$19,884	0	\$0	0	19,884
2023	0.0000	\$0	62,835	125,670	\$0.118	\$0.103	27	54	\$0.00	\$0.00	\$20,381	0	\$0	0	20,381
2024	0.0000	\$0	62,835	125,670	\$0.121	\$0.106	27	54	\$0.00	\$0.00	\$20,891	0	\$0	0	20,891
2025	0.0000	0	0	0	\$0.124	\$0.108	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
			879,690	1,759,380							\$265,966	\$0	\$0	\$0	\$265,966
											\$155,091	0	0	0	155,091

Total NPV = \$155,091

Benefit/Cost Ratio = #DIV/0!

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)

**Residential**  
**Air Conditioning Cycling**  
**Benefit/Cost Analysis**

**Demand-Side Management Program - DSM  
Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
Project: **Air Conditioning Cycling - Res & Sm Comm**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.07212
1a) Retail Rate Winter (\$/kWh) =	\$0.06174
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$44.90
3a) Retail Winter Demand Rate (\$/kW/season) =	\$65.79
Escalation Rate =	2.50%
4) System Peak Shaving Demand Cost (\$/kW/yr)	\$107.77
MRO Reserve Margin=	15.0%
Escalation Rate =	4.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	585,608,722
Growth Rate =	1.03%
8) Total Customers by class =	62,068
Growth Rate =	44.00%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$49
Direct Operating Costs =	\$700,511
Incentive Costs =	\$0
<b>Total Utility Project Costs Year 1 =</b>	<b>\$700,560</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$49
Direct Operating Costs =	\$2,277,137
Incentive Costs =	\$0
<b>Total Utility Project Costs Year 2 =</b>	<b>\$2,277,186</b>
15b) Total Utility Cost Year 3 =	\$975,902
15c) Total Utility Cost Year 4 =	\$168,302
15d) Total Utility Cost Year 5 =	\$170,502
15e) Total Utility Operating Cost (Program Life) =	\$170,502
Escalation Rate =	1.20%
16) Direct Participant Costs (\$/Part.) =	\$0
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	1.0
20a) Avg Winter kW/part Saved =	0.0
21) Avg. Summer kWh/Part. Saved =	130
21a) Avg. Winter kWh/Part. Saved =	0
22) Number of Participants (First Year) =	780
22a) Number of Participants (Second Year) =	4,225
22a) Number of Participants (Third Year) =	1,495
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ -

## Demand-Side Management Program - DSM

Integrated Electric System Cost-Effectiveness Analysis

### Summary Information

Company: **Montana-Dakota Utilities Co.**  
Project: **Air Conditioning Cycling - Res & Sm Comm**

### Cost Summary

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Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$4,292,452
Total Program Participants	6,500
Utility Cost per Participant (First Year) =	\$898.15
Utility Cost per Participant (Program) =	\$660.38
Total kW Reduction	7,014
Total Energy Reduction (kWh)	12,664,277
Societal Cost per kwh	\$0.34

### Test Results

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	NPV	B/C
Utility Test	\$3,251,247	1.71
Ratepayer Test	\$3,466,353	1.80
Societal Cost Test	\$10,327,631	3.37
Participant Test	\$3,496,650	#DIV/0!

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Air Conditioning Cycling - Res & Sm Comm**

t	Year	Cost of Energy Saved				Project Cost					Cost of Energy Saved Less
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	Project Cost (J)
1	2010	109,411	\$0.0289	\$0	842	\$126.63	\$109,739	\$700,560	3,230	\$703,790	(\$594,051)
2	2011	702,051	\$0.0299	0	5,400	\$129.39	719,784	\$2,277,186	20,295	2,297,481	(1,577,697)
3	2012	911,755	\$0.0310	0	7,014	\$132.22	955,593	\$975,902	25,774	1,001,677	(46,083)
4	2013	911,755	\$0.0321	0	7,014	\$135.12	976,931	\$168,302	25,171	193,473	783,458
5	2014	911,755	\$0.0332	0	7,014	\$138.10	998,812	\$170,502	24,547	195,048	803,764
6	2015	911,755	\$0.0344	0	7,014	\$141.15	1,021,251	\$172,548	23,900	196,448	824,803
7	2016	911,755	\$0.0356	0	7,014	\$144.27	1,044,261	\$174,618	23,232	197,850	846,411
8	2017	911,755	\$0.0368	0	7,014	\$147.47	1,067,857	\$176,714	22,539	199,253	868,604
9	2018	911,755	\$0.0381	0	7,014	\$150.76	1,092,055	\$178,834	21,823	200,657	891,398
10	2019	911,755	\$0.0394	0	7,014	\$154.12	1,116,869	\$180,980	21,081	202,062	914,807
11	2020	911,755	\$0.0408	0	7,014	\$157.57	1,142,316	\$183,152	20,314	203,466	938,850
12	2021	911,755	\$0.0422	0	7,014	\$161.10	1,168,411	\$185,350	19,520	204,870	963,542
13	2022	911,755	\$0.0437	0	7,014	\$164.73	1,195,172	\$187,574	18,698	206,272	988,901
14	2023	911,755	\$0.0452	0	7,014	\$168.44	1,222,616	\$189,825	17,847	207,672	1,014,944
15	2024	911,755	\$0.0468	0	7,014	\$172.25	1,250,759	\$192,103	16,966	209,069	1,041,691
16	2025	0	\$0.0485	0	0	\$176.15	0	0	0	0	0

Total = 12,664,277 97,418 \$15,082,428 \$6,114,150 \$304,936 \$6,419,087 \$8,663,341  
NPV = 7,821,701 4,401,068 169,387 4,570,455 3,251,247

Total NPV = \$3,251,247  
Benefit/Cost Ratio = 1.71

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**

Project: **Air Conditioning Cycling - Res & Sm Comm**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$3,165	\$0	\$106,574	\$109,739	\$700,560	\$700,560	(\$590,821)
2011	21,020	0	698,764	719,784	\$2,277,186	2,277,186	(1,557,402)
2012	28,254	0	927,339	955,593	\$975,902	975,902	(20,309)
2013	29,243	0	947,688	976,931	\$168,302	168,302	808,629
2014	30,266	0	968,546	998,812	\$170,502	170,502	828,311
2015	31,326	0	989,925	1,021,251	\$170,502	170,502	850,749
2016	32,422	0	1,011,839	1,044,261	\$170,502	170,502	873,759
2017	33,557	0	1,034,300	1,067,857	\$170,502	170,502	897,356
2018	34,731	0	1,057,323	1,092,055	\$170,502	170,502	921,553
2019	35,947	0	1,080,922	1,116,869	\$170,502	170,502	946,367
2020	37,205	0	1,105,111	1,142,316	\$170,502	170,502	971,814
2021	38,507	0	1,129,904	1,168,411	\$170,502	170,502	997,910
2022	39,855	0	1,155,317	1,195,172	\$170,502	170,502	1,024,671
2023	41,250	0	1,181,366	1,222,616	\$170,502	170,502	1,052,114
2024	42,694	0	1,208,066	1,250,759	\$170,502	170,502	1,080,258
2025	0	0	0	0	0	0	0

Total =	\$479,444	\$0	\$14,602,985	\$15,082,428	\$5,997,469	\$5,997,469	\$9,084,959
NPV =	244,854	0	7,576,847	7,821,701	4,355,348	4,355,348	3,466,353

Total NPV = \$3,466,353  
Benefit/Cost Ratio = 1.80

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (A) + (B) + (C)
- (E) = Total Utility Project Costs (15)
- (F) = (E)
- (G) = (D) - (F)

Table 3

**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
 Project: **Air Conditioning Cycling - Res & Sm Comm**

Year	Decreases				Increases						Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)		
2010	\$3,165	\$0	\$106,574	\$55,951	\$165,690	\$700,560	\$0	\$0	\$700,560	(\$534,870)	
2011	\$21,020	\$0	\$698,764	\$377,992	1,097,776	\$2,277,186	0	\$0	2,277,186	(1,179,411)	
2012	\$28,254	\$0	\$927,339	\$516,880	1,472,473	\$975,902	0	\$0	975,902	496,571	
2013	\$29,243	\$0	\$947,688	\$544,275	1,521,206	\$168,302	0	\$0	168,302	1,352,903	
2014	\$30,266	\$0	\$968,546	\$573,159	1,571,971	\$170,502	0	\$0	170,502	1,401,470	
2015	\$31,326	\$0	\$989,925	\$603,616	1,624,867	\$170,502	0	\$0	170,502	1,454,366	
2016	\$32,422	\$0	\$1,011,839	\$635,733	1,679,994	\$170,502	0	\$0	170,502	1,509,492	
2017	\$33,557	\$0	\$1,034,300	\$669,601	1,737,459	\$170,502	0	\$0	170,502	1,566,957	
2018	\$34,731	\$0	\$1,057,323	\$705,318	1,797,372	\$170,502	0	\$0	170,502	1,626,871	
2019	\$35,947	\$0	\$1,080,922	\$742,984	1,859,854	\$170,502	0	\$0	170,502	1,689,352	
2020	\$37,205	\$0	\$1,105,111	\$782,710	1,925,026	\$170,502	0	\$0	170,502	1,754,524	
2021	\$38,507	\$0	\$1,129,904	\$824,608	1,993,020	\$170,502	0	\$0	170,502	1,822,518	
2022	\$39,855	\$0	\$1,155,317	\$868,800	2,063,972	\$170,502	0	\$0	170,502	1,893,470	
2023	\$41,250	\$0	\$1,181,366	\$915,412	2,138,027	\$170,502	0	\$0	170,502	1,967,526	
2024	\$42,694	\$0	\$1,208,066	\$964,578	2,215,337	\$170,502	0	\$0	170,502	2,044,836	
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0	
<b>Total =</b>	<b>\$479,444</b>	<b>\$0</b>	<b>\$14,602,985</b>	<b>\$9,781,616</b>	<b>\$24,864,044</b>	<b>\$5,997,469</b>	<b>\$0</b>	<b>\$0</b>	<b>\$5,997,469</b>	<b>\$18,866,575</b>	
<b>NPV =</b>	<b>244,854</b>	<b>0</b>	<b>7,576,847</b>	<b>6,861,277</b>	<b>14,682,978</b>	<b>4,355,348</b>	<b>0</b>	<b>0</b>	<b>4,355,348</b>	<b>10,327,631</b>	

Total NPV = \$10,327,631  
 Benefit/Cost Ratio = 3.37

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)
- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4  
Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Air Conditioning Cycling - Res & Sm Comm**

Year	Ratio of Part. to Total Customers (A)	Benefits										Costs			Annual Benefits Less Costs (M)
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)	Total Annual Costs (L)	
2010	0.0087	\$0	101,400	0	\$0.086	\$0.075	780	0	\$46.02	\$67.43	\$44,570	\$0	\$0	\$0	\$44,570
2011	0.0389	\$0	650,650	0	\$0.088	\$0.077	5,005	0	\$47.17	\$69.12	\$293,140	0	\$0	0	293,140
2012	0.0270	\$0	845,000	0	\$0.090	\$0.079	6,500	0	\$48.35	\$70.85	\$390,219	0	\$0	0	390,219
2013	0.0188	\$0	845,000	0	\$0.092	\$0.081	6,500	0	\$49.56	\$72.62	\$399,974	0	\$0	0	399,974
2014	0.0130	\$0	845,000	0	\$0.094	\$0.083	6,500	0	\$50.80	\$74.44	\$409,973	0	\$0	0	409,973
2015	0.0090	\$0	845,000	0	\$0.097	\$0.085	6,500	0	\$52.07	\$76.30	\$420,223	0	\$0	0	420,223
2016	0.0063	\$0	845,000	0	\$0.099	\$0.087	6,500	0	\$53.37	\$78.20	\$430,728	0	\$0	0	430,728
2017	0.0044	\$0	845,000	0	\$0.102	\$0.089	6,500	0	\$54.71	\$80.16	\$441,497	0	\$0	0	441,497
2018	0.0030	\$0	845,000	0	\$0.104	\$0.091	6,500	0	\$56.07	\$82.16	\$452,534	0	\$0	0	452,534
2019	0.0021	\$0	845,000	0	\$0.107	\$0.094	6,500	0	\$57.48	\$84.22	\$463,847	0	\$0	0	463,847
2020	0.0015	\$0	845,000	0	\$0.109	\$0.096	6,500	0	\$58.91	\$86.32	\$475,444	0	\$0	0	475,444
2021	0.0010	\$0	845,000	0	\$0.112	\$0.098	6,500	0	\$60.39	\$88.48	\$487,330	0	\$0	0	487,330
2022	0.0007	\$0	845,000	0	\$0.115	\$0.101	6,500	0	\$61.90	\$90.69	\$499,513	0	\$0	0	499,513
2023	0.0005	\$0	845,000	0	\$0.118	\$0.103	6,500	0	\$63.44	\$92.96	\$512,001	0	\$0	0	512,001
2024	0.0003	\$0	845,000	0	\$0.121	\$0.106	6,500	0	\$65.03	\$95.28	\$524,801	0	\$0	0	524,801
2025	0.0002	0	0	0	\$0.124	\$0.108	0	0	\$66.65	\$97.67	\$0	0	\$0	0	0
			11,737,050	0							\$6,245,792	\$0	\$0	\$0	\$6,245,792
											\$3,496,650	0	0	0	3,496,650

Total NPV = \$3,496,650

Benefit/Cost Ratio = #DIV/0!

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)

# **Commercial Lighting Benefit/Cost Analysis**

**Demand-Side Management Program - DSM**  
**Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Commercial Lighting Program**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.04427
1a) Retail Rate Winter (\$/kWh) =	\$0.03858
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$44.90
3a) Retail Winter Demand Rate (\$/kW/season) =	\$65.79
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	4.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	903,595,055
Growth Rate =	2.02%
8) Total Customers by class =	10,590
Growth Rate =	0.73%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$2,450
Direct Operating Costs =	\$0
Incentive Costs =	\$160,000
<b>Total Utility Project Costs Year 1 =</b>	<b>\$162,450</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$2,450
Direct Operating Costs =	\$0
Incentive Costs =	\$160,000
<b>Total Utility Project Costs Year 2 =</b>	<b>\$162,450</b>
15b) Total Utility Cost Year 3 =	\$162,450
15c) Total Utility Cost Year 4 =	\$162,450
15d) Total Utility Cost Year 5 =	\$162,450
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$22,000
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	10
20) Avg Summer kW/part. Saved =	5.0
20a) Avg Winter kW/part Saved =	9.9
21) Avg. Summer kWh/Part. Saved =	12,433
21a) Avg. Winter kWh/Part. Saved =	24,867
22) Number of Participants (First Year) =	50
22a) Number of Participants (Second Year) =	50
22a) Number of Participants (Third Year) =	50
22a) Number of Participants (Fourth Year) =	50
22a) Number of Participants (Fifth Year) =	50
23) Incentive/Participant (All) =	\$ 3,200

**Demand-Side Management Program - DSM**  
Integrated Electric System Cost-Effectiveness Analysis

**Summary Information**

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Lighting Program**

**Cost Summary**

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Program Promotion (Years)	3
Project Life (Years)	10
Total Program Cost (Utility)	\$812,250
Total Program Participants	250
Utility Cost per Participant (First Year) =	\$3,249.00
Utility Cost per Participant (Program) =	\$3,249.00
Total kW Reduction	4,025
Total Energy Reduction (kWh)	80,493,400
Societal Cost per kwh	\$0.05

**Test Results**

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	<u>NPV</u>	<u>B/C</u>
<b>Utility Test</b>	\$9,215,042	8.65
<b>Ratepayer Test</b>	\$9,774,888	16.18
<b>Societal Cost Test</b>	\$14,192,730	4.37
<b>Participant Test</b>	\$475,344	1.10

**Table 1**  
**Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Lighting Program**

t	Year	Cost of Energy Saved				Project Cost					Cost of Energy Saved Less Project Cost
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	(J)
1	2010	2,012,335	\$0.0289	\$0	805	\$395.70	\$376,730	\$162,450	24,362	\$186,813	\$189,917
2	2011	4,024,670	\$0.0299	0	1,610	\$404.33	771,427	\$162,450	48,179	210,629	560,798
3	2012	6,037,005	\$0.0310	0	2,415	\$413.18	1,184,827	\$162,450	71,391	233,841	950,985
4	2013	8,049,340	\$0.0321	0	3,220	\$422.25	1,617,691	\$162,450	93,939	256,389	1,361,302
5	2014	10,061,675	\$0.0332	0	4,025	\$431.54	2,070,811	\$162,450	115,755	278,205	1,792,606
6	2015	10,061,675	\$0.0344	0	4,025	\$441.07	2,120,839	\$0	113,977	113,977	2,006,862
7	2016	10,061,675	\$0.0356	0	4,025	\$450.83	2,172,234	\$0	112,082	112,082	2,060,152
8	2017	10,061,675	\$0.0368	0	4,025	\$460.84	2,225,035	\$0	110,067	110,067	2,114,969
9	2018	10,061,675	\$0.0381	0	4,025	\$471.10	2,279,281	\$0	107,924	107,924	2,171,357
10	2019	10,061,675	\$0.0394	0	4,025	\$481.61	2,335,014	\$0	105,649	105,649	2,229,364
11	2020	0	\$0.0408	0	0	\$492.39	0	\$0	0	0	0
12	2021	0	\$0.0422	0	0	\$503.43	0	\$0	0	0	0
13	2022	0	\$0.0437	0	0	\$514.76	0	\$0	0	0	0
14	2023	0	\$0.0452	0	0	\$526.36	0	\$0	0	0	0
15	2024	0	\$0.0468	0	0	\$538.26	0	\$0	0	0	0
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 80,493,400 32,197 \$17,153,888 \$812,250 \$903,325 \$1,715,576 \$15,438,312  
NPV = 10,418,915 644,026 559,847 1,203,873 9,215,042

Total NPV = \$9,215,042  
Benefit/Cost Ratio = 8.65

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Lighting Program**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$58,213	\$0	\$318,516	\$376,730	\$162,450	\$162,450	\$214,279
2011	120,502	0	650,925	771,427	\$162,450	162,450	608,977
2012	187,079	0	997,748	1,184,827	\$162,450	162,450	1,022,376
2013	258,169	0	1,359,522	1,617,691	\$162,450	162,450	1,455,241
2014	334,006	0	1,736,805	2,070,811	\$162,450	162,450	1,908,361
2015	345,696	0	1,775,143	2,120,839	\$0	0	2,120,839
2016	357,795	0	1,814,439	2,172,234	\$0	0	2,172,234
2017	370,318	0	1,854,717	2,225,035	\$0	0	2,225,035
2018	383,279	0	1,896,002	2,279,281	\$0	0	2,279,281
2019	396,694	0	1,938,320	2,335,014	\$0	0	2,335,014
2020	0	0	0	0	\$0	0	0
2021	0	0	0	0	\$0	0	0
2022	0	0	0	0	\$0	0	0
2023	0	0	0	0	\$0	0	0
2024	0	0	0	0	\$0	0	0
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$2,811,750</b>	<b>\$0</b>	<b>\$14,342,138</b>	<b>\$17,153,888</b>	<b>\$812,250</b>	<b>\$812,250</b>	<b>\$16,341,638</b>
<b>NPV =</b>	<b>1,698,902</b>	<b>0</b>	<b>8,720,012</b>	<b>10,418,915</b>	<b>644,026</b>	<b>644,026</b>	<b>9,774,888</b>
<b>Total NPV =</b>		<b>\$9,774,888</b>					
<b>Benefit/Cost Ratio =</b>		<b>16.18</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)  
 (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)  
 (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)  
 (D) = (A) + (B) + (C)  
 (E) = Total Utility Project Costs (15)  
 (F) = (E)  
 (G) = (D) - (F)

**Table 3**  
**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
Project: **Commercial Lighting Program**

Year	Decreases				Increases					
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)	Net Change (J)
2010	\$58,213	\$0	\$318,516	\$192,076	\$568,805	\$162,450	\$1,100,000	\$160,000	\$1,102,450	(\$533,645)
2011	\$120,502	\$0	\$650,925	\$405,111	1,176,538	\$162,450	1,100,000	\$320,000	942,450	234,088
2012	\$187,079	\$0	\$997,748	\$640,872	1,825,699	\$162,450	1,100,000	\$480,000	782,450	1,043,249
2013	\$258,169	\$0	\$1,359,522	\$901,259	2,518,950	\$162,450	1,100,000	\$0	1,262,450	1,256,500
2014	\$334,006	\$0	\$1,736,805	\$1,188,316	3,259,127	\$162,450	1,100,000	\$0	1,262,450	1,996,677
2015	\$345,696	\$0	\$1,775,143	\$1,253,534	3,374,373	\$0	0	\$0	0	3,374,373
2016	\$357,795	\$0	\$1,814,439	\$1,322,429	3,494,663	\$0	0	\$0	0	3,494,663
2017	\$370,318	\$0	\$1,854,717	\$1,395,211	3,620,246	\$0	0	\$0	0	3,620,246
2018	\$383,279	\$0	\$1,896,002	\$1,472,103	3,751,384	\$0	0	\$0	0	3,751,384
2019	\$396,694	\$0	\$1,938,320	\$1,553,341	3,888,355	\$0	0	\$0	0	3,888,355
2020	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2021	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2022	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2023	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2024	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0
<b>Total =</b>	<b>\$2,811,750</b>	<b>\$0</b>	<b>\$14,342,138</b>	<b>\$10,324,252</b>	<b>\$27,478,140</b>	<b>\$812,250</b>	<b>\$5,500,000</b>	<b>\$960,000</b>	<b>\$5,352,250</b>	<b>\$22,125,890</b>
<b>NPV =</b>	<b>1,698,902</b>	<b>0</b>	<b>8,720,012</b>	<b>7,979,789</b>	<b>18,398,704</b>	<b>644,026</b>	<b>4,360,904</b>	<b>798,956</b>	<b>4,205,974</b>	<b>14,192,730</b>

Total NPV = \$14,192,730  
Benefit/Cost Ratio = 4.37

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)
- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4**  
**Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Lighting Program**

Year	Ratio of Part. to Total Customers (A)	Benefits					Costs					Total Annual Benefits Less Costs (M)			
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)		Direct Part. Costs (H)	Other Part. Costs (I)	Total Annual Costs (L)
2010	0.0047	\$160,000	621,667	1,243,333	\$0.057	\$0.051	249	497	\$46.02	\$67.43	\$303,998	\$1,100,000	\$0	\$1,100,000	(\$796,002)
2011	0.0093	\$320,000	1,243,333	2,486,667	\$0.058	\$0.052	497	995	\$47.17	\$69.12	\$615,195	1,100,000	\$0	1,100,000	(484,805)
2012	0.0092	\$480,000	1,865,000	3,730,000	\$0.060	\$0.054	746	1,492	\$48.35	\$70.85	\$933,862	1,100,000	\$0	1,100,000	(166,138)
2013	0.0092	\$0	2,486,667	4,973,333	\$0.061	\$0.055	995	1,989	\$49.56	\$72.62	\$620,279	1,100,000	\$0	1,100,000	(479,721)
2014	0.0091	\$0	3,108,333	6,216,667	\$0.063	\$0.056	1,243	2,487	\$50.80	\$74.44	\$794,732	1,100,000	\$0	1,100,000	(305,268)
2015	0.0090	\$0	3,108,333	6,216,667	\$0.064	\$0.058	1,243	2,487	\$52.07	\$76.30	\$814,600	0	\$0	0	814,600
2016	0.0090	\$0	3,108,333	6,216,667	\$0.066	\$0.059	1,243	2,487	\$53.37	\$78.20	\$834,965	0	\$0	0	834,965
2017	0.0089	\$0	3,108,333	6,216,667	\$0.068	\$0.061	1,243	2,487	\$54.71	\$80.16	\$855,840	0	\$0	0	855,840
2018	0.0088	\$0	3,108,333	6,216,667	\$0.069	\$0.062	1,243	2,487	\$56.07	\$82.16	\$877,236	0	\$0	0	877,236
2019	0.0088	\$0	3,108,333	6,216,667	\$0.071	\$0.064	1,243	2,487	\$57.48	\$84.22	\$899,166	0	\$0	0	899,166
2020	0.0087	\$0	0	0	\$0.073	\$0.065	0	0	\$58.91	\$86.32	\$0	0	\$0	0	0
2021	0.0087	\$0	0	0	\$0.075	\$0.067	0	0	\$60.39	\$88.48	\$0	0	\$0	0	0
2022	0.0086	\$0	0	0	\$0.077	\$0.069	0	0	\$61.90	\$90.69	\$0	0	\$0	0	0
2023	0.0085	\$0	0	0	\$0.079	\$0.071	0	0	\$63.44	\$92.96	\$0	0	\$0	0	0
2024	0.0085	\$0	0	0	\$0.081	\$0.072	0	0	\$65.03	\$95.28	\$0	0	\$0	0	0
2025	0.0084	\$0	0	0	\$0.083	\$0.074	0	0	\$66.65	\$97.67	\$0	0	\$0	0	0
			24,866,667	49,733,333							\$7,549,873	\$5,500,000	\$0	\$5,500,000	\$2,049,873
											\$5,196,894	4,721,550	0	4,721,550	475,344

Total NPV = \$475,344  
Benefit/Cost Ratio = 1.10

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)

# **Commercial Motors Benefit/Cost Analysis**

**Demand-Side Management Program - DSM**  
**Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Commercial Motors**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.04427
1a) Retail Rate Winter (\$/kWh) =	\$0.03858
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$44.90
3a) Retail Winter Demand Rate (\$/kW/season) =	\$65.79
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	4.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	903,595,055
Growth Rate =	2.02%
8) Total Customers by class =	10,590
Growth Rate =	0.73%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$3,234
Direct Operating Costs =	\$0
Incentive Costs =	\$17,454
<b>Total Utility Project Costs Year 1 =</b>	<b>\$20,688</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$3,234
Direct Operating Costs =	\$0
Incentive Costs =	\$17,454
<b>Total Utility Project Costs Year 2 =</b>	<b>\$20,688</b>
15b) Total Utility Cost Year 3 =	\$17,454
15c) Total Utility Cost Year 4 =	\$0
15d) Total Utility Cost Year 5 =	\$0
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$1,467
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	0.1
20a) Avg Winter kW/part Saved =	0.3
21) Avg. Summer kWh/Part. Saved =	588
21a) Avg. Winter kWh/Part. Saved =	1,175
22) Number of Participants (First Year) =	66
22a) Number of Participants (Second Year) =	66
22a) Number of Participants (Third Year) =	66
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ 264

## Demand-Side Management Program - DSM

Integrated Electric System Cost-Effectiveness Analysis

### Summary Information

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Motors**

### Cost Summary

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Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$58,829
Total Program Participants	198
Utility Cost per Participant (First Year) =	\$313.45
Utility Cost per Participant (Program) =	\$297.12
Total kW Reduction	85
Total Energy Reduction (kWh)	5,273,112
Societal Cost per kwh	\$0.04

### Test Results

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	<u>NPV</u>	<u>B/C</u>
Utility Test	\$312,731	4.83
Ratepayer Test	\$343,906	7.81
Societal Cost Test	\$528,023	3.49
Participant Test	\$47,645	1.18

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Motors**

t	Year	Cost of Energy Saved				Project Cost					Cost of Energy Saved Less Project Cost (J)
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	
1	2010	125,550	\$0.0289	\$0	28	\$395.70	\$14,904	\$20,688	1,520	\$22,208	(\$7,304)
2	2011	251,101	\$0.0299	0	57	\$404.33	30,554	\$20,688	3,006	23,694	6,860
3	2012	376,651	\$0.0310	0	85	\$413.18	46,981	\$17,454	4,454	21,908	25,073
4	2013	376,651	\$0.0321	0	85	\$422.25	48,164	\$0	4,396	4,396	43,769
5	2014	376,651	\$0.0332	0	85	\$431.54	49,381	\$0	4,333	4,333	45,048
6	2015	376,651	\$0.0344	0	85	\$441.07	50,633	\$0	4,267	4,267	46,366
7	2016	376,651	\$0.0356	0	85	\$450.83	51,920	\$0	4,196	4,196	47,724
8	2017	376,651	\$0.0368	0	85	\$460.84	53,244	\$0	4,120	4,120	49,124
9	2018	376,651	\$0.0381	0	85	\$471.10	54,606	\$0	4,040	4,040	50,566
10	2019	376,651	\$0.0394	0	85	\$481.61	56,007	\$0	3,955	3,955	52,052
11	2020	376,651	\$0.0408	0	85	\$492.39	57,447	\$0	3,865	3,865	53,583
12	2021	376,651	\$0.0422	0	85	\$503.43	58,929	\$0	3,769	3,769	55,161
13	2022	376,651	\$0.0437	0	85	\$514.76	60,454	\$0	3,667	3,667	56,787
14	2023	376,651	\$0.0452	0	85	\$526.36	62,022	\$0	3,560	3,560	58,462
15	2024	376,651	\$0.0468	0	85	\$538.26	63,635	\$0	3,446	3,446	60,189
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 5,273,112 1,196 \$758,882 \$58,829 \$56,593 \$115,422 \$643,459  
 NPV = 394,414 50,508 31,175 81,683 312,731

Total NPV = \$312,731  
 Benefit/Cost Ratio = 4.83

- (A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)
- (B) = System Energy Cost (2)
- (C) = (A) x Variable O&M (5)
- (D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)
- (E) = SystemDemand Cost (4)

- (F) = (A)x(B) + (C) + (D)x(E)
- (G) = Total Utility Project Costs (15)
- (H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]
- (I) = (G) + (H)
- (J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**

Project: **Commercial Motors**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$3,632	\$0	\$11,272	\$14,904	\$20,688	\$20,688	(\$5,784)
2011	7,518	0	23,035	30,554	\$20,688	20,688	9,866
2012	11,672	0	35,309	46,981	\$17,454	17,454	29,527
2013	12,080	0	36,084	48,164	\$0	0	48,164
2014	12,503	0	36,878	49,381	\$0	0	49,381
2015	12,941	0	37,692	50,633	\$0	0	50,633
2016	13,394	0	38,526	51,920	\$0	0	51,920
2017	13,863	0	39,382	53,244	\$0	0	53,244
2018	14,348	0	40,258	54,606	\$0	0	54,606
2019	14,850	0	41,157	56,007	\$0	0	56,007
2020	15,370	0	42,078	57,447	\$0	0	57,447
2021	15,908	0	43,022	58,929	\$0	0	58,929
2022	16,464	0	43,989	60,454	\$0	0	60,454
2023	17,041	0	44,981	62,022	\$0	0	62,022
2024	17,637	0	45,998	63,635	\$0	0	63,635
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$199,220</b>	<b>\$0</b>	<b>\$559,662</b>	<b>\$758,882</b>	<b>\$58,829</b>	<b>\$58,829</b>	<b>\$700,052</b>
<b>NPV =</b>	<b>102,303</b>	<b>0</b>	<b>292,110</b>	<b>394,414</b>	<b>50,508</b>	<b>50,508</b>	<b>343,906</b>
<b>Total NPV =</b>		<b>\$343,906</b>					
<b>Benefit/Cost Ratio =</b>		<b>7.81</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)  
 (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)  
 (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)  
 (D) = (A) + (B) + (C)  
 (E) = Total Utility Project Costs (15)  
 (F) = (E)  
 (G) = (D) - (F)

**Table 3**  
**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
Project: **Commercial Motors**

Year	Decreases				Increases						Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)		
2010	\$3,632	\$0	\$11,272	\$7,599	\$22,503	\$20,688	\$96,822	\$17,454	\$100,056	(\$77,554)	
2011	\$7,518	\$0	\$23,035	\$16,045	46,599	\$20,688	96,822	\$34,907	82,602	(36,004)	
2012	\$11,672	\$0	\$35,309	\$25,412	72,393	\$17,454	96,822	\$52,361	61,915	10,478	
2013	\$12,080	\$0	\$36,084	\$26,834	74,998	\$0	0	\$0	0	74,998	
2014	\$12,503	\$0	\$36,878	\$28,337	77,718	\$0	0	\$0	0	77,718	
2015	\$12,941	\$0	\$37,692	\$29,927	80,560	\$0	0	\$0	0	80,560	
2016	\$13,394	\$0	\$38,526	\$31,608	83,529	\$0	0	\$0	0	83,529	
2017	\$13,863	\$0	\$39,382	\$33,387	86,631	\$0	0	\$0	0	86,631	
2018	\$14,348	\$0	\$40,258	\$35,268	89,874	\$0	0	\$0	0	89,874	
2019	\$14,850	\$0	\$41,157	\$37,258	93,265	\$0	0	\$0	0	93,265	
2020	\$15,370	\$0	\$42,078	\$39,363	96,810	\$0	0	\$0	0	96,810	
2021	\$15,908	\$0	\$43,022	\$41,590	100,519	\$0	0	\$0	0	100,519	
2022	\$16,464	\$0	\$43,989	\$43,945	104,399	\$0	0	\$0	0	104,399	
2023	\$17,041	\$0	\$44,981	\$46,438	108,460	\$0	0	\$0	0	108,460	
2024	\$17,637	\$0	\$45,998	\$49,075	112,710	\$0	0	\$0	0	112,710	
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0	
<b>Total =</b>	<b>\$199,220</b>	<b>\$0</b>	<b>\$559,662</b>	<b>\$492,085</b>	<b>\$1,250,966</b>	<b>\$58,829</b>	<b>\$290,466</b>	<b>\$104,722</b>	<b>\$244,573</b>	<b>\$1,006,393</b>	
<b>NPV =</b>	<b>102,303</b>	<b>0</b>	<b>292,110</b>	<b>345,271</b>	<b>739,685</b>	<b>50,508</b>	<b>248,309</b>	<b>87,155</b>	<b>211,662</b>	<b>528,023</b>	
<b>Total NPV =</b>			<b>\$528,023</b>								
<b>Benefit/Cost Ratio =</b>			<b>3.49</b>								

- (A) = Energy Red/Part. (21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)

- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4**  
**Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Motors**

Year	Ratio of Part. to Total Customers (A)	Benefits										Costs			Annual Benefits Less Costs (M)	
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)	Total Annual Costs (L)		
2010	0.0062	\$17,454	38,786	77,572	\$0.057	\$0.051	9	18	\$46.02	\$67.43	\$25,223	\$96,822	\$0	\$96,822	(\$71,599)	
2011	0.0123	\$34,907	77,572	155,144	\$0.058	\$0.052	18	35	\$47.17	\$69.12	\$50,835	96,822	\$0	96,822	(45,987)	
2012	0.0122	\$52,361	116,358	232,716	\$0.060	\$0.054	26	53	\$48.35	\$70.85	\$76,850	96,822	\$0	96,822	(19,972)	
2013	0.0121	\$0	116,358	232,716	\$0.061	\$0.055	26	53	\$49.56	\$72.62	\$25,101	0	\$0	0	25,101	
2014	0.0120	\$0	116,358	232,716	\$0.063	\$0.056	26	53	\$50.80	\$74.44	\$25,728	0	\$0	0	25,728	
2015	0.0119	\$0	116,358	232,716	\$0.064	\$0.058	26	53	\$52.07	\$76.30	\$26,371	0	\$0	0	26,371	
2016	0.0118	\$0	116,358	232,716	\$0.066	\$0.059	26	53	\$53.37	\$78.20	\$27,031	0	\$0	0	27,031	
2017	0.0118	\$0	116,358	232,716	\$0.068	\$0.061	26	53	\$54.71	\$80.16	\$27,706	0	\$0	0	27,706	
2018	0.0117	\$0	116,358	232,716	\$0.069	\$0.062	26	53	\$56.07	\$82.16	\$28,399	0	\$0	0	28,399	
2019	0.0116	\$0	116,358	232,716	\$0.071	\$0.064	26	53	\$57.48	\$84.22	\$29,109	0	\$0	0	29,109	
2020	0.0115	\$0	116,358	232,716	\$0.073	\$0.065	26	53	\$58.91	\$86.32	\$29,837	0	\$0	0	29,837	
2021	0.0114	\$0	116,358	232,716	\$0.075	\$0.067	26	53	\$60.39	\$88.48	\$30,583	0	\$0	0	30,583	
2022	0.0113	\$0	116,358	232,716	\$0.077	\$0.069	26	53	\$61.90	\$90.69	\$31,347	0	\$0	0	31,347	
2023	0.0113	\$0	116,358	232,716	\$0.079	\$0.071	26	53	\$63.44	\$92.96	\$32,131	0	\$0	0	32,131	
2024	0.0112	\$0	116,358	232,716	\$0.081	\$0.072	26	53	\$65.03	\$95.28	\$32,934	0	\$0	0	32,934	
2025	0.0111	0	0	0	\$0.083	\$0.074	0	0	\$66.65	\$97.67	\$0	0	\$0	0	0	
		1,629,012		3,258,024								\$499,185	\$290,466	\$0	\$290,466	\$208,719
												\$316,489	268,844	0	268,844	47,645

Total NPV = \$47,645  
Benefit/Cost Ratio = 1.18

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)

**Commercial  
High Efficiency Air Conditioning  
Benefit/Cost Analysis**

**Demand-Side Management Program - DSM**  
**Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Commercial Air Conditioning**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.04427
1a) Retail Rate Winter (\$/kWh) =	\$0.03858
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$44.90
3a) Retail Winter Demand Rate (\$/kW/season) =	\$65.79
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	4.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	903,595,055
Growth Rate =	2.02%
8) Total Customers by class =	10,590
Growth Rate =	0.73%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$1,225
Direct Operating Costs =	\$0
Incentive Costs =	\$12,500
<b>Total Utility Project Costs Year 1 =</b>	<b>\$13,725</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$1,225
Direct Operating Costs =	\$0
Incentive Costs =	\$12,500
<b>Total Utility Project Costs Year 2 =</b>	<b>\$13,725</b>
15b) Total Utility Cost Year 3 =	\$13,725
15c) Total Utility Cost Year 4 =	\$0
15d) Total Utility Cost Year 5 =	\$0
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$1,000
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ -
Escalation Rate =	0%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	0.9
20a) Avg Winter kW/part Saved =	0.0
21) Avg. Summer kWh/Part. Saved =	950
21a) Avg. Winter kWh/Part. Saved =	0
22) Number of Participants (First Year) =	25
22a) Number of Participants (Second Year) =	25
22a) Number of Participants (Third Year) =	25
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ 500

## Demand-Side Management Program - DSM

Integrated Electric System Cost-Effectiveness Analysis

### Summary Information

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Air Conditioning**

### Cost Summary

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Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$41,175
Total Program Participants	75
Utility Cost per Participant (First Year) =	\$549.00
Utility Cost per Participant (Program) =	\$549.00
Total kW Reduction	70
Total Energy Reduction (kWh)	1,076,303
Societal Cost per kwh	\$0.03

### Test Results

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	NPV	B/C
Utility Test	\$219,748	6.41
Ratepayer Test	\$225,180	7.40
Societal Cost Test	\$450,833	13.22
Participant Test	\$65,333	1.94

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Air Conditioning**

t	Year	Cost of Energy Saved				Project Cost				Cost of Energy	
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	Saved Less Project Cost (J)
1	2010	25,626	\$0.0289	\$0	23	\$395.70	\$9,983	\$13,725	353	\$14,078	(\$4,095)
2	2011	51,253	\$0.0299	0	47	\$404.33	20,421	\$13,725	675	14,400	6,021
3	2012	76,879	\$0.0310	0	70	\$413.18	31,332	\$13,725	963	14,688	16,644
4	2013	76,879	\$0.0321	0	70	\$422.25	32,050	\$0	912	912	31,138
5	2014	76,879	\$0.0332	0	70	\$431.54	32,788	\$0	859	859	31,929
6	2015	76,879	\$0.0344	0	70	\$441.07	33,545	\$0	805	805	32,740
7	2016	76,879	\$0.0356	0	70	\$450.83	34,321	\$0	748	748	33,573
8	2017	76,879	\$0.0368	0	70	\$460.84	35,118	\$0	690	690	34,428
9	2018	76,879	\$0.0381	0	70	\$471.10	35,936	\$0	630	630	35,306
10	2019	76,879	\$0.0394	0	70	\$481.61	36,775	\$0	567	567	36,208
11	2020	76,879	\$0.0408	0	70	\$492.39	37,636	\$0	502	502	37,134
12	2021	76,879	\$0.0422	0	70	\$503.43	38,520	\$0	435	435	38,084
13	2022	76,879	\$0.0437	0	70	\$514.76	39,427	\$0	366	366	39,061
14	2023	76,879	\$0.0452	0	70	\$526.36	40,358	\$0	294	294	40,063
15	2024	76,879	\$0.0468	0	70	\$538.26	41,313	\$0	220	220	41,093
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 1,076,303 981 \$499,522 \$41,175 \$9,021 \$50,196 \$449,326  
NPV = 260,379 35,199 5,431 40,631 219,748

Total NPV = \$219,748  
Benefit/Cost Ratio = 6.41

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**



*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Air Conditioning**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$741	\$0	\$9,242	\$9,983	\$13,725	\$13,725	(\$3,742)
2011	1,535	0	18,886	20,421	\$13,725	13,725	6,696
2012	2,382	0	28,949	31,332	\$13,725	13,725	17,607
2013	2,466	0	29,585	32,050	\$0	0	32,050
2014	2,552	0	30,236	32,788	\$0	0	32,788
2015	2,641	0	30,903	33,545	\$0	0	33,545
2016	2,734	0	31,587	34,321	\$0	0	34,321
2017	2,830	0	32,288	35,118	\$0	0	35,118
2018	2,929	0	33,007	35,936	\$0	0	35,936
2019	3,031	0	33,744	36,775	\$0	0	36,775
2020	3,137	0	34,499	37,636	\$0	0	37,636
2021	3,247	0	35,273	38,520	\$0	0	38,520
2022	3,361	0	36,066	39,427	\$0	0	39,427
2023	3,478	0	36,880	40,358	\$0	0	40,358
2024	3,600	0	37,713	41,313	\$0	0	41,313
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$40,663</b>	<b>\$0</b>	<b>\$458,859</b>	<b>\$499,522</b>	<b>\$41,175</b>	<b>\$41,175</b>	<b>\$458,347</b>
<b>NPV =</b>	<b>20,881</b>	<b>0</b>	<b>239,497</b>	<b>260,379</b>	<b>35,199</b>	<b>35,199</b>	<b>225,180</b>
<b>Total NPV =</b>		<b>\$225,180</b>					
<b>Benefit/Cost Ratio =</b>		<b>7.40</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (A) + (B) + (C)
- (E) = Total Utility Project Costs (15)
- (F) = (E)
- (G) = (D) - (F)

**Table 3**  
**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
Project: **Commercial Air Conditioning**

Year	Decreases				Increases					Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)	
2010	\$741	\$0	\$9,242	\$5,090	\$15,073	\$13,725	\$25,000	\$12,500	\$26,225	(\$11,152)
2011	\$1,535	\$0	\$18,886	\$10,724	\$31,145	\$13,725	25,000	\$25,000	13,725	17,420
2012	\$2,382	\$0	\$28,949	\$16,947	48,279	\$13,725	25,000	\$37,500	1,225	47,054
2013	\$2,466	\$0	\$29,585	\$17,856	49,907	\$0	0	\$0	0	49,907
2014	\$2,552	\$0	\$30,236	\$18,815	51,603	\$0	0	\$0	0	51,603
2015	\$2,641	\$0	\$30,903	\$19,827	53,371	\$0	0	\$0	0	53,371
2016	\$2,734	\$0	\$31,587	\$20,894	55,215	\$0	0	\$0	0	55,215
2017	\$2,830	\$0	\$32,288	\$22,021	57,139	\$0	0	\$0	0	57,139
2018	\$2,929	\$0	\$33,007	\$23,210	59,145	\$0	0	\$0	0	59,145
2019	\$3,031	\$0	\$33,744	\$24,464	61,239	\$0	0	\$0	0	61,239
2020	\$3,137	\$0	\$34,499	\$25,788	63,424	\$0	0	\$0	0	63,424
2021	\$3,247	\$0	\$35,273	\$27,186	65,705	\$0	0	\$0	0	65,705
2022	\$3,361	\$0	\$36,066	\$28,660	68,087	\$0	0	\$0	0	68,087
2023	\$3,478	\$0	\$36,880	\$30,217	70,575	\$0	0	\$0	0	70,575
2024	\$3,600	\$0	\$37,713	\$31,860	73,173	\$0	0	\$0	0	73,173
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0
<b>Total =</b>	<b>\$40,663</b>	<b>\$0</b>	<b>\$458,859</b>	<b>\$323,559</b>	<b>\$823,081</b>	<b>\$41,175</b>	<b>\$75,000</b>	<b>\$75,000</b>	<b>\$41,175</b>	<b>\$781,906</b>
<b>NPV =</b>	<b>20,881</b>	<b>0</b>	<b>239,497</b>	<b>227,349</b>	<b>487,728</b>	<b>35,199</b>	<b>64,115</b>	<b>62,418</b>	<b>36,895</b>	<b>450,833</b>

Total NPV = \$450,833  
Benefit/Cost Ratio = 13.22

(A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)

(B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)

(C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)

(D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)

(E) = (A) + (B) + (C) + (D)

(F) = Total Utility Project Costs (15)

(G) = Direct (16) + Other (17) Participant Costs x Participants (22)

(H) = Incentive Costs (15)

(I) = (F) + (G) - (H)

(J) = (E) - (I)

**Table 4  
Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Commercial Air Conditioning**

Year	Ratio of Part. to Total Customers (A)	Benefits								Costs				Annual Benefits Less Costs (M)			
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)		Total Annual Costs (L)		
2010	0.0023	\$12,500	23,750	0	\$0.057	\$0.051	22	0	\$46.02	\$67.43	\$14,849	\$25,000	\$0	\$25,000	(\$10,151)		
2011	0.0047	\$25,000	47,500	0	\$0.058	\$0.052	43	0	\$47.17	\$69.12	\$29,816	25,000	\$0	25,000	4,816		
2012	0.0046	\$37,500	71,250	0	\$0.060	\$0.054	65	0	\$48.35	\$70.85	\$44,905	25,000	\$0	25,000	19,905		
2013	0.0046	\$0	71,250	0	\$0.061	\$0.055	65	0	\$49.56	\$72.62	\$7,590	0	\$0	0	7,590		
2014	0.0046	\$0	71,250	0	\$0.063	\$0.056	65	0	\$50.80	\$74.44	\$7,780	0	\$0	0	7,780		
2015	0.0045	\$0	71,250	0	\$0.064	\$0.058	65	0	\$52.07	\$76.30	\$7,974	0	\$0	0	7,974		
2016	0.0045	\$0	71,250	0	\$0.066	\$0.059	65	0	\$53.37	\$78.20	\$8,174	0	\$0	0	8,174		
2017	0.0045	\$0	71,250	0	\$0.068	\$0.061	65	0	\$54.71	\$80.16	\$8,378	0	\$0	0	8,378		
2018	0.0044	\$0	71,250	0	\$0.069	\$0.062	65	0	\$56.07	\$82.16	\$8,588	0	\$0	0	8,588		
2019	0.0044	\$0	71,250	0	\$0.071	\$0.064	65	0	\$57.48	\$84.22	\$8,802	0	\$0	0	8,802		
2020	0.0044	\$0	71,250	0	\$0.073	\$0.065	65	0	\$58.91	\$86.32	\$9,022	0	\$0	0	9,022		
2021	0.0043	\$0	71,250	0	\$0.075	\$0.067	65	0	\$60.39	\$88.48	\$9,248	0	\$0	0	9,248		
2022	0.0043	\$0	71,250	0	\$0.077	\$0.069	65	0	\$61.90	\$90.69	\$9,479	0	\$0	0	9,479		
2023	0.0043	\$0	71,250	0	\$0.079	\$0.071	65	0	\$63.44	\$92.96	\$9,716	0	\$0	0	9,716		
2024	0.0042	\$0	71,250	0	\$0.081	\$0.072	65	0	\$65.03	\$95.28	\$9,959	0	\$0	0	9,959		
2025	0.0042	0	0	0	\$0.083	\$0.074	0	0	\$66.65	\$97.67	\$0	0	\$0	0	0		
		997,500		0									\$194,282	\$75,000	\$0	\$75,000	\$119,282
												\$134,750	69,417	0	69,417	65,333	

Total NPV = \$65,333  
Benefit/Cost Ratio = 1.94

- (A) = Total Participants (22) / Total Customers (8)
- (B) = Incentive Costs (15)
- (C1) = Energy Reduction/Part. (21) x Participants (22)
- (C2) = Energy Reduction/Part. (21a) x Participants (22)
- (D1) = Summer Retail Rate (1)
- (D2) = Winter Retail Rate (1a)
- (E1) = kW Demand Reduction/Part. (20) x Participants (22)

- (E2) = kW Demand Reduction/Part. (20a) x Participants (22)
- (F1) = Summer Retail Demand Rate (3)
- (F2) = Winter Retail Demand Rate (3a)
- (G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)
- (H) = Direct Participant Costs (16) x Participant (22)
- (I) = Other Participant Costs (17) x Participant (22)
- (L) = (H) + (I)
- (M) = (G) - (L)

**Residential  
New Construction Bundle  
Benefit/Cost Analysis**

**Demand-Side Management Program - DSM**  
**Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
 Project: **Residential New Construction Bundle**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.07212
1a) Retail Rate Winter (\$/kWh) =	\$0.06174
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$0.00
3a) Retail Winter Demand Rate (\$/kW/season) =	\$0.00
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	3.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	585,608,722
Growth Rate =	1.03%
8) Total Customers by class =	62,068
Growth Rate =	44.00%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$1,960
Direct Operating Costs =	\$0
Incentive Costs =	\$22,500
<b>Total Utility Project Costs Year 1 =</b>	<b>\$24,460</b>
15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$1,960
Direct Operating Costs =	\$0
Incentive Costs =	\$34,000
<b>Total Utility Project Costs Year 2 =</b>	<b>\$35,960</b>
15b) Total Utility Cost Year 3 =	\$49,960
15c) Total Utility Cost Year 4 =	\$0
15d) Total Utility Cost Year 5 =	\$0
15e) Total Utility Operating Cost (Program Life) =	\$0
Escalation Rate =	0.00%
16) Direct Participant Costs (\$/Part.) =	\$1,094
Escalation Rate =	3.00%
17a) Other Participant Costs (Annual \$/Part.) =	\$ -
Escalation Rate =	3.00%
17b) Other Participant Savings (Annual \$/Part.) =	\$ 39
Escalation Rate =	3%
18) Project Life (Years) =	15
20) Avg Summer kW/part. Saved =	0.46
20a) Avg Winter kW/part Saved =	0.93
21) Avg. Summer kWh/Part. Saved =	392
21a) Avg. Winter kWh/Part. Saved =	785
22) Number of Participants (First Year) =	40
22a) Number of Participants (Second Year) =	60
22a) Number of Participants (Third Year) =	85
22a) Number of Participants (Fourth Year) =	0
22a) Number of Participants (Fifth Year) =	0
23) Incentive/Participant (All) =	\$ 565

## Demand-Side Management Program - DSM

Integrated Electric System Cost-Effectiveness Analysis

### Summary Information

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential New Construction Bundle**

### Cost Summary

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Program Promotion (Years)	3
Project Life (Years)	15
Total Program Cost (Utility)	\$110,380
Total Program Participants	185
Utility Cost per Participant (First Year) =	\$611.50
Utility Cost per Participant (Program) =	\$596.65
Total kW Reduction	278
Total Energy Reduction (kWh)	3,231,810
Societal Cost per kwh	\$0.03

### Test Results

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	<u>NPV</u>	<u>B/C</u>
Utility Test	\$851,528	7.15
Ratepayer Test	\$897,410	10.69
Societal Cost Test	\$1,751,567	16.79
Participant Test	\$196,549	2.07

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential New Construction Bundle**

t	Year	Cost of Energy Saved				Project Cost				Cost of Energy Saved Less Project Cost (J)	
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)		Annual Project Costs (I)
1	2010	50,795	\$0.0289	\$0	60	\$395.70	\$25,292	\$24,460	1,336	\$25,796	(\$504)
2	2011	126,987	\$0.0299	0	151	\$404.33	64,657	\$35,960	3,351	39,311	25,346
3	2012	234,925	\$0.0310	0	278	\$413.18	122,324	\$49,960	6,219	56,179	66,145
4	2013	234,925	\$0.0321	0	278	\$422.25	125,103	\$0	6,238	6,238	118,865
5	2014	234,925	\$0.0332	0	278	\$431.54	127,955	\$0	6,256	6,256	121,699
6	2015	234,925	\$0.0344	0	278	\$441.07	130,880	\$0	6,272	6,272	124,608
7	2016	234,925	\$0.0356	0	278	\$450.83	133,881	\$0	6,287	6,287	127,594
8	2017	234,925	\$0.0368	0	278	\$460.84	136,960	\$0	6,301	6,301	130,659
9	2018	234,925	\$0.0381	0	278	\$471.10	140,119	\$0	6,314	6,314	133,805
10	2019	234,925	\$0.0394	0	278	\$481.61	143,360	\$0	6,325	6,325	137,035
11	2020	234,925	\$0.0408	0	278	\$492.39	146,685	\$0	6,334	6,334	140,351
12	2021	234,925	\$0.0422	0	278	\$503.43	150,096	\$0	6,341	6,341	143,755
13	2022	234,925	\$0.0437	0	278	\$514.76	153,596	\$0	6,347	6,347	147,249
14	2023	234,925	\$0.0452	0	278	\$526.36	157,187	\$0	6,351	6,351	150,836
15	2024	234,925	\$0.0468	0	278	\$538.26	160,871	\$0	6,352	6,352	154,519
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 3,231,810 3,830 \$1,918,965 \$110,380 \$86,625 \$197,006 \$1,721,959  
NPV = 990,042 92,632 45,882 138,514 851,528

Total NPV = \$851,528  
Benefit/Cost Ratio = 7.15

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential New Construction Bundle**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$1,469	\$0	\$23,822	\$25,292	\$24,460	\$24,460	\$832
2011	3,802	0	60,855	64,657	\$35,960	35,960	28,697
2012	7,280	0	115,044	122,324	\$49,960	49,960	72,364
2013	7,535	0	117,569	125,103	\$0	0	125,103
2014	7,799	0	120,156	127,955	\$0	0	127,955
2015	8,071	0	122,808	130,880	\$0	0	130,880
2016	8,354	0	125,527	133,881	\$0	0	133,881
2017	8,646	0	128,314	136,960	\$0	0	136,960
2018	8,949	0	131,170	140,119	\$0	0	140,119
2019	9,262	0	134,097	143,360	\$0	0	143,360
2020	9,586	0	137,098	146,685	\$0	0	146,685
2021	9,922	0	140,174	150,096	\$0	0	150,096
2022	10,269	0	143,327	153,596	\$0	0	153,596
2023	10,629	0	146,558	157,187	\$0	0	157,187
2024	11,001	0	149,871	160,871	\$0	0	160,871
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$122,575</b>	<b>\$0</b>	<b>\$1,796,390</b>	<b>\$1,918,965</b>	<b>\$110,380</b>	<b>\$110,380</b>	<b>\$1,808,585</b>
<b>NPV =</b>	<b>62,317</b>	<b>0</b>	<b>927,725</b>	<b>990,042</b>	<b>92,632</b>	<b>92,632</b>	<b>897,410</b>
<b>Total NPV =</b>		<b>\$897,410</b>					
<b>Benefit/Cost Ratio =</b>		<b>10.69</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)  
 (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)  
 (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)  
 (D) = (A) + (B) + (C)  
 (E) = Total Utility Project Costs (15)  
 (F) = (E)  
 (G) = (D) - (F)

Table 3

**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
Project: **Residential New Construction Bundle**

Year	Decreases				Increases					Net Change (J)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)	
2010	\$1,469	\$0	\$23,822	\$12,895	\$38,187	\$24,460	\$43,768	\$22,595	\$45,633	(\$7,446)
2011	\$3,802	\$0	\$60,855	\$33,954	98,611	\$35,960	65,651	\$56,486	45,125	53,486
2012	\$7,280	\$0	\$115,044	\$66,165	188,489	\$49,960	93,006	\$104,500	38,466	150,023
2013	\$7,535	\$0	\$117,569	\$69,698	194,802	\$0	0	\$0	0	194,802
2014	\$7,799	\$0	\$120,156	\$73,426	201,380	\$0	0	\$0	0	201,380
2015	\$8,071	\$0	\$122,808	\$77,357	208,237	\$0	0	\$0	0	208,237
2016	\$8,354	\$0	\$125,527	\$81,505	215,386	\$0	0	\$0	0	215,386
2017	\$8,646	\$0	\$128,314	\$85,881	222,841	\$0	0	\$0	0	222,841
2018	\$8,949	\$0	\$131,170	\$90,498	230,616	\$0	0	\$0	0	230,616
2019	\$9,262	\$0	\$134,097	\$95,368	238,728	\$0	0	\$0	0	238,728
2020	\$9,586	\$0	\$137,098	\$100,508	247,192	\$0	0	\$0	0	247,192
2021	\$9,922	\$0	\$140,174	\$105,930	256,026	\$0	0	\$0	0	256,026
2022	\$10,269	\$0	\$143,327	\$111,653	265,249	\$0	0	\$0	0	265,249
2023	\$10,629	\$0	\$146,558	\$117,691	274,878	\$0	0	\$0	0	274,878
2024	\$11,001	\$0	\$149,871	\$124,063	284,934	\$0	0	\$0	0	284,934
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0

Total =	\$122,575	\$0	\$1,796,390	\$1,246,592	\$3,165,557	\$110,380	\$202,425	\$183,581	\$129,224	\$3,036,333
NPV =	62,317	0	927,725	872,475	1,862,517	92,632	169,710	151,392	110,950	1,751,567

Total NPV = \$1,751,567  
Benefit/Cost Ratio = 16.79

- (A) = Energy Red/Part. (21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)

- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4**  
**Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential New Construction Bundle**

Year	Ratio of Part. to Total Customers (A)	Benefits						Costs						Annual Benefits Less Costs (M)	
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)		Total Annual Costs (L)
2010	0.0004	\$22,595	15,692	31,384	\$0.086	\$0.075	19	37	\$0.00	\$0.00	\$27,864	\$43,768	\$0	\$43,768	(\$15,904)
2011	0.0008	\$56,486	39,230	78,459	\$0.088	\$0.077	46	93	\$0.00	\$0.00	\$69,890	65,651	\$0	65,651	4,239
2012	0.0005	\$104,500	72,575	145,150	\$0.090	\$0.079	86	172	\$0.00	\$0.00	\$129,735	93,006	\$0	93,006	36,729
2013	0.0004	\$0	72,575	145,150	\$0.092	\$0.081	86	172	\$0.00	\$0.00	\$25,683	0	\$0	0	25,683
2014	0.0003	\$0	72,575	145,150	\$0.094	\$0.083	86	172	\$0.00	\$0.00	\$26,143	0	\$0	0	26,143
2015	0.0002	\$0	72,575	145,150	\$0.097	\$0.085	86	172	\$0.00	\$0.00	\$26,614	0	\$0	0	26,614
2016	0.0001	\$0	72,575	145,150	\$0.099	\$0.087	86	172	\$0.00	\$0.00	\$27,097	0	\$0	0	27,097
2017	0.0001	\$0	72,575	145,150	\$0.102	\$0.089	86	172	\$0.00	\$0.00	\$27,593	0	\$0	0	27,593
2018	0.0001	\$0	72,575	145,150	\$0.104	\$0.091	86	172	\$0.00	\$0.00	\$28,100	0	\$0	0	28,100
2019	0.0000	\$0	72,575	145,150	\$0.107	\$0.094	86	172	\$0.00	\$0.00	\$28,620	0	\$0	0	28,620
2020	0.0000	\$0	72,575	145,150	\$0.109	\$0.096	86	172	\$0.00	\$0.00	\$29,153	0	\$0	0	29,153
2021	0.0000	\$0	72,575	145,150	\$0.112	\$0.098	86	172	\$0.00	\$0.00	\$29,700	0	\$0	0	29,700
2022	0.0000	\$0	72,575	145,150	\$0.115	\$0.101	86	172	\$0.00	\$0.00	\$30,260	0	\$0	0	30,260
2023	0.0000	\$0	72,575	145,150	\$0.118	\$0.103	86	172	\$0.00	\$0.00	\$30,834	0	\$0	0	30,834
2024	0.0000	\$0	72,575	145,150	\$0.121	\$0.106	86	172	\$0.00	\$0.00	\$31,423	0	\$0	0	31,423
2025	0.0000	0	0	0	\$0.124	\$0.108	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
			998,397	1,996,793							\$568,711	\$202,425	\$0	\$202,425	\$366,286
											\$380,294	183,745	0	183,745	196,549

Total NPV = \$196,549

Benefit/Cost Ratio = 2.07

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)

# **Residential Lighting Benefit/Cost Analysis**

**Demand-Side Management Program - DSM  
Integrated Electric System Cost-Effectiveness Analysis**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Lighting - Various Delivery Methods**

**Input Data**

1) Retail Rate Summer (\$/kWh) =	\$0.07212
1a) Retail Rate Winter (\$/kWh) =	\$0.06174
Fuel Clause Adjustment (FCA)	\$0.01132
Escalation Rate =	2.50%
2) Avg. System Marginal Energy Cost (\$/kWh) =	\$0.02795
Escalation Rate =	3.50%
3) Retail Summer Demand Rate (\$/kW/season) =	\$0.00
3a) Retail Winter Demand Rate (\$/kW/season) =	\$0.00
Escalation Rate =	2.50%
4) System Conservation Demand Cost (\$/kW/yr)	\$336.77
MRO Reserve Margin=	15.0%
Escalation Rate =	3.00%
5) System Variable O&M Savings(\$/kWh) =	\$0.00000
Escalation Rate =	3.00%
6) Environmental Damage Factor =	49.5%
Escalation Rate =	3.00%
7) Total Sales by class (kWh) =	585,608,722
Growth Rate =	1.03%
8) Total Customers by class =	62,068
Growth Rate =	44.00%
9) Utility Discount Rate =	8.27%
10) Social Discount Rate(Tbill) =	3.99%
11) General Input Data Year =	2009
12) Project Analysis Year 1 =	2010
12a) Project Analysis Year 2 =	2011
13) Effective Fed & State Income Tax Rate =	39.00%
14a) System demand Line loss factor	7.90%
14b) System Energy Line loss factor	7.90%

15) Utility Project Costs (First Year)	
Admin & Promotion Costs =	\$8,820
Direct Operating Costs =	\$0
Incentive Costs =	\$6,300
<b>Total Utility Project Costs Year 1 =</b>	<b>\$15,120</b>

15a) Utility Project Costs (Second Year)	
Admin & Promotion Costs =	\$8,820
Direct Operating Costs =	\$0
Incentive Costs =	\$6,300
<b>Total Utility Project Costs Year 2 =</b>	<b>\$15,120</b>

15b) Total Utility Cost Year 3 = \$15,120

15c) Total Utility Cost Year 4 = \$0

15d) Total Utility Cost Year 5 = \$0

15e) Total Utility Operating Cost (Program Life) = \$0  
Escalation Rate = 0.00%

16) Direct Participant Costs (\$/Part.) = \$0  
Escalation Rate = 3.00%

17a) Other Participant Costs (Annual \$/Part.) = \$ -  
Escalation Rate = 3.00%

17b) Other Participant Savings (Annual \$/Part.) = \$ -  
Escalation Rate = 0%

18) Project Life (Years) = 9

20) Avg Summer kW/part. Saved = 0.010

20a) Avg Winter kW/part Saved = 0.021

21) Avg. Summer kWh/Part. Saved = 11

21a) Avg. Winter kWh/Part. Saved = 23

22) Number of Participants (First Year) = 3,600

22a) Number of Participants (Second Year) = 3,600

22a) Number of Participants (Third Year) = 3,600

22a) Number of Participants (Fourth Year) = 0

22a) Number of Participants (Fifth Year) = 0

23) Incentive/Participant (All) = \$ -

**Demand-Side Management Program - DSM**  
Integrated Electric System Cost-Effectiveness Analysis

**Summary Information**

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Lighting - Various Delivery Methods**

**Cost Summary**

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Program Promotion (Years)	3
Project Life (Years)	9
Total Program Cost (Utility)	\$45,361
Total Program Participants	10,800
Utility Cost per Participant (First Year) =	\$4.20
Utility Cost per Participant (Program) =	\$4.20
Total kW Reduction	364
Total Energy Reduction (kWh)	3,185,572
Societal Cost per kwh	\$0.01

**Test Results**

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	<u>NPV</u>	<u>B/C</u>
Utility Test	\$804,962	9.50
Ratepayer Test	\$860,892	23.20
Societal Cost Test	\$1,507,557	39.88
Participant Test	\$182,924	#DIV/0!

**Table 1  
Utility Test**

*This test quantifies incremental decreases and increases to revenue as a direct result of the project.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Lighting - Various Delivery Methods**

t	Year	Cost of Energy Saved				Project Cost					Cost of Energy Saved Less Project Cost (J)
		Total Energy (kWh) Reduction (A)	System Energy Cost (B)	Variable O & M Cost Savings (C)	Demand Reduction (D)	System Demand Cost (E)	Annual Cost of Energy Saved (F)	Utility Project Costs (G)	Lost Margin (H)	Annual Project Costs (I)	
1	2010	132,732	\$0.0289	\$0	121	\$395.70	\$51,806	\$15,120	3,491	\$18,611	\$33,194
2	2011	265,464	\$0.0299	0	242	\$404.33	105,972	\$15,120	7,006	22,126	83,846
3	2012	398,196	\$0.0310	0	364	\$413.18	162,592	\$15,120	10,542	25,662	136,930
4	2013	398,196	\$0.0321	0	364	\$422.25	166,321	\$0	10,574	10,574	155,748
5	2014	398,196	\$0.0332	0	364	\$431.54	170,148	\$0	10,603	10,603	159,544
6	2015	398,196	\$0.0344	0	364	\$441.07	174,074	\$0	10,631	10,631	163,443
7	2016	398,196	\$0.0356	0	364	\$450.83	178,104	\$0	10,657	10,657	167,447
8	2017	398,196	\$0.0368	0	364	\$460.84	182,239	\$0	10,681	10,681	171,558
9	2018	398,196	\$0.0381	0	364	\$471.10	186,482	\$0	10,702	10,702	175,780
10	2019	0	\$0.0394	0	0	\$481.61	0	\$0	0	0	0
11	2020	0	\$0.0408	0	0	\$492.39	0	\$0	0	0	0
12	2021	0	\$0.0422	0	0	\$503.43	0	\$0	0	0	0
13	2022	0	\$0.0437	0	0	\$514.76	0	\$0	0	0	0
14	2023	0	\$0.0452	0	0	\$526.36	0	\$0	0	0	0
15	2024	0	\$0.0468	0	0	\$538.26	0	\$0	0	0	0
16	2025	0	\$0.0485	0	0	\$550.45	0	0	0	0	0

Total = 3,185,572 2,909 \$1,377,739 \$45,361 \$84,886 \$130,247 \$1,247,492  
NPV = 899,669 38,777 55,930 94,707 804,962

Total NPV = \$804,962  
Benefit/Cost Ratio = 9.50

(A) = Energy Reduction/Part. (21+ 21a) x Participants (22) x energy line loss (14b)  
(B) = System Energy Cost (2)  
(C) = (A) x Variable O&M (5)  
(D) = kW demand Reduction/Part. (20) x Participants (22) x demand line loss (14a)  
(E) = SystemDemand Cost (4)

(F) = (A)x(B) + (C) + (D)x(E)  
(G) = Total Utility Project Costs (15)  
(H) = [ 1 - Effective Tax Rate (13) x [(A) x Retail Rate (1) - (A+B)]  
(I) = (G) + (H)  
(J) = (F) - (I)

**Table 2**  
**Ratepayer Impact Test**

*This test compares the cost of energy saved to the total cost of saving that same amount of energy and its impact on all ratepayers.*

Company: **Montana-Dakota Utilities Co.**

Project: **Residential Lighting - Various Delivery Methods**

Year	Decreases			Increases			Net Change (G)
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Annual Total Decrease (D)	Utility Program Costs (E)	Annual Total Increase (F)	
2010	\$3,840	\$0	\$47,966	\$51,806	\$15,120	\$15,120	\$36,685
2011	7,948	0	98,024	105,972	\$15,120	15,120	90,852
2012	12,340	0	150,253	162,592	\$15,120	15,120	147,472
2013	12,771	0	153,550	166,321	\$0	0	166,321
2014	13,218	0	156,929	170,148	\$0	0	170,148
2015	13,681	0	160,393	174,074	\$0	0	174,074
2016	14,160	0	163,944	178,104	\$0	0	178,104
2017	14,656	0	167,583	182,239	\$0	0	182,239
2018	15,168	0	171,314	186,482	\$0	0	186,482
2019	0	0	0	0	\$0	0	0
2020	0	0	0	0	\$0	0	0
2021	0	0	0	0	\$0	0	0
2022	0	0	0	0	\$0	0	0
2023	0	0	0	0	\$0	0	0
2024	0	0	0	0	\$0	0	0
2025	0	0	0	0	0	0	0
<b>Total =</b>	<b>\$107,783</b>	<b>\$0</b>	<b>\$1,269,956</b>	<b>\$1,377,739</b>	<b>\$45,361</b>	<b>\$45,361</b>	<b>\$1,332,378</b>
<b>NPV =</b>	<b>70,021</b>	<b>0</b>	<b>829,648</b>	<b>899,669</b>	<b>38,777</b>	<b>38,777</b>	<b>860,892</b>
<b>Total NPV =</b>		<b>\$860,892</b>					
<b>Benefit/Cost Ratio =</b>		<b>23.20</b>					

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (A) + (B) + (C)
- (E) = Total Utility Project Costs (15)
- (F) = (E)
- (G) = (D) - (F)

**Table 3**  
**Societal Cost Test**

*This test measures the net cost of the program based on total cost including both the participant's and utility's costs.*

Compar **Montana-Dakota Utilities Co.**  
Project: **Residential Lighting - Various Delivery Methods**

Year	Decreases				Increases					
	Total Energy Savings (A)	Variable O & M Cost Savings (B)	System Demand Savings (C)	Avoided Environmental Damage Costs (D)	Annual Total Decrease (E)	Utility Program Costs (F)	Total Participants' Costs (G)	Incentives Paid to Participants (H)	Annual Total Increase (I)	Net Change (J)
2010	\$3,840	\$0	\$47,966	\$26,413	\$78,219	\$15,120	\$0	\$0	\$15,120	\$63,099
2011	\$7,948	\$0	\$98,024	\$55,651	161,623	\$15,120	0	\$0	15,120	146,503
2012	\$12,340	\$0	\$150,253	\$87,946	250,539	\$15,120	0	\$0	15,120	235,418
2013	\$12,771	\$0	\$153,550	\$92,662	258,983	\$0	0	\$0	0	258,983
2014	\$13,218	\$0	\$156,929	\$97,638	267,786	\$0	0	\$0	0	267,786
2015	\$13,681	\$0	\$160,393	\$102,888	276,962	\$0	0	\$0	0	276,962
2016	\$14,160	\$0	\$163,944	\$108,427	286,531	\$0	0	\$0	0	286,531
2017	\$14,656	\$0	\$167,583	\$114,273	296,512	\$0	0	\$0	0	296,512
2018	\$15,168	\$0	\$171,314	\$120,442	306,924	\$0	0	\$0	0	306,924
2019	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2020	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2021	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2022	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2023	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2024	\$0	\$0	\$0	\$0	0	\$0	0	\$0	0	0
2025	\$0	\$0	\$0	\$0	0	0	0	\$0	0	0
<b>Total =</b>	<b>\$107,783</b>	<b>\$0</b>	<b>\$1,269,956</b>	<b>\$806,340</b>	<b>\$2,184,079</b>	<b>\$45,361</b>	<b>\$0</b>	<b>\$0</b>	<b>\$45,361</b>	<b>\$2,138,718</b>
<b>NPV =</b>	<b>70,021</b>	<b>0</b>	<b>829,648</b>	<b>646,665</b>	<b>1,546,334</b>	<b>38,777</b>	<b>0</b>	<b>0</b>	<b>38,777</b>	<b>1,507,557</b>

Total NPV = \$1,507,557  
Benefit/Cost Ratio = 39.88

- (A) = Energy Red/Part.(21 + 21a) x Parts(22) x Energy L Loss(14b) x Energy Cost(2)
- (B) = Energy Reduction/Part. (21) x Participants (22) x Variable O&M (5)
- (C) = kW demand Redc/Part. (20) x Participants (22) x demand line loss (14a) x System Demand Cost (4)
- (D) = (Energy Savings (A) + System Demand Savings (C)) x Environmental Damage Factor (6)
- (E) = (A) + (B) + (C) + (D)

- (F) = Total Utility Project Costs (15)
- (G) = Direct (16) + Other (17) Participant Costs x Participants (22)
- (H) = Incentive Costs (15)
- (I) = (F) + (G) - (H)
- (J) = (E) - (I)

**Table 4**  
**Participant Test**

*This test quantifies the benefits and costs that accrue directly to the participant.*

Company: **Montana-Dakota Utilities Co.**  
Project: **Residential Lighting - Various Delivery Methods**

Year	Ratio of Part. to Total Customers (A)	Benefits								Costs				Annual Benefits Less Costs (M)	
		Incentives Received (B)	Summer Energy Reduction (C1)	Winter Energy Reduction (C2)	Summer Retail Rate (D1)	Winter Retail Rate (D2)	Summer Demand Reduction (E1)	Winter Demand Reduction (E2)	Summer Demand Rate (F1)	Winter Demand Rate (F2)	Total Annual Benefits (G)	Direct Part. Costs (H)	Other Part. Costs (I)		Total Annual Costs (L)
2010	0.0403	\$0	41,005	82,009	\$0.086	\$0.075	37	75	\$0.00	\$0.00	\$9,648	\$0	\$0	\$0	\$9,648
2011	0.0559	\$0	82,009	164,019	\$0.088	\$0.077	75	150	\$0.00	\$0.00	\$19,779	0	\$0	0	19,779
2012	0.0388	\$0	123,014	246,028	\$0.090	\$0.079	112	225	\$0.00	\$0.00	\$30,410	0	\$0	0	30,410
2013	0.0270	\$0	123,014	246,028	\$0.092	\$0.081	112	225	\$0.00	\$0.00	\$31,171	0	\$0	0	31,171
2014	0.0187	\$0	123,014	246,028	\$0.094	\$0.083	112	225	\$0.00	\$0.00	\$31,950	0	\$0	0	31,950
2015	0.0130	\$0	123,014	246,028	\$0.097	\$0.085	112	225	\$0.00	\$0.00	\$32,749	0	\$0	0	32,749
2016	0.0090	\$0	123,014	246,028	\$0.099	\$0.087	112	225	\$0.00	\$0.00	\$33,567	0	\$0	0	33,567
2017	0.0063	\$0	123,014	246,028	\$0.102	\$0.089	112	225	\$0.00	\$0.00	\$34,407	0	\$0	0	34,407
2018	0.0044	\$0	123,014	246,028	\$0.104	\$0.091	112	225	\$0.00	\$0.00	\$35,267	0	\$0	0	35,267
2019	0.0030	\$0	0	0	\$0.107	\$0.094	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
2020	0.0021	\$0	0	0	\$0.109	\$0.096	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
2021	0.0015	\$0	0	0	\$0.112	\$0.098	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
2022	0.0010	\$0	0	0	\$0.115	\$0.101	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
2023	0.0007	\$0	0	0	\$0.118	\$0.103	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
2024	0.0005	\$0	0	0	\$0.121	\$0.106	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
2025	0.0003	0	0	0	\$0.124	\$0.108	0	0	\$0.00	\$0.00	\$0	0	\$0	0	0
			984,112	1,968,225							\$258,948	\$0	\$0	\$0	\$258,948
											\$182,924	0	0	0	182,924

Total NPV = \$182,924

Benefit/Cost Ratio = #DIV/0!

(A) = Total Participants (22) / Total Customers (8)

(B) = Incentive Costs (15)

(C1) = Energy Reduction/Part. (21) x Participants (22)

(C2) = Energy Reduction/Part. (21a) x Participants (22)

(D1) = Summer Retail Rate (1)

(D2) = Winter Retail Rate (1a)

(E1) = kW Demand Reduction/Part. (20) x Participants (22)

(E2) = kW Demand Reduction/Part. (20a) x Participants (22)

(F1) = Summer Retail Demand Rate (3)

(F2) = Winter Retail Demand Rate (3a)

(G) = (B) + (C1 x D1) + (C2 x D2) + (E1 x F1)+(E2 x F2)

(H) = Direct Participant Costs (16) x Participant (22)

(I) = Other Participant Costs (17) x Participant (22)

(L) = (H) + (I)

(M) = (G) - (L)