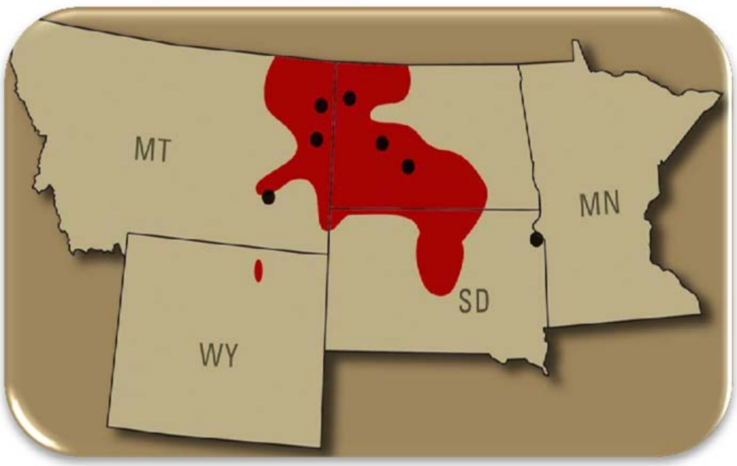
Integrated Resource Plan

2013



Submitted to the
North Dakota Public Service Commission
July 1, 2013

Volume I: Main Report

Montana-Dakota Utilities Co.

2013 Integrated Resource Plan

Submitted to the North Dakota Public Service Commission

July 1, 2013

Volume I

Main Report

MONTANA-DAKOTA
UTILITIES CO.
A Division of MDU Resources Group, Inc.

INTEGRATED RESOURCE PLAN

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Montana-Dakota Utilities Co.'s (Montana-Dakota) 2013 Integrated Resource Plan (IRP) conducted for the integrated electric system comprised of its service territories in the states of Montana, North Dakota and South Dakota continues a 26-year practice of documenting efforts used to determine the best value resource plan for its customers. The purpose of integrated resource planning is to consider all resource options reasonably available to meet the end-use customer's demand for reliable and cost-effective energy, and provide a road map for Montana-Dakota's future resources. Considered resources include a combination of traditional generating stations, distributed generation, renewable resources, demand-side management programs, and new and emerging technologies.

Montana-Dakota's IRP process encompasses four main areas: load forecasting, demand-side analysis, supply-side analysis, and integration and risk analysis. A summary of the IRP study results for each of these areas is provided.

The **load forecasting** activities, as discussed in Chapter 2, employ an econometric forecasting method along with other forecasting methods and analyses resulting in a combined analysis approach to predict the integrated system customers' future demand for electricity. The long-term forecast is an estimate of energy requirements and peak demand for twenty years into the future. The results for the base forecast show that, during the 2013-2032 timeframe, the projected average annual growth rate for summer peak demand is 1.6 percent prior to any reductions due to demand response programs, while annual energy requirements are expected to increase at a rate of 2.0 percent.

The **demand-side analysis** is an evaluation process to identify the feasible demand-side management (DSM) programs for Montana-Dakota's system. As discussed in Chapter 3, Montana-Dakota has worked with a third party on completion of the *Montana Electric Energy Efficiency Potential Study*. The results of the Study are summarized in Chapter 3 and the complete Study is included in Attachment B of this IRP. In Chapter 3 Montana-Dakota also discusses current energy efficiency and demand response program activity, hereinafter referred to collectively as DSM programs, for its customers in Montana, North Dakota, and South Dakota. Montana-Dakota's expected DSM program plans over the 2013-2015 period for each state are discussed at the end of Chapter 3.

The **supply-side analysis** is an evaluation process to determine the feasible generation options available to serve Montana-Dakota's system. The future resources to which Montana-Dakota has committed include the new simple cycle combustion turbine at Heskett (Heskett 3) and the air quality control system (AQCS) at the existing Big Stone plant. The potential resource options studied included simple-cycle combustion turbines, combined cycle combustion turbines, internal combustion engines, coal-fired generation, wind generation, solar, geothermal, biomass, landfill gas, 50 to 100 MW wind purchase power agreement from bids received as part of a 2013 Request for Proposals (2013 RFP), and the addition of a baghouse required to continue operating the existing Lewis & Clark plant. Along with the potential resource options, MISO energy purchases are available to meet energy needs.

The **integration and risk** process considers the feasible supply-side and demand-side options to determine a least-cost resource expansion plan to economically and reliably meet customer requirements into the future. A number of scenarios were investigated to determine the sensitivity of the least-cost plan to several factors that may impact the expansion plan. The analytical tool used for the integration process was the Electric Generation Expansion Analysis System (EGEAS), a resource expansion program developed by the Electric Power Research Institute. The results of the integration and risk process are then considered as part of the overall decision in determining the best resource plan for Montana-Dakota and its customers.

The **results** of the integration analysis indicate that Montana-Dakota's current optimal resource plan includes the commercial operation of Heskett 3 by 2015, three additional 36.6 MW internal combustion engine projects (two by 2015 and one in 2017), the continued construction of the Big Stone AQCS to be in service by 2015, the addition of a bag house at the Lewis & Clark Station in 2015, contracting for 50 to 100 MW of wind generation, and adding 200 MW of a combined cycle unit in 2020. As previously noted, the results of the least-cost model are used to inform the process of selecting the best plan to meet the future needs of Montana-Dakota's customers.

On the demand management side, along with a 10 MW demand response program developed under an external contract by 2015, Montana-Dakota will continue to promote the interruptible rates to reach a total of 13 MW.

Figure E-1 provides an overview of the identified need for capacity for the period 2013-2032. In this figure, "PRMR UCAP" represents Montana-Dakota's planning reserve margin requirements (PRMR) within Midcontinent Independent System Operator, Inc. (MISO) based upon Montana-Dakota's current 50/50 demand forecast and a 90 percent coincident factor, while "Existing

ZRC" represents the amount of zonal resource credits (ZRC) that Montana-Dakota has secured to meet its PRMR. The drop in ZRCs in 2015 represents the expiration of the WE Energies capacity purchase agreement in May 2015. For resource adequacy purposes, Montana-Dakota must have an amount of ZRC equal to or greater than PRMR; otherwise deficiency charges are assessable under the MISO tariff.

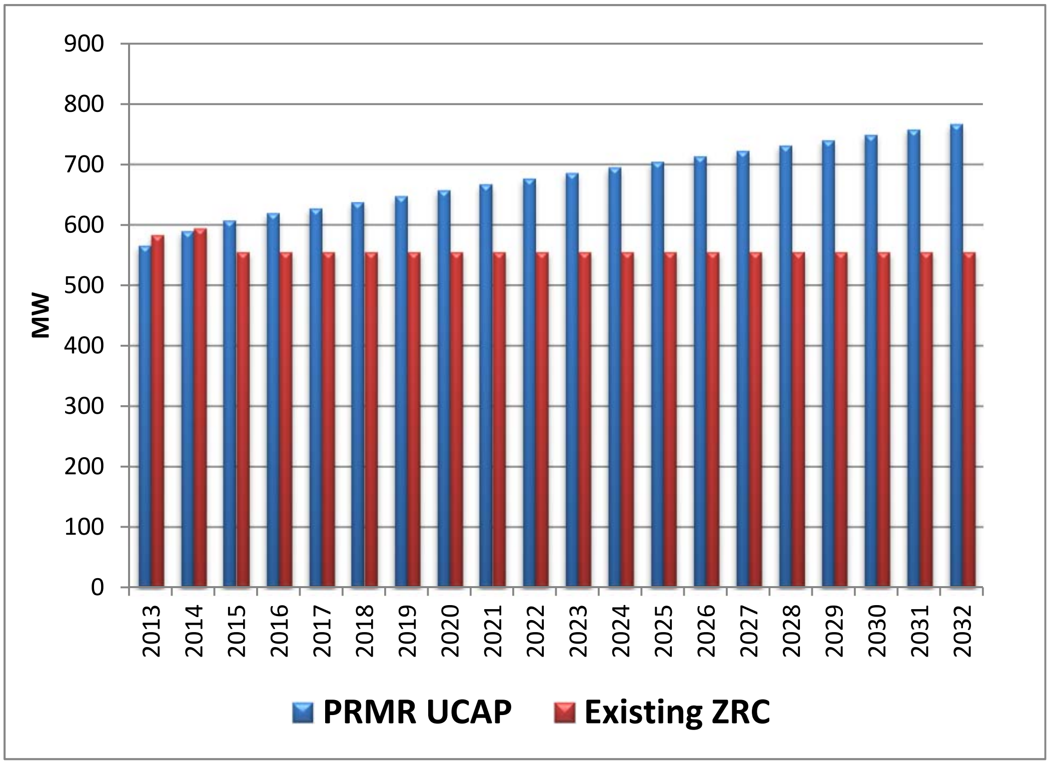


Figure E-1: Zonal Resource Credit and Planning Reserve Margin Requirement

Based on the analysis of the resource expansion models and the consideration of customer impacts, market availability of capacity and energy, and other factors such as environmental regulations and the balance of its generation mix, Montana-Dakota's recommended resource plan is to pursue the following resources to meet the requirements identified for the 2013-2017 period:

- Contract for 50 MW to 100 MW of wind generation by 2015;

- Continue the implementation of the commercial demand response program and the interruptible rate to obtain a total of 23 MW by 2015;
- Continue installation of the AQCS equipment required to continue operating the Big Stone Plant beyond 2015;
- Continue the installation of Heskett 3, an 88 MW simple-cycle combustion turbine (SCCT) to be operational by July 2014; and
- Install the Lewis & Clark Station baghouse by 2015.

The recommended resource plan is considered to be the best plan to economically and reliably meet customers' requirements over the five-year planning horizon. Montana-Dakota also plans to issue a new request for proposal for capacity and energy resources in 2015 to start the process for the next planning cycle.

The 2013 IRP process and product (report and attachments) were enhanced by the participation of Montana-Dakota's IRP Public Advisory Group (PAG). The PAG has been a valuable tool within the IRP process since 1994. The 2013 advisory group was established at the beginning of the 2013 planning cycle and provided Montana-Dakota with input throughout the 2013 IRP process.

*

For ease of handling, this IRP report is printed and bound in five separate volumes:

Volume I – Main Report (the current document)

Volume II – Attachment A: Load Forecast Documentation

Volume III – Attachment B: Demand-Side Analysis Documentation

Volume IV – Attachment C: Supply-Side and Integration Analysis Documentation
Attachment D: Public Advisory Group Documentation
Attachment E: 2013 Request for Proposal for Capacity and Energy Supply
Attachment F: Supply Side Resources Analysis
Attachment G: Pollution Control Projects
Attachment H: Bakken Impacts

CHAPTER 1

ENVIRONMENTAL CONSIDERATIONS

MDU Resources Group, Inc.'s Corporate Environmental Statement states:

> *"Our company will operate efficiently to meet the needs of the present without compromising the ability of future generations to meet their own needs. Our environmental goals are:*
>
> - *To minimize waste and maximize resources;*
> - *To support environmental laws and regulations that are based on sound science and cost-effective technology; and*
> - *To comply with or exceed all applicable environmental laws, regulations and permit requirements".*

Montana-Dakota strives to maintain compliance and operate in an environmentally proactive manner, while taking into consideration the cost to customers. Montana-Dakota actively monitors federal and state legislative and regulatory activity related to environmental issues, including air emissions, greenhouse gases (GHG), waste disposal and water discharges. The Company has also established memberships in relevant trade organizations to assist in monitoring the potential impact of proposed legislation and regulation to the Company's operations.

The U.S. Environmental Protection Agency (EPA) has finalized significant air emissions regulations for coal-fired electric generating facilities and has made known that it intends to propose several other significant new regulations that aim to reduce air emissions, including GHGs at fossil-fired electric generating facilities and pollutants in wastewater discharges and management of coal ash at coal-fired electric generating facilities. The culmination of all various pending environmental requirements may result in the retirement of existing coal-fired baseload units earlier than otherwise would occur. Montana-Dakota will continue to monitor the proposed regulations and will take the regulations into consideration when planning for future resource needs.

<u>Renewable Energy</u>

Montana-Dakota has been involved with renewable energy analysis and development for many years, and has several renewable energy installations.

Montana-Dakota has 50 MW of installed wind generation capacity at two locations, providing approximately seven percent of its customers' electric energy requirements. The Company also owns a 7.5 MW heat recovery facility on the Northern Border Pipeline Compressor Station in central North Dakota, which uses high-temperature exhaust gas as the primary heat source. Given that waste heat is utilized as the "fuel" for this generating facility, no additional fossil fuel is required and therefore incremental emissions to generate electricity are negligible.

Commitment to Reducing Air Emissions

In 2003, Montana-Dakota joined other utilities, through a memorandum of understanding from the Edison Electric Institute to the Department of Energy, to commit to reduce the utility industry's carbon dioxide emission intensity by three to five percent by 2010. Montana-Dakota has shown its commitment by reducing the Company's carbon dioxide emissions intensity in 2008 by approximately seven percent as compared to 2003. The reductions were realized through utility operational changes, customer energy efficiency programs, and renewable energy projects.

In 2010, Montana-Dakota updated its GHG goal, committing to a 10 percent reduction of the Company's average GHG emissions intensity from its electric generating facilities by 2012 compared to 2003 levels. As of January 1, 2012, Montana-Dakota achieved an 11 percent reduction from the company's 2003 electric generating facility greenhouse gas emissions intensity, surpassing the company's goal. The Company has met this goal through customer energy efficiency and renewable energy projects.

Montana-Dakota has been active in researching options for carbon dioxide capture, sequestration, and beneficial uses. The Company has been a member of the Plains CO_2 Reduction Partnership (PCOR) since its inception in 2003. The partnership is led by the Energy and Environmental Research Center at the University of North Dakota and is one of seven regional partnerships across the United States. Montana-Dakota has also actively participated in the environmental workgroups of the North Dakota Lignite Energy Council such as the Lignite Technology Development Workgroup and the Environmental Workgroup. In the last few years, these workgroups have focused on CO_2-related issues such as lignite gasification, oxyfuel combustion, pre- and post-combustion CO_2 capture technologies, and beneficial uses of CO_2.

Future Air Emissions Reduction Regulation Impacts

Air emissions regulations that will have the most immediate impact on operations at Montana-Dakota's electric generating facilities are the federal Regional Haze (RH) Rule and the Mercury and Air Toxics Standard (MATS) Rule. The most significant projects that will be implemented to comply with these rules include a projected $27.7 million filterable particulate matter pollution control project for MATS Rule compliance at the Lewis & Clark Station to be installed in 2015, as well as the air quality control system (AQCS) project at the Big Stone Plant for RH Rule compliance that is currently under construction and is to be completed by 2016. Montana-Dakota's ownership share in Big Stone Plant is 22.7 percent. Details regarding the Big Stone Plant AQCS project were included in Montana-Dakota's 2011 IRP. Additional information on the Lewis & Clark Station's MATS Rule compliance project, as well as some discussion on potential future environmental regulatory impacts to all Montana-Dakota's coal-fired electric generating facilities, are provided in Attachment G.

CHAPTER 2

LOAD FORECASTING

Montana-Dakota uses econometric modeling as the starting point for its forecasts. The econometric models for the 2013-2032 forecast were developed using the statistical software package called SAS®. In order to capture the extraordinary growth currently being experienced and expected as a result of the Bakken oil field activity, other forecasting methods and analyses also enter into the forecasting process for the Integrated System resulting in a combined analysis approach to the forecast.

An econometric model is a set of equations that expresses electricity use as a function of underlying factors such as customer income, price of electricity and alternate fuels, and weather. The strengths of econometric forecasting models include:

- Econometric models explicitly measure the effects of underlying causes of trends and patterns.
- Econometric models provide statistical evaluation of forecast uncertainty.
- Econometric models utilize economic and demographic information that is easily understood.
- Econometric models can be readily re-estimated.

With the forecast developed in 2012 for this IRP, the energy forecast was for the first time created for each state individually – Montana, North Dakota, and South Dakota – and the forecasts by state were combined to arrive at the Integrated System forecast in total.

The load forecasting process develops a forecast for annual energy sales and a forecast for peak demand. Detail regarding the specific econometric factors used in the energy sales forecast and peak demand forecast is given in the detailed description of the load forecast provided as Attachment A.

<u>Energy Sales Forecast</u>

The energy sales forecast is disaggregated into five sales sectors:

- Residential sector.

- Small Commercial & Industrial (SC&I) sector. This sector consists of those commercial and industrial customers whose peak demand averages less than 50 kilowatts a month over a year's time.

- Large Commercial & Industrial (LC&I) sector. This sector consists of those commercial and industrial customers whose peak demand averages more than 50 kilowatts a month over a year's time.

- Street Lighting. This sector consists of energy for public street and highway lighting.

- Miscellaneous. This sector includes energy for sales to other public authorities, interdepartmental sales, and company use.

The LC&I sector was disaggregated into seven end-use categories which were then forecasted separately. Six large customers were forecasted individually and all other LC&I energy sales were categorized as General LC&I energy sales (energy sales to all other LC&I customers) and forecasted as a group.

Econometric equations were tried initially in the development of the forecasted sales for the three primary customer categories by state – residential, SC&I, and General LC&I – while sales forecasts for the street lighting and miscellaneous sectors were developed primarily using linear regression. The final models used for each of the primary customer categories were a combination of econometrics and judgment. The sales forecasts for the six LC&I end-use customers were developed using a combination of regressions and information available from Montana-Dakota's field personnel regarding these large customers. More detail regarding the specific econometric factors used in the sales forecast is described the load forecast in Attachment A.

<u>Peak Demand Forecast</u>

The peak demand forecast is developed for the summer peaking season on a total integrated system basis; it is not disaggregated by state or by sector. The peak demand forecast was developed through the use of an econometric analysis where weighted average temperatures for Bismarck, North Dakota (70%), Miles City, Montana (15%) and Williston, North Dakota (15%) were used as part of the equation in order to capture weather diversity across the integrated system.

Any known interruptions (Interruptible Demand Response Rate 38 and/or customer outages) that occurred at the time of the summer peak were added to the historical actual summer peak used in the peak demand econometric model. The summer peak value thus represents the peak as it would have occurred had there not been any interruptions. More detail regarding the specific factors used in the peak demand forecast is described in Attachment A.

Forecast Adjustments

The forecast methodology for both energy sales and peak demand results in an initial energy sale forecast by sales sector for each state and an initial peak demand forecast. Reductions to the energy sales forecasts by sector and by state and to the peak demand forecast are made to reflect demand-side management programs. Once these reductions are reflected in the energy sales forecasts, the total of the energy sales forecasts by class are adjusted by the loss factor to arrive at the final forecast of total energy requirements.

Demand-Side Management (DSM) Reductions

The load forecast presented in this IRP was prepared in 2012 (*Electric Load Forecast 2013-2032*, published December 31, 2012). The DSM programs that were selected for the 2011 IRPs were incorporated in the forecast so that it reflects reductions resulting from the DSM programs planned at that time.

Losses

The energy sales forecast reflects the energy delivered to Montana-Dakota's customers' meters. The total amount of electricity provided by generating resources to meet Montana-Dakota's customers' energy needs is greater than what is delivered to the meters and is called the total energy requirements. The difference between the energy sales and total energy requirements reflects the losses that occur within the transmission and distribution system.

The percentage of the annual energy losses has varied from year to year. The average value for the past ten years is 7.929 percent. Using this value for all future years, the total system hourly loads are calculated for each year during the study period.

Final Energy Requirements and Peak Demand Forecast

The forecasted energy sales and system peak demand are first adjusted to reflect the effects of the DSM programs planned in the 2011 IRP and then adjusted for losses to calculate the total energy requirements and demand forecast. This is the amount of energy and capacity that must be acquired to meet Montana-Dakota's customers' energy needs.

The final forecast results are presented in Table 2-1 summarizing the total energy requirements and seasonal peak demand.

Table 2-1

Montana-Dakota Utilities Co.
Historical and Forecasted Energy and Demand
Integrated System
Reflecting Demand-Side Management Programs from 2011 IRP
Calendar Month Basis

	Total Energy Requirements (net of DSM and EE)		Summer Peak - MW				Winter Peak 2/		Demand Response		
Year	MWh	% Change	Total Demand Before any DSM or EE	Energy Efficiency (EE)	Demand Net of EE 1/	% Change	MW	% Change	Rate 38/39 Interrupt Loads	Residential AC Demand Response	Commercial Demand Response
2002	2,158,431				458.8		343.5				
2003	2,226,531	3.16%			470.5	2.55%	367.7	7.05%			
2004	2,204,012	-1.01%			458.4	-2.57%	383.9	4.41%			
2005	2,327,117	5.59%			459.1	0.15%	387.2	0.86%			
2006	2,397,793	3.04%			485.5	5.75%	397.2	2.58%			
2007	2,510,540	4.70%			525.6	8.26%	407.3	2.54%			
2008	2,596,990	3.44%			476.6	-9.32%	455.0	11.71%			
2009	2,593,368	-0.14%			473.8	-0.59%	459.6	1.01%			
2010	2,718,192	4.81%			502.5	6.06%	457.8	-0.39%			
2011	2,776,082	2.13%			535.8	6.63%	510.8	11.58%			
2012	2,919,752	5.18%			573.6	7.05%	not yet available				
2013	3,229,369	10.60%	583.6	1.3	582.3	1.51%	582.0		11.8	4.0	15.0
2014	3,428,355	6.16%	608.5	1.5	607.0	4.25%	612.6	5.25%	13.0	10.0	25.0
2015	3,566,791	4.04%	626.6	1.5	625.1	2.97%	633.9	3.47%	13.0	10.0	25.0
2016	3,658,701	2.58%	639.3	1.5	637.8	2.04%	648.0	2.23%	13.0	10.0	25.0
2017	3,707,826	1.34%	647.2	1.5	645.7	1.24%	655.5	1.16%	13.0	10.0	25.0
2018	3,778,809	1.91%	657.6	1.5	656.1	1.61%	666.4	1.66%	13.0	10.0	25.0
2019	3,849,868	1.88%	668.0	1.5	666.5	1.58%	677.3	1.64%	13.0	10.0	25.0
2020	3,917,073	1.75%	678.0	1.5	676.5	1.49%	687.7	1.52%	13.0	10.0	25.0
2021	3,985,719	1.75%	688.1	1.5	686.6	1.50%	698.2	1.53%	13.0	10.0	25.0
2022	4,051,562	1.65%	697.9	1.5	696.4	1.43%	708.3	1.45%	13.0	10.0	25.0
2023	4,116,212	1.60%	707.5	1.5	706.0	1.39%	718.3	1.40%	13.0	10.0	25.0
2024	4,178,028	1.50%	716.9	1.5	715.4	1.32%	727.7	1.32%	13.0	10.0	25.0
2025	4,241,515	1.52%	726.4	1.5	724.9	1.33%	737.5	1.34%	13.0	10.0	25.0
2026	4,302,729	1.44%	735.7	1.5	734.2	1.28%	746.9	1.27%	13.0	10.0	25.0
2027	4,363,792	1.42%	744.9	1.5	743.4	1.26%	756.3	1.26%	13.0	10.0	25.0
2028	4,422,149	1.34%	753.9	1.5	752.4	1.20%	765.2	1.19%	13.0	10.0	25.0
2029	4,481,277	1.34%	762.9	1.5	761.4	1.20%	774.3	1.19%	13.0	10.0	25.0
2030	4,541,269	1.34%	772.1	1.5	770.6	1.20%	783.5	1.19%	13.0	10.0	25.0
2031	4,602,215	1.34%	781.3	1.5	779.8	1.20%	792.9	1.19%	13.0	10.0	25.0
2032	4,663,964	1.34%	790.6	1.5	789.1	1.20%	802.4	1.20%	13.0	10.0	25.0

1/ Historical demand reported is system actual demand.
2/ Winter Peak is for Nov-Dec of current year and Jan-Apr of following year.

Forecast Uncertainty

Forecasting is a process permeated with uncertainty. The demand and energy projections produced by the combined analysis forecasting process results in a forecast based solely on the information used as inputs to the equations. For purposes of integrated resource planning, a single forecast does not allow the analysis of risk and uncertainty associated with the input assumptions. Robust resource decisions cannot be made unless uncertainty is considered. This uncertainty can be expressed by peak demand forecasts that reflect temperatures which correspond to higher confidence levels as well as high-growth and low-growth scenarios in energy forecasts.

Effect of Temperature on Peak Demand

The final forecast results were developed assuming average temperatures at the time of the system peak. However, with an average temperature forecast, by definition actual peak demand would have a 50 percent probability of being lower than the forecast values and a 50 percent probability of exceeding forecast values (50/50 forecast). It can appear that peak demand is under-forecasted when the actual temperature at the time of system peak exceeds average temperatures.

Montana-Dakota conducts a study annually to establish the relationship between summer peak demand and temperature at the time of system peak. As part of the study, the Company's historical July and August demands and corresponding temperatures at times when the temperatures equaled or exceeded 85°F on Mondays through Thursdays are analyzed. The 2012 study results indicated each one degree increase in temperature at the time of summer peak would result in an increase of approximately 6.0 MW in summer peak demand.

Further statistical analysis of temperatures at the time of system peak for the years 1984 through 2011 (prior to 1984 Montana-Dakota was a winter peaking utility) provided the results shown in Table 2-2.

Table 2-2
Temperature Probability at Peak and Effect on Peak Demand

Probability	Weighted Average Temperature	Approximate Increase in Peak Demand (MW)
50.0%	96.8	0.0
75.0%	99.6	16.8
80.0%	100.4	21.6
85.0%	101.2	26.4
90.0%	102.2	32.4
95.0%	103.7	41.4
97.0%	104.7	47.4

As Table 2-2 shows, with a weighted average temperature of 96.8°F at the time of peak, there is a 50 percent probability the temperature at peak would be lower than 96.8°F and a 50 percent probability the temperature at peak would be higher than 96.8°F. This forecast is referred to as the 50/50 demand forecast.

Also from Table 2-2, there is a 90 percent probability actual temperatures at the time of the system peak will not exceed 102.2°F. However, at this temperature (102.2°F), the system peak demand would be 32.4 MW higher than the demand in the base, or 50/50, forecast. This forecast is called the 90/10 forecast and provides a peak demand forecast that represents a 90 percent probability the actual peak demand will not exceed the forecast value and a 10 percent probability the actual peak demand will be higher than the forecast value. Table 2-3 summarizes the results of the 50/50 probability and 90/10 probability demand forecasts.

Table 2-3
Alternate Summer Peak Demand Forecast Comparison

Year	Base Forecast (96.8 degrees F) 50/50 Forecast (MW)	Growth Rate	Alternate Forecast (102.2 degrees F) 90/10 Forecast (MW) 1/
2013	582.3		614.7
2014	607.0	4.25%	640.8
2015	625.1	2.97%	659.9
2016	637.8	2.04%	673.4
2017	645.7	1.24%	681.7
2018	656.1	1.61%	692.7
2019	666.5	1.58%	703.7
2020	676.5	1.49%	714.2
2021	686.6	1.50%	724.9
2022	696.4	1.43%	735.2
2023	706.0	1.39%	745.4
2024	715.4	1.32%	755.3
2025	724.9	1.33%	765.4
2026	734.2	1.28%	775.2
2027	743.4	1.26%	785.0
2028	752.4	1.20%	794.4
2029	761.4	1.20%	803.9
2030	770.6	1.20%	813.5
2031	779.8	1.20%	823.3
2032	789.1	1.20%	833.2

1/ The growth rate for the 90/10 Forecast scenario is assumed to be the same as that of the 50/50 Forecast scenario.

High-Growth and Low-Growth Scenario Forecasts

Another approach taken to express forecast uncertainty in this study was to simulate high-growth and low-growth scenarios which represent the corresponding economic conditions that may occur. These high-growth and low-growth scenario forecasts were developed as follows.

Historical total energy was analyzed in order to find a period of time during which unusually high growth was experienced and a period of time during which unusually low growth was experienced. Based on the historical sales data, the average growth rate that occurred from 1977 to 1985 was used as the high-growth rate, and the average growth rate that occurred from 1985 to 1993 was used as the low-growth rate. Both of these periods consist of eight years of history.

However, as shown on Table 2-1, the growth now projected for the Integrated System in both 2013 and 2014 is greater than 4.4 percent. Montana-Dakota decided that the high-growth scenario would be set to the growth projected for 2013 and 2014 and growth would then fall to 4.4 percent per year for 2015 to 2032. Forecasted growth for 2013 and 2014 is fairly well defined and it is unlikely that additional growth opportunities will develop in the near term which will increase the forecasted growth above these levels. For the low-growth scenario, an average growth rate of 0.5 percent per year was assumed to occur during the 20-year forecast horizon.

Demand for each scenario was derived by applying the load factors calculated from the base forecast to the high-growth and low-growth scenario forecasted energy. The results of the high- and low-growth scenarios for energy and demand are shown on Table 2-4. The following page presents the graphs of the numeric results.

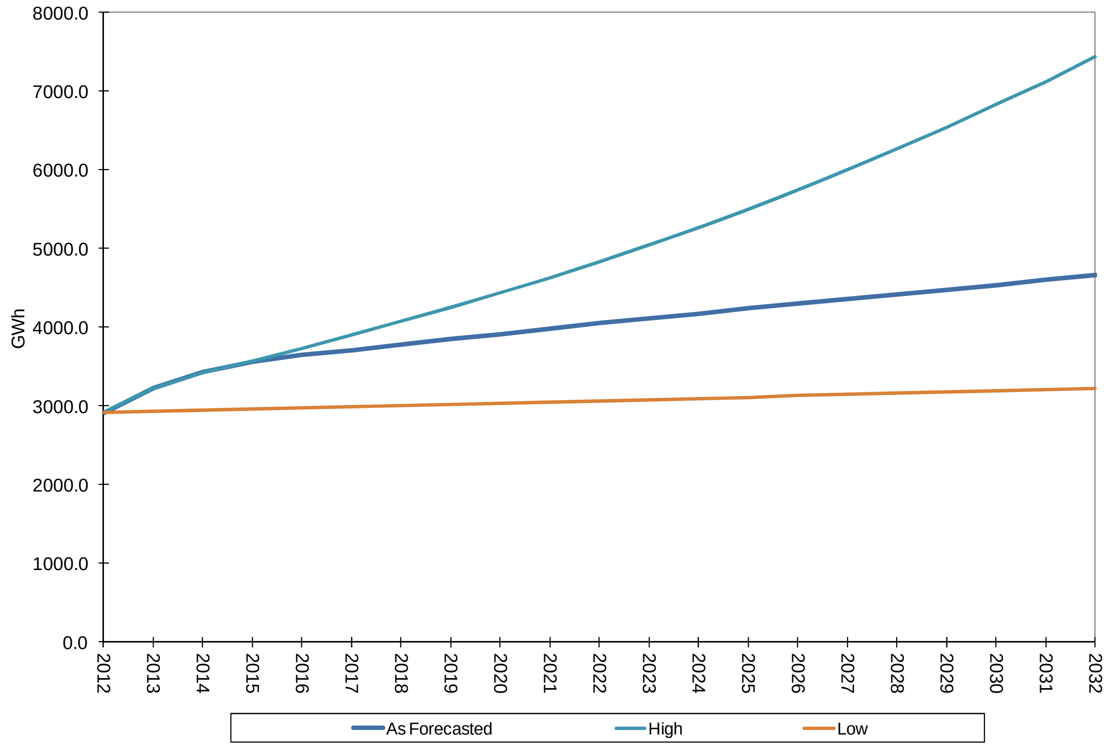
Table 2-4

High-Growth and Low-Growth Scenarios
Total Annual Energy (GWh) and
Summer Peak Demand (MW)

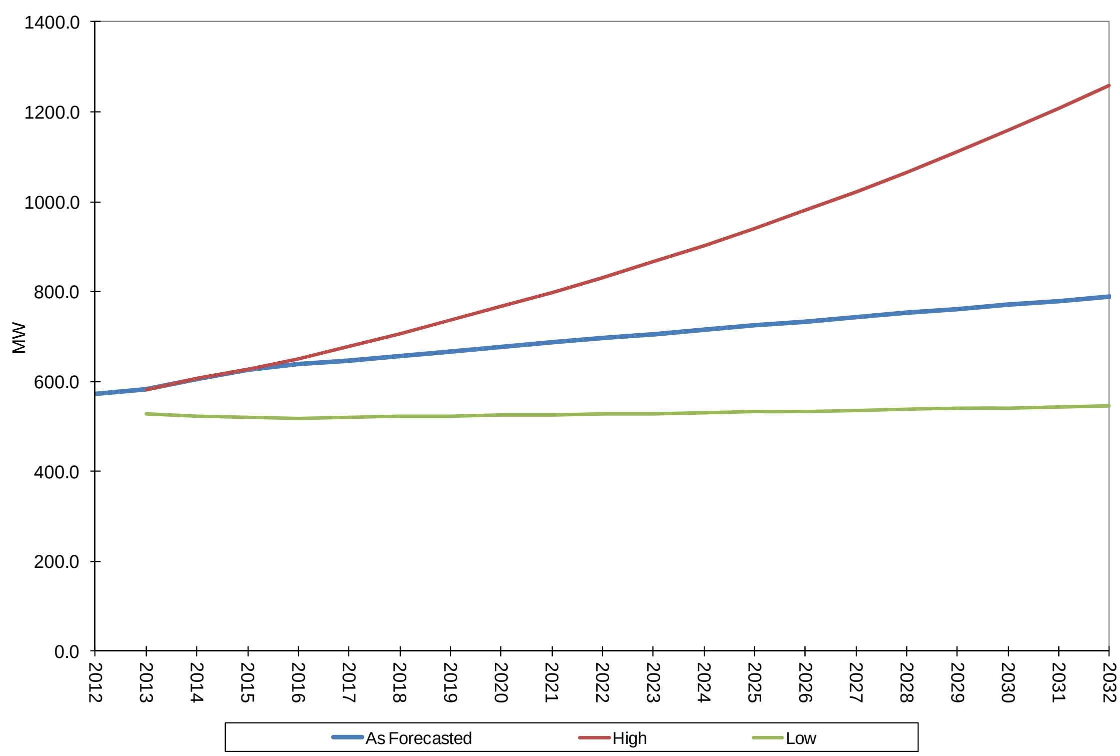
	ENERGY			DEMAND		
	Forecast	HIGH 1/	LOW 2/	Forecast	HIGH	LOW
2013	3229.4	3229.4	2934.4	582.3	582.3	529.1
2014	3428.4	3428.4	2949.1	607.0	607.0	522.1
2015	3566.8	3579.2	2963.8	625.1	627.2	519.4
2016	3658.7	3736.7	2978.6	637.8	651.4	519.3
2017	3707.8	3901.2	2993.5	645.7	679.4	521.3
2018	3778.8	4072.8	3008.5	656.1	707.2	522.4
2019	3849.9	4252.0	3023.5	666.5	736.1	523.4
2020	3917.1	4439.1	3038.7	676.5	766.6	524.8
2021	3985.7	4634.4	3053.8	686.6	798.3	526.1
2022	4051.6	4838.3	3069.1	696.4	831.6	527.5
2023	4116.2	5051.2	3084.5	706.0	866.4	529.1
2024	4178.0	5273.5	3099.9	715.4	903.0	530.8
2025	4241.5	5505.5	3115.4	724.9	940.9	532.4
2026	4302.7	5747.7	3131.0	734.2	980.8	534.2
2027	4363.8	6000.6	3146.6	743.4	1022.3	536.1
2028	4422.1	6264.7	3162.4	752.4	1065.9	538.1
2029	4481.3	6540.3	3178.2	761.4	1111.3	540.0
2030	4541.3	6828.1	3194.1	770.6	1158.6	542.0
2031	4602.2	7128.5	3210.0	779.8	1207.9	543.9
2032	4664.0	7442.2	3226.1	789.1	1259.2	545.8

1/ High forecast assumes no growth greater than that already forecasted for 2013 and 2014 with 4.4% growth per year (actual 77-85 growth) for the remainder of the forecast horizon 2015-2032.
2/ Low forecast assumes 0.5% growth per year (actual 85-93 growth).

Montana-Dakota Integrated System
High-Growth and Low-Growth Scenarios - Energy in GWh



Montana-Dakota Integrated System
High-Growth and Low-Growth Scenarios - Demand in MW



Forecast Accuracy

In July 2009, Montana-Dakota conducted a study, "Evaluation of Load Forecast Accuracy," to examine the accuracy of its forecast. The study provided a statistical validation of the accuracy of the Company's forecasts and also helped the Company better understand forecast problems and improve forecast accuracy. The evaluation was conducted on three forecasted quantities: annual energy requirements, summer peak demand, and winter peak demand.

The results of the study indicated that Montana-Dakota had produced relatively accurate forecasts. For the five-year-ahead forecasts, where the largest error levels occur, the annual energy requirement forecasts were within seven percent of the actual, while the summer and winter peak demand forecasts were within five percent and three percent of the actual, respectively. In actuality, Montana-Dakota generally underforecasted both the annual energy requirements and the summer peak demand.

CHAPTER 3

DEMAND-SIDE ANALYSIS

Overview

Demand-Side Management (DSM) is a resource planning tool a utility can use to meet two objectives: (1) to potentially offset future generation resource costs through load management and/or conservation measures and (2) to enhance customer service through the offering of programs to customers that will help reduce their overall demand and/or energy requirements.

With the demand for electricity and the need for additional resources growing, Montana-Dakota recognizes the value that DSM can play in meeting our customer's future energy requirements. However, the implementation of DSM programs cannot be done without cost consideration to the utility's customers and shareholders. Interests need to be balanced to achieve results at an affordable cost to both the utility and its customers.

The true value of DSM can only be achieved as an integrated resource implemented across all jurisdictions; however, cost recovery is necessary in each jurisdiction in order for full implementation to occur. In some cases, particularly in the case of demand response programs, the cost of infrastructure is such that if full system implementation is not achieved, the program may not be feasible.

In the 2011 IRP Montana-Dakota moved to a state by state approach (Montana, North Dakota, and South Dakota) for DSM analysis versus an Integrated System approach, due to the complexities of offering DSM programs across multiple jurisdictions and then in total for the Integrated System. In addition, Montana-Dakota set interim energy savings goals and committed to commissioning an energy efficiency potential study for Montana customers to serve as a guide to refining energy efficiency goals and programs throughout its integrated system. The study was completed by Nexant, Inc. (Nexant) in early December 2012 and is provided as Attachment B to this IRP.

Provided in this Chapter is a summary discussion of the *Montana Electric Energy Efficiency Potential Study*, a detailed discussion of current DSM Programs and activities, and Montana-Dakota's future DSM approach to program planning and implementation.

Overview of the Energy Efficiency Potential Study

Montana-Dakota is committed to investing in cost-effective DSM; however, there is uncertainty about how much can be implemented within the Company's service territory. Therefore, in order to attempt to quantify the achievable potential of energy conservation and set attainable DSM goals, Montana-Dakota commissioned a third party to perform an energy efficiency potential study for Montana customers.

The Montana service territory was selected as a starting point for analysis due to the implementation barriers that are inherent with a small rural customer base and a limited contractor network. Montana-Dakota plans to extrapolate the information from the *Montana Electric Energy Efficiency Potential Study* and apply it to North Dakota and South Dakota as appropriate.

Purpose of the Study

The purpose of the study was to identify and characterize remaining cost-effective electric energy efficiency potential in Montana-Dakota's Montana electric service territory and to quantify the amount of electric energy savings achievable through energy efficiency programs.

The objectives of the study were to:

- Establish attainable ten-year energy savings goals through comparing the costs and savings of energy efficiency measures relative to standard equipment and practices.
- Develop understanding of implementation barriers specific to Montana-Dakota's Montana service territory.
- Identify potential energy efficiency savings opportunities to support development or expansion of new programs appropriate to Montana-Dakota's Montana service territory.
- Quantify the potential energy efficiency resource for systems planning.

The values and figures presented in this study are intended to provide target ranges of achievable energy efficiency savings for Montana-Dakota's Montana electric service territory. This report does not provide precise goals for energy efficiency savings, nor does it provide a specific road map on how to achieve these energy efficiency targets. The results of this study are intended to provide Montana-Dakota with an understanding of energy efficiency as a resource, add clarity to Montana-Dakota's DSM program development process, and add context to any goals set by Montana-Dakota for future DSM programs.

CALCULATION METHODOLOGY

DSM resources for electric energy efficiency programs can be characterized by their technical, economic, and achievable potential. Technical potential is a theoretical "snapshot" of savings if all technologically feasible efficiency measures were implemented immediately at the highest possible efficiency, without regard for cost. Economic potential is a subset of technical potential that considers only cost-effective measures as compared to supply-side resources. Achievable potential accounts for real-world implementation barriers by considering market adoption rates developed from market research and evaluation data gathered through the implementation of representative DSM programs. Achievable potential represents the savings that Montana-Dakota could expect to achieve through energy efficiency programs. Figure 3-1 shows the relationship of these different types of energy efficiency potential with one another. Nexant did not assess program potential savings under the original scope of this study.

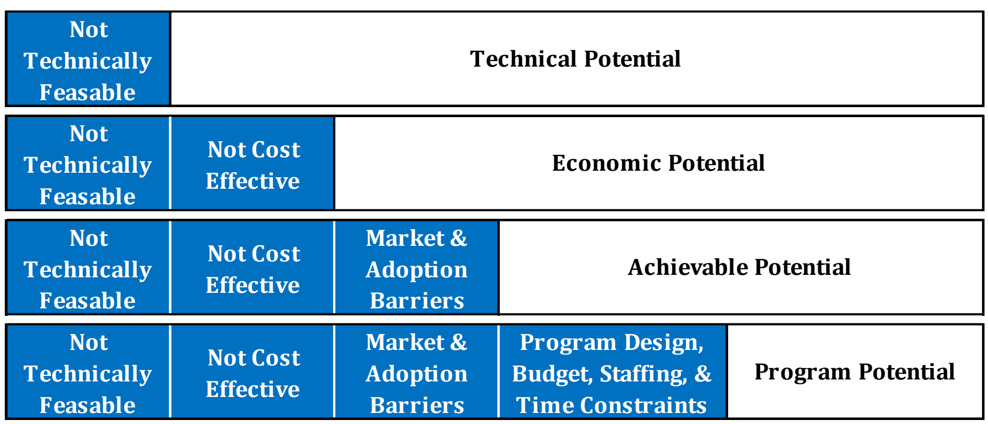


Figure 3-1: Types of Energy Efficiency Potential

Nexant conducted the evaluation of electric energy efficiency potential in Montana-Dakota's Montana service territory using a top-down modeling approach and following a three-step process. The core steps in the top-down potential estimation are described below. A more detailed description of calculation methodology is included in the full report that is contained in Attachment B of this IRP.

- **Step 1: Determine Baseline Energy Use and End-use Saturation.** Nexant first created a baseline energy consumption forecast for each sector: residential, commercial and industrial. A Montana-Dakota provided database of 2011 electricity sales by customer account enabled Nexant to classify base year consumption according to housing, business, or building type. Residential and commercial base year consumption was further disaggregated into end-uses before individual end-use growth rates were applied, resulting in a fully disaggregated end-use-level baseline forecast for residential and commercial sectors, and a slightly less granular business-type-level disaggregated forecast for the industrial sector.

- **Step 2: Identify Energy Efficiency Measures and other Program Opportunities.** Nexant developed measure libraries by consolidating and refining base-case and efficient-case energy impacts and costs specific to Montana-Dakota's unique market classes and other characteristics (such as load profile, discount rate, and avoided costs). Measure economic inputs were developed using Montana-Dakota-specific avoided energy and capacity costs, and refined using Montana-specific models of typical homes and businesses.
- **Step 3: Estimate Technical, Economic, and Achievable Potential.** Nexant employed a top-down approach to estimate energy and demand savings potential in technical, economic, and various achievable scenarios. The full report contained in Attachment B includes an explanation of the methods used to generate results by sector, segment, and end-use.
- **Step 4: Program Planning and Implementation Plan.** This step was not included in the original scope of the study; however Montana-Dakota has engaged Nexant to complete this task. Nexant is currently working on this phase and results are expected in late July or early August of 2013.

ENERGY EFFICIENCY ATTITUDES SURVEY RESULTS

Through the process of developing the study with Nexant, Montana-Dakota and Nexant decided to conduct an "Energy Efficiency Attitudes Survey" for both residential and commercial customers. Nexant developed the questionnaire for the survey and completed the survey analysis. Montana-Dakota randomly selected the survey sample and completed mailing of the survey.

The results of the survey and survey questions are contained in Appendix C of the Nexant study report that is located in Attachment B of this IRP. The following are key findings from the results of the survey.

Key Findings of Residential Survey

- Reduction of customers' energy bill is a strong market driver.
- Residential customers are generally open to energy efficiency, but cost is a barrier. Lifestyle and comfort are not key concerns.
- While customers are actively pursuing energy efficiency, the majority of actions are related to behavior change like turning off lights and adjusting thermostat settings.
- Residential customers have an interest in a wide variety of measures that includes weatherization, occupancy sensors, and upgrading or replacing appliances and HVAC equipment.
- Only the least expensive measures are likely to be considered with an incentive level of 25 percent of the incremental cost. In many cases, customers would be more likely to take action at the 50 percent or greater incentive level.
- Residential customers have two major reasons for not taking action to adopt energy efficiency: waiting until current equipment fails and that the upfront cost of the measures is too high.
- A large percentage of residential customers are looking for more information on energy efficiency measures, and many feel they know very little about their current energy usage.
- Only about 1 in 6 residential customers are currently aware of Montana-Dakota's energy efficiency programs.

Key Findings of Commercial/Industrial Survey

- Reduction of customers' energy bill/operating cost is the primary market driver for energy efficiency.
- Commercial and Industrial customers are generally open to energy efficiency, but cost is a barrier. Convenience and comfort are not primary concerns.
- While customers are actively pursuing energy efficiency, the majority of actions are related to behavior change like turning off lights and adjusting thermostat settings. There are some businesses that purchase ENERGY STAR® rated computers and office equipment.
- Commercial and Industrial customers have an interest in a wide variety of measures that include weatherization, occupancy sensors, and upgrading or replacing appliances and HVAC equipment.
- Commercial and Industrial customers require a minimum incentive level of 50 percent of incremental cost in most cases.
- Customers have two major reasons for not taking action to adopt energy efficiency: waiting until current equipment fails and that the upfront cost of the measures is too high.

- A large percentage of commercial customers are looking for more information on energy efficiency measures.
- Less than 1 in 10 commercial and industrial customers are currently aware of Montana-Dakota’s energy efficiency programs.

Program Portfolio Overview

Montana-Dakota currently offers Energy Efficiency DSM Programs only in Montana which are funded through the Universal Systems Benefit Charge. Demand Response DSM Programs are available to commercial customers in Montana, North Dakota, and South Dakota. The following is an overview of program details associated with each residential and commercial DSM measure that is currently being offered. The overview provides a description of the program, applicable states, DSM measures included in the program, incentive levels, and marketing and promotion plan. A summary of all there programs is presented in Table 3-2

Residential Cooling Program

This program offers rebates to Montana-Dakota residential customers installing high-efficiency central air conditioning equipment in single family dwellings. This program is available to residential electric customers in Montana and is applicable to high-efficiency central air conditioners and window air conditioners. Heat pump systems do not qualify for this program. The residential cooling program includes:

- Tier 1 Central Air Conditioner Program: This program is applicable to existing residential electric customers who are replacing a central air conditioning unit. The new central air conditioning unit must have a minimum 14.5 SEER rating in order to qualify for the rebate.

- Tier 2 Central Air Conditioner Program: This program is applicable to new construction and existing residential electric customers. The new central air conditioning unit must have a minimum 16 SEER rating in order to qualify for the rebate.

- Window Air Conditioning Program: The program is applicable to residential electric customers who purchase an ENERGY STAR®-rated window air conditioning unit. Qualifying equipment is eligible for a rebate.

- The air conditioner tune-up program will be applicable only to existing residential electric customers. The air conditioner tune-up will be performed by a contractor, and the tune-up will include computer diagnostics, refrigerant check, and air flow corrections. Customers who participate in this program will be eligible for a rebate.

Program Incentives:

Measure	Incentive Level
Tier 1 Central Air Conditioner – 14.5 SEER or greater	$100/ton
Tier 2 Central Air Conditioner – 16 SEER or greater	$200/ton
Window Air Conditioner	$50

Montana-Dakota will effectively market the program through following:

- Website,
- Bill inserts,
- Pamphlets and brochures,
- Radio advertisements,
- Newspaper inserts,
- Direct mail,
- Co-op advertising, and
- HVAC contractor relationships and promotion.

Residential Thermal Storage with an Air Source Heat Pump (ASHP)

This program offers rebates to Montana-Dakota residential electric customers when they purchase and install a brick electric thermal storage unit with a high-efficiency air-source heat pump (ASHP). This program is available to residential electric customers in Montana.

The program applies to the purchase and installation of a brick electric thermal storage unit with a new high-efficiency air source heat pump. The maximum capacity for the thermal storage unit is limited to 38.4 kW with an ASHP that must have a minimum efficiency rating of 8.2 HSPF/13 SEER/ 12 EER.

Program Incentive:

Measure	Incentive Level
Thermal Storage and ASHP Program	$60/kW

Montana-Dakota will effectively market the program through the following:

- Website,
- Bill inserts,
- Pamphlets and brochures,
- Direct mail,
- Radio advertisements,
- Newspaper inserts,
- Co-op advertising, and
- HVAC contractor and builder relationships and promotion.

Residential CFL Lighting Program

This program offers rebates to Montana-Dakota residential customers when they install high-efficiency compact fluorescent lighting (CFL) in single family dwellings. This program is available to residential electric customers in Montana and provides a rebate on a per bulb basis.

The residential CFL lighting program applies to residential electric customers who purchase and utilize high-efficiency CFL light bulbs in their home. The rebate applies to the number of bulbs purchased, with a maximum of 15 bulbs. This will be mail-in rebate with proof of purchase required.

Program Incentive:

Measure	Incentive Level
Residential CFL Lighting Program	$2/bulb

Montana-Dakota will effectively market the program through the following:

- Website,
- Bill inserts,
- Pamphlets and brochures,
- Direct mail,
- Radio advertisements,
- Newspaper inserts,
- Co-op advertising, and
- HVAC contractor and builder relationships and promotion.

Commercial Prescriptive Programs

This program offers prescriptive rebates to Montana-Dakota commercial industrial customers when they install high-efficiency lighting, cooling, and motor systems. This program will be available to Montana-Dakota's commercial customers in Montana that are served under a commercial electric tariff. The commercial prescriptive programs include:

- The Commercial Lighting program designed to incent customers to replace fluorescent lighting systems with more efficient technology and lighting systems. Through 2013 the baseline equipment will be T-12 technology and T-8 technology will be considered high efficiency. Beyond 2013, it is expected T-8 technology will become the standard and T-5 technology or better will be considered high efficiency. The lighting rebate covers a variety of fixtures with the exception of CFL lighting and outdoor lighting. The rebate will be based on $/watt saved and is offered as a standard prescriptive rebate for one replacement of standard fixtures. The program also offers a custom project feature to capture savings due to changes in fixture type and de-lamping.

- The Commercial Cooling program designed to cover the most common types of cooling equipment and includes prescriptive rebates for split systems, packaged systems, and chillers. The rebates are based on a prescriptive $/ton for each type of cooling equipment.

- The Commercial Motor program designed to cover new motors installed by customers as replacement for existing motors. The new motor must be a National Electrical Manufactures Association (NEMA) Premium Motor® to qualify for a rebate. Variable Speed Drive rebates will also be offered under the motor program. Rebates will be based on a prescriptive $/hp.

Program Incentives:

Measure	Incentive Level
Commercial Lighting Program	$0.40 per watt
Commercial Cooling Split Systems	$75 per ton
Commercial Cooling Packaged Systems	$75 per ton
Commercial Cooling Centrifugal Chillers	$25 per ton

Commercial Cooling Water Cooled Chillers	$25 per ton
Commercial Motors - Replacement	$15 per HP
Commercial Motors – New or replace on failure	$4 per HP
Variable Speed Drives	$30 per HP

Montana-Dakota will market the program through the following:

- Website,
- Key account representatives,
- Pamphlets and brochures,
- Radio advertisements,
- Newspaper inserts,
- Co-op advertising, and
- HVAC contractor relationships and promotion.

Commercial Partnership Program

This program offers rebates to Montana-Dakota's commercial and industrial customers installing energy conservation measures that are not eligible under the prescriptive rebates due to the variability in the energy savings and cost of the project. Rebates are based on the amount of energy savings, and the project must pass the Total Resource Cost test (TRC) with a Benefit/Cost ratio greater than one. This program was launched in 2012 and is available to Montana-Dakota's general service customers in Montana.

The commercial partnership program is designed to lower the initial cost of a variety of energy-efficient upgrades that are not available for any of the prescriptive rebates. While the incentive levels for this program are project specific, other criteria under this program are:

- Equipment installed must be more efficient than the industry standard;
- Simple payback must be greater than 18 months;
- Rebate cannot exceed 50 percent of the incremental cost of the equipment;
- Rebate will be based on the amount of energy and demand saved;
- Weatherization is not eligible for a rebate;

- Distributed renewable generation such as solar and wind under 50 kW will be considered under a net metering arrangement;
- Additional measurement and verification of the energy savings maybe required; and
- Rebate is also available to new construction.

The incentive levels for this program will be project specific. Montana-Dakota will market the program through the following:

- Website,
- Key account representatives,
- Pamphlets and brochures, and
- HVAC contractor relationships and promotion.

Commercial Demand Response Program

The Commercial Demand Response Program was launched in June of 2012 and is offered to commercial and industrial electric customers with a load of 50 kW or higher, with a priority focused on customers with loads of 150 kW or higher. This program is administered by a third-party demand response aggregator under contract with Montana-Dakota. The third-party aggregator is responsible for customer enrollment, settlement, and administration of the program on behalf of Montana-Dakota. This program is available to commercial and industrial electric customers in Montana, North Dakota, and South Dakota.

The program applies to commercial and industrial electric customers who agree to shed non-critical load during a demand response event initiated by Montana-Dakota. The program provides for a one-hour notification of an event, with a four-hour maximum event period, and for up to 50 hours per year.

The customer will receive a capacity and energy payment for participating in the program, and payment amounts will be pursuant to a negotiated contract between the customer and the third-party aggregator, who will market and promote the program on behalf of Montana-Dakota.

Montana-Dakota promotes the program with support from the third-party aggregator’s marketing and promotion efforts through the following:

- Key account representatives,
- Website,

- Bill inserts, and
- Trade shows and public awareness events.

Interruptible Demand Response Rate

The Interruptible Demand Response Rate has been available for several years and is offered to commercial and industrial electric customers with loads of 500 kW or higher. This program is administered by Montana-Dakota and the rate is offered as an optional rate for customers to consider for their power service. It offers a discounted demand charge in exchange for the load being available to call upon for reduction during demand response events. This program is available to commercial and industrial electric customers in Montana and North Dakota.

The program applies to commercial and industrial electric customers who agree to shed their entire load during a demand response event initiated by Montana-Dakota. The program provides for a one-hour notification of an event, with no maximum event time period, and for up to 100 hours per year.

Montana-Dakota's marketing and promotion efforts are primarily through the following:

- Key account representatives,
- Website,
- Architect and engineering contractors

Summary of Portfolio of Programs

Table 3-2

	Montana	North Dakota	South Dakota
Residential Programs			
Central Air Conditioner Tier 1 (14.5 SEER)	$100/ton		
Central Air Conditioner Tier 2 (16 SEER) - Replacement	$200/ton		
Central Air Conditioner Tier 2 - New	$200/ton		
Window Air Conditioner Units	$50		
Thermal Storage with Air-Source Heat Pump	$60/kW		
Residential Lighting	$2/bulb		
Commercial Programs			
Commercial Lighting	$0.40/watt		
Commercial Motors - Replacement	$15/HP		
Commercial Motors - New/On Failure of Exist. Equip.	$4/HP		
Variable Speed Drives - VFD	$30/HP		
Commercial Air Conditioner - Split Systems	$75/ton		
Commercial Air Conditioner - Packaged Systems	$75/ton		
Commercial Air Conditioner - Water Cooled Chillers	$25/ton		
Commercial Air Conditioner - Centrifugal Chillers	$25/ton		
Commercial Partnership Program (Custom)	Project-Specific		
Commercial Demand Response Program	Customer-Specific	Customer-Specific	Customer-Specific
Interruptible Rate Demand Response Program	$2.50/kW	$2.50/kW	

DSM Activity Summary

Montana-Dakota currently offers Energy Efficiency DSM Programs in Montana and Demand Response DSM Programs in Montana, North Dakota, and South Dakota. The following is a discussion of the activity in the currently offered programs.

Montana Energy Efficiency DSM Programs

The Montana Energy Efficiency Programs are funded through the Universal Systems Benefit Charge and, with the exception of the Residential Lighting, Commercial Partnership and Motor Programs, have been offered for the last several years. Small changes to program rebate levels and qualifying equipment covered under some existing programs were implemented in 2012.

Participation in the Montana EE portfolio of programs continues to be limited in both the residential and commercial programs. In 2012 there were no participants in the residential programs; however the commercial programs did have sixteen participants, of which there were three Commercial Lighting and thirteen Commercial Motors participants.

Several changes and new programs that were identified in the 2011 IRP were implemented in 2012. A summary of the changes that were implemented to the Montana Portfolio of programs in 2012 follows: Residential Program Activity:

- Residential Electric Cooling Program central air conditioners rebate levels and qualifying equipment were modified in effort increase participation and provide multiple efficiency tiers. New construction homes are also allowed to participate in the higher efficiency level of the program.
- ENERGY STAR® rate Window Air Conditioners were added to the Residential Electric Cooling Program with a rebate of $50 for qualifying window air conditioners.
- Residential Lighting Program was implemented and offers a $2 per bulb rebate for replacing incandescent lighting with CFL lighting.
- Residential Electric Thermal Storage Program was implemented in 2012 and offers a $60/kW rebate for installation air source heat pump and thermal storage system. This rebate is intended to coincide with customers electing to take service under Montana Rate 13, which offers a discounted rate for customers that can use these systems in the off peak hours.

Commercial Program Activity:

- Commercial Lighting Program rebate level was increased from $0.20 / watt to $0.40/watt saved. This change provides greater rebates levels to cover the higher upfront cost of some retrofit measures, such as high-bay lighting, that offer significant energy savings but are more costly than standard retrofits.
- Commercial Cooling Program was modified to include rebates for the various types of cooling systems used in commercial buildings and the various efficiency standards that apply to the different sizes of the equipment.
- The Electric Commercial Partnership Program was implemented in 2012. As discussed this program is designed to allow participation by commercial and industrial customers for measures not eligible under the prescriptive programs.

Demand Response Programs (Montana, North Dakota, and South Dakota)

Montana-Dakota currently offers two demand response programs for commercial and industrial customers. The Commercial Demand Response Program and Interruptible Demand Response Rate which together provide demand response options to customers starting at 50 kW of demand billing.

Commercial Demand Response Program

The Commercial Demand Response Program was launched in June of 2012 and is available to commercial and industrial electric customers, with a priority focused on customers with loads of 150 kW or higher. The total program goal is 25 MW, with 5MW available for the summer of 2013, an additional 10 MW available in the summer of 2014, and another 10MW in the summer of 2015. For the integration analysis a conservative approach was taken assuming 5 MW for the summer of 2013 and an additional 5 MW in the summer of 2014 for a total of 10 MW.

The Commercial Demand Response program saw very modest activity in 2012, with 0.107 MW enrolled and participating in the program by year end 2012, however additional customers were enrolled but were not ready for full participation. Including the additional enrolled customers, the total program is currently at 1.94 MW.

Currently, the enrollment of two large participants is pending. These two customers will account for an additional 4 MW in the program and it is expected that the total program with have approximately 6 MW by summer of 2013.

Interest in the program remains strong, with several customers in various stages of the sales process, however Montana-Dakota and the third party administrator continue to experience a longer than expected sales cycle time. This can be attributed to this being a new type of program in Montana-Dakota's service territory and the rapid growth that is being experienced due to the Bakken oilfield development. It is anticipated that this program will come very close to achieving the goal of 15 MW prior to the summer of 2014.

Interruptible Demand Response Rate

The Interruptible Demand Response Rate has been available for several years and is available to commercial and industrial electric customers with loads of 500 kW or higher. This program currently has 6.8 MW enrolled and Montana-Dakota's goal is to increase participation by 6.4 MW or to a total enrollment of 13 MW by the summer of 2015.

No additional customers were enrolled in the program in 2012 and the program remains at 6.8 MW. However, Montana-Dakota has executed an Interruptible Service Agreement with a new customer that is expected to begin operations in June of 2013. It is expected this customer's total enrolled MW's in the program will be 3 MW in 2013 and growing to over 6 MW in the next few years.

Montana-Dakota continues to work with customers and engineering companies to promote the use of the Interruptible Demand Response Rate and expects that the goal of 13 MW will be achieved by the summer of 2015.

Irrigation Study

In the 2011 IRP Montana-Dakota identified the need to continue with an irrigation load study to help determine if a focused direct-load-control demand response program would be appropriate for customers engaged in irrigation activities. However, after further consideration and with the launch of the Commercial Demand Response Program this study was determined to no longer be of significant benefit.

Irrigation customers that perform this activity on peak already qualify for participation in the Commercial Demand Response program and have been targeted for promotion with the third party aggregator. The irrigation customers as a whole do not represent a large piece of Montana-Dakota's total load and therefore to develop and maintain separate hardware and software, and operate a program specifically for irrigation customers is not as cost-effective as allowing them to participate in the Commercial Demand Response Program.

Program Planning and Implementation Plan

The completion of the Montana Energy Efficiency Potential Study provided valuable target ranges for achievable energy efficiency for the Montana service territory and is currently being evaluated to see if the results can be applied to Montana-Dakota's electric service territories in North Dakota and South Dakota. However, as identified in the study it does not provide precise goals nor does it provide a road map on how to acquire these energy efficiency targets.

Therefore Montana-Dakota has engaged Nexant to complete the additional task of Program Planning. This task will assist Montana-Dakota in setting the course for implementation of future programs that will achieve cost-effective energy efficiency. In this task Nexant will assist Montana-Dakota with the following:

- Identify program constraints such as budgeting, staffing, and time constraints;
- Establish program targets based on constraints to achievable savings;
- Identify measure bundles for both residential and non-residential customers;
- Identify delivery opportunities that will work in the Montana service territory;
- Identify incentive levels based upon incremental cost and amount necessary to remove the barriers to participation;
- Establish measure attributes such as minimum efficiency requirements, baseline efficiencies, and deemed unit costs and savings.

The Program Planning task is expected to be completed in late July or early August. The following is a discussion by state of the expected DSM activity for program years 2013-2015.

North Dakota

Montana-Dakota will continue to implement the Commercial Demand Response Program and promote the Interruptible Demand Response Rate in an effort to attain total program goals of 25 MW and 13 MW respectively. In addition, Montana-Dakota will continue to review the residential air conditioning cycling program for possible implementation in 2014 or 2015.

Montana-Dakota also will continue to review the results and information of the Nexant Energy Efficiency Potential Study for Montana to determine if they are adequate to extrapolate the results to the areas served by the Montana-Dakota in North Dakota.

Montana

Montana-Dakota will continue the existing energy efficiency programs offered in Montana for the remainder of 2013 and implement new programs identified in the Programs Planning task that is currently being performed by Nexant and authorized by the Montana Public Service Commission in 2014-2015.

In addition, Montana-Dakota will continue to implement the Commercial Demand Response Program and promote the Interruptible Demand Response Rate in an effort to attain total program goals of 25 MW and 13 MW respectively. Montana-Dakota will also continue to review the residential air conditioning cycling program for possible implementation in 2014 or 2015.

South Dakota

Montana-Dakota's South Dakota electric service territory represents approximately six percent of the Integrated System demand with a customer base of approximately 8,600 customers. Montana-Dakota will continue to implement the Commercial Demand Response Program in an effort to attain total program goals of 25 MW and 13 MW respectively. In addition, Montana-Dakota will continue to review the residential air conditioning cycling program for possible implementation in 2014 or 2015.

Montana-Dakota also will continue to review the results and information from the Nexant Energy Efficiency Potential Study for Montana to determine if they are adequate to extrapolate the results obtained to the areas served by the Montana-Dakota in South Dakota.

CHAPTER 4

SUPPLY-SIDE RESOURCE ANALYSIS

The objective of the supply side analysis is to identify the available and most cost-effective supply-side capacity resources to be added to Montana-Dakota's generating portfolio. Capacity resources must be proven technology and be able to maintain the system reliability that Montana-Dakota's customers have come to expect. Selected supply-side resources, together with the feasible Demand-Side Management (DSM) programs are used as inputs to the integration analysis, the final process to determine the least-cost integrated resource plan.

The supply-side analysis considers supply-side alternatives currently available to Montana-Dakota as well as those resources to which Montana-Dakota has made a commitment to install or purchase. A detailed discussion of the supply-side model assumptions, characteristics of the existing generation, the committed resources, and the proposed resources is included in Attachment C.

Committed Supply-Side Options

Current Resources

Montana-Dakota's existing generation serving the Integrated System is comprised of baseload coal-fired generation at Heskett Station (Units I and II), the Lewis & Clark Station, Montana-Dakota's shares of the Coyote and Big Stone Stations, and natural gas- fired peaking generation at Glendive (Units I and II), and Miles City. Montana-Dakota also owns the Diamond Willow and Cedar Hills wind farms, three 2 MW portable diesel units, and the Glen Ullin Station 6 waste heat generating unit serving the Integrated System. Total zonal resource credits (ZRC) available from the existing units in 2013 are 452.5 ZRC.

As described in the Company's 2009 Integrated Resource Plan, Montana-Dakota has entered into an agreement with Wisconsin Electric Power Company (WE Energies) to purchase peaking capacity during the 2012-2015 timeframe. The contract term began June 1, 2012 and expires on May 31, 2015. The capacity purchased on an annual basis is as follows:

- June 2012 through May 2013 – 110 MW
- June 2013 through May 2014 – 115 MW
- June 2014 through May 2015 – 120 MW

Future Capacity Resources

As noted in the 2011 IRP analysis, Montana-Dakota has committed to building a new natural gas fired combustion turbine near the existing Heskett coal-fired plants in Mandan, ND. The new Heskett 3 combustion turbine will be an 88 MW unit expected to be commercially available by July 2014, and was modeled as committed to be available at the start of 2015.

Also as noted in the 2011 IRP analysis, the Big Stone Air Quality Control Systems (AQCS) project at the existing Big Stone plant, of which Montana-Dakota is a 22.7 percent owner, has become a committed project for Montana-Dakota. To comply with the EPA regional haze rules, the Big Stone plant is required to install the AQCS using Best Available Retrofit Technology (BART), which was committed in the model in 2015. The analysis assumed the retirement of the Big Stone plant (with 101.3 ZRCs) in 2015 with a new resource option available to the EGEAS model in 2015 that includes the AQCS retrofit project and associated future operating costs for the Big Stone plant. The new resource option was assumed to be accredited with a lower ZRC value (99.7 ZRCs), as the AQCS will slightly reduce the capacity output of the Big Stone plant.

On March 25, 2013, Montana-Dakota issued a request for proposal (2013 RFP), a copy of which is included in Attachment E, to solicit proposals for capacity and energy supply from June 1, 2014 and beyond. The results of the 2013 RFP process were used to formulate market resource alternatives modeled in the resource expansion analysis described below.

Considered Supply-Side Resource Alternatives

Coal

Coal-fired baseload generation is a stable capacity and energy source characterized as having a high capital cost with low operating and fuel costs. With low operating and fuel costs, baseload units produce large amounts of energy at a relatively low cost. The high capital costs are spread over the life of the project. However, as significant new federal air quality, water discharge, and waste management regulations are proposed, new coal-fired baseload generation is unlikely to be feasible in the foreseeable future.

Simple Cycle Internal Combustion Engine

Simple-cycle internal combustion engines (ICE) are primarily built to serve peaking capacity needs. Because they are fueled by natural gas or fuel oil, which have higher fuel costs than coal, they are usually limited in the amount of energy they supply. The ICE units are, however, lower in capital costs compared to other generating types and can be installed within a relatively short lead time (two to three years).

Simple Cycle Combustion Turbines

Simple-cycle combustion turbines (SCCT) are primarily used to supply low-cost capacity, but a limited amount of energy, since they are fueled by either natural gas or fuel oil, which are more costly than coal. Combustion turbines have a relatively low capital cost, but the energy produced is more expensive than that produced from coal because of the higher fuel cost. Combustion turbines can be installed with a relatively short lead time (two to three years) and serve peaking capacity needs for the Company.

Combined Cycle Combustion Turbines

A conventional combined cycle combustion turbine (CCCT) burns natural gas or fuel oil in a SCCT. The hot exhaust gases from the SCCT pass through a heat recovery steam generator that produces steam for a steam turbine. Because CCCTs use natural gas or fuel oil, CCCTs have higher fuel costs than coal-fired baseload units. The advantage of a CCCT is that it is more efficient to operate than a SCCT, but its hours of operation could be limited because of its high fuel costs.

Wind (Self-Built)

A wind energy resource is characterized as a renewable resource with low energy costs associated with its operation and maintenance. The main disadvantage of wind generation is that, because of the variability of wind, it cannot be relied on as a firm capacity resource. Unlike the thermal resources such as coal-fired units and combustion turbines, wind energy resources are allowed limited zonal resource credits (ZRC) by the MISO. Therefore, the installation of additional wind generation on Montana-Dakota's system requires adding other capacity resources to meet the MISO planning reserve margin requirements.

This option represents Montana-Dakota's self-built wind generation. A $23/MWh (after tax) Production Tax Credit (PTC), which was modeled as a negative variable O&M cost, was assumed to be in effect for new wind generation installed before the end of 2014 as long as construction started by the end of 2013. Once the wind generation was selected (as part of the least-cost plan), the tax credit would continue for ten years from its year of installation.

Solar

Another renewable resource alternative is solar, which has a higher capital cost than wind generation. Like wind, solar is a variable output energy resource and must rely on other capacity resources to meet Montana-Dakota's MISO zonal reserve margin requirements. Three different types of solar options were included in the model: thermal, concentrated, and photovoltaic solar.

Landfill Gas

Methane gas produced from landfill sites can be captured and used as an alternative fuel to produce electricity. The landfill gas option modeled by Montana-Dakota was of a relatively large size, and would require a large and mature landfill, which may not be representative of a unit capable of being built within Montana-Dakota's service territory.

Biomass

There are several types of fuels that can be used for biomass generation including but not limited to: agriculture wastes, forestry by-products, and municipal waste. The biomass option is considered a renewable resource with high capital and fuel costs as compared to coal and natural gas fired options.

Solid Waste

Operating similar to a biomass-fired power plant, a solid waste power plant burns municipal solid waste as its fuel. A performance and cost analysis was completed for this unit for inclusion as a supply-side resource alternative. However, after a considerable amount of research, an accurate estimate for fuel costs could not be obtained. Therefore, the solid waste option was not included as an alternative for the supply-side resource options.

Geothermal

Geothermal power uses the earth's temperature to heat water or another working fluid which in turn is used to turn a turbine and a generator. The hot fluid is then cooled and returned to depth for reheating. The geothermal option is considered a renewable resource with high capital and operating and maintenance costs as compared to coal and natural gas fired options. A geothermal plant is dispatchable and would receive ZRCs for resource adequacy purposes similar to a coal or gas-fired facility.

Wind (Purchased Energy)

The wind energy purchase option was modeled in two blocks of 25 MW that provide energy only with no eligible ZRCs. This option represents a favorable priced energy resource for a 30 year term, available to Montana-Dakota through the 2013 RFP process. This was included as a 2015 option in the model.

Lewis & Clark Options

Additional alternatives were included in the analysis in order to model the cost effectiveness of adding a baghouse to the Lewis & Clark Station or converting the plant to run only on natural gas. To comply with the Mercury and Air Toxics Standards (MATS), the Lewis & Clark Station will be required to install a baghouse for particulate control or convert to natural gas-fired generation only. The baghouse project and natural gas options were studied to compare the required retrofits against other alternatives to determine if it would be more effective to retire the Lewis & Clark Station, convert the plant to natural gas-fired generation only, or install the baghouse required to allow continued operation of the plant. The analysis assumed the retirement of the Lewis & Clark Station at the end of 2014 with the new resource options available to the EGEAS model in 2015. The model assumed if the baghouse option was chosen the life of the plant would be five additional years from the time the baghouse was installed. The five year life is a conservative modeling approach and is used to show the value of continuing to run Lewis & Clark Station on coal even under a limited remaining life scenario. The natural gas-fired options for Lewis & Clark Station were considered to have a twenty year life. The Lewis & Clark Station is located within the Bakken oil field development area and is an important generation resource within the Bakken area that serves load and provides voltage support to the region. With the rapid growth of activity in the Bakken area, the Lewis & Clark Station is needed to maintain reliability in the area under both peak system conditions and various transmission outage conditions. For reliability purposes, the Lewis & Clark Station natural gas-fired options in the EGEAS model were required to operate at their minimum generation level for four months, equal to a minimum ten percent capacity factor, every year through 2019 to support the Bakken area load.

Existing and Committed Resources

The need for any type of new planning resource, whether it is a supply-side resource or the implementation of demand-side programs, is primarily driven by the forecast of the peak demand and energy needs of customers. In addition, the retirement of aging and high maintenance existing facilities will also trigger the need for new resources.

As reflected in previous integrated resource plans, Montana-Dakota will continue to purchase capacity from WE Energies during the 2012-2015 timeframe to meet increasing customer demand. For an understanding of Montana-Dakota's capability to serve projected loads, a comparison of ZRCs and planning reserve margin requirement (PRMR) is shown in Tables 4-1 through 4-3. ZRCs are defined as the total resources within MISO available to meet Montana-Dakota's own PRMR. MISO requires each generator to determine its summer capability through a Generator Verification Test Capability (GVTC) process that establishes the generator's Installed Capacity (ICAP) value. The ICAP value and each individual generator's equivalent forced outage rate ($XEFOR_d$) are then used to establish an unforced capacity (UCAP) value for the generator:

$$UCAP = ICAP – (1\text{-}XEFOR_d).$$

UCAP values are then directly converted to ZRCs, which are used to verify the ability to meet Montana-Dakota's peak load obligation, as required by MISO.

As a member of MISO, Montana-Dakota is required to maintain a total number of ZRCs equal to or greater than the Company's projected yearly MISO non-coincident summer peak demand with a 1.83 percent adder for MISO losses, plus a 6.2 percent planning reserve margin (PRM).

Montana-Dakota is required to meet an 80.6 percent coincident factor for the 2013-14 planning year in MISO based on the fact Montana-Dakota does not peak at the time of the MISO system-wide peaks. However, for planning purposes Montana-Dakota will be using a 90 percent coincident factor to plan for a potential increase in the coincident factor as it's adjusted annually.

Table 4-1 shows that, under the current system load forecast and with the current capacity purchase contracts, Montana-Dakota has adequate capacity to meet its PRMR through 2012. However, to meet customer demand, an additional 52.3 ZRC will be needed in 2015. This capacity deficit will increase to 102.3 ZRC in 2020 and grow to 149.4 ZRC in 2025. With the high-growth scenario forecast, as shown in Table 4-2, a capacity deficit will occur in 2015 (54.3 ZRC) and grow to 190.0 ZRC in 2020. Under the low-growth scenario forecast, as shown in Table 4-3, a capacity deficit never occurs.

To address future capacity deficits, Montana-Dakota will need additional demand-side and/or supply-side resources. The analyses in this IRP will help provide direction for the best selection of new resources to economically and reliably meet customers' requirements.

Table 4-1

Montana-Dakota Utilities Co. Integrated System
Load and Capability Comparison

BASE FORECAST

Year	Generator Planning Resource Credits	WE Energies Peaking Purchase	Total Zonal Resource Credits	50/50 Coincident Summer Peak Demand w/MISO Losses	Planning Reserve Margin Requirement	Surplus/ Deficit (+)/(-)
2013	469.3	115.0	584.3	533.7	566.7	17.6
2014	475.5	120.0	595.5	556.3	590.8	4.7
2015	556.1		556.1	572.9	608.4	-52.3
2016	556.1		556.1	584.5	620.8	-64.7
2017	556.1		556.1	591.8	628.5	-72.4
2018	556.1		556.1	601.3	638.6	-82.5
2019	556.1		556.1	610.8	648.7	-92.6
2020	556.1		556.1	620.0	658.4	-102.3
2021	556.1		556.1	629.2	668.3	-112.2
2022	556.1		556.1	638.2	677.8	-121.7
2023	556.1		556.1	647.0	687.1	-131.0
2024	556.1		556.1	655.6	696.3	-140.2
2025	556.1		556.1	664.3	705.5	-149.4
2026	556.1		556.1	672.9	714.6	-158.5

Table 4-2

Montana-Dakota Utilities Co. Integrated System
Load and Capability Comparison

HIGH-GROWTH FORECAST

Year	Generator Planning Resource Credits	WE Energies Peaking Purchase	Total Zonal Resource Credits	Coincident Summer Peak Demand w/Losses	Planning Reserve Margin Requirement	Surplus/ Deficit (+)/(-)
2013	469.3	115.0	584.3	533.7	566.7	17.6
2014	475.5	120.0	595.5	556.3	590.8	4.7
2015	556.1		556.1	574.8	610.4	-54.3
2016	556.1		556.1	597.0	634.0	-77.9
2017	556.1		556.1	622.6	661.3	-105.2
2018	556.1		556.1	648.1	688.3	-132.2
2019	556.1		556.1	674.6	716.4	-160.3
2020	556.1		556.1	702.6	746.1	-190.0
2021	556.1		556.1	731.6	777.0	-220.9
2022	556.1		556.1	762.1	809.4	-253.3
2023	556.1		556.1	794.0	843.3	-287.2
2024	556.1		556.1	827.6	878.9	-322.8
2025	556.1		556.1	862.3	915.8	-359.7
2026	556.1		556.1	898.9	954.6	-398.5

Table 4-3

Montana-Dakota Utilities Co. Integrated System
Load and Capability Comparison

LOW-GROWTH FORECAST

Year	Generator Planning Resource Credits	WE Energies Peaking Purchase	Total Zonal Resource Credits	Coincident Summer Peak Demand w/Losses	Planning Reserve Margin Requirement	Surplus/ Deficit (+)/(-)
2013	469.3	115.0	584.3	484.9	515.0	69.3
2014	475.5	120.0	595.5	478.5	508.2	87.3
2015	556.1		556.1	476.0	505.5	50.6
2016	556.1		556.1	475.9	505.4	48.7
2017	556.1		556.1	477.8	507.4	47.7
2018	556.1		556.1	478.8	508.4	46.7
2019	556.1		556.1	479.7	509.4	45.3
2020	556.1		556.1	481.0	510.8	44.1
2021	556.1		556.1	482.2	512.0	42.7
2022	556.1		556.1	483.4	513.4	41.1
2023	556.1		556.1	484.9	515.0	39.5
2024	556.1		556.1	486.5	516.6	37.9
2025	556.1		556.1	487.9	518.2	36.2
2026	556.1		556.1	489.6	519.9	34.3

CHAPTER 5

INTEGRATION AND RISK ANALYSIS

The integration process considers all the demand-side programs discussed in Chapter 3 as well as the supply-side options discussed in Chapter 4 and integrates both resource types into a single least-cost plan. The Electric Generation Expansion Analysis System version 9.02 (EGEAS), a computer program developed by the Electric Power Research Institute (EPRI), is used to perform the resource expansion analysis and develop the least-cost integrated resource plan. From this analysis, Montana-Dakota will determine the least-cost integrated resource plan to guide its future resource selections.

Integration of Demand-Side and Supply-Side Resources

As indicated in Chapter 2, the DSM programs planned in the 2011 IRP have been or are expected to be implemented, and the reduction in energy and peak demand is reflected in Montana-Dakota's load forecast, which is modeled in EGEAS. Therefore, those programs have been integrated with the supply-side options in all performed resource expansion analysis.

As a result of the demand-side analysis described in Chapter 3, there were no additional new DSM programs planned at the time of the 2013 IRP filing to be modeled in EGEAS. The model did include a committed amount of 13 MW from the interruptible rate and 10 MW of the commercial demand response program.

Sensitivity Analysis

A sensitivity analysis was performed to see how the resource expansion plans would be affected by variations of certain key parameters that may change in the future from modeled assumptions.

Carbon Tax

With the potential of a future carbon penalty applied to all fossil fuel units and MISO energy purchases, a carbon tax was modeled to assess the impact on the resource expansion plan. The assumed carbon tax was applied to all carbon emissions from Montana-Dakota's existing coal-fired units and natural gas-fired SCCTs, energy purchases from the MISO market, and new generating units added to the resource plan starting in 2020. While no carbon tax was modeled in the base case consistent with N.D.C.C. §49-02-23, Montana-Dakota modeled a carbon tax of $30 and $50 per ton for sensitivity analysis. Montana-Dakota recognizes the amount and applicability of any carbon allowance price or tax have not been established, but this analysis was conducted to provide information regarding possible impacts to customers and to identify potential changes in the Company's future generation resource mix as part of the least-cost plan in the event a carbon tax is implemented.

Natural Gas Price Sensitivity

Prices for natural gas supplies as delivered to Montana-Dakota's existing turbines, future combustion turbines, and future combined cycle plants were developed in-house for use in the resource expansion analysis based on Montana-Dakota's view of the long-term outlook of natural gas pricing. For the base case, natural gas was priced for delivery at $3.51/MBTU, for 2013 and increasing to $4.33/MBTU in 2017. After 2017, natural gas prices were escalated by three percent annually. Considering the historical fluctuations of natural gas prices, there is a need to consider what impact both higher and lower gas prices would have on the least-cost plan. Therefore, high and low gas price scenarios were also developed, whereby the gas price used in the base case was increased by $3/MBTU and decreased by $1/MBTU from the Optimal Resource Case, respectively.

High- and Low-Growth Scenario Forecasts

The base forecast in Chapter 2 projected that summer peak demand would increase at an average rate of 2.4 percent per year for the next five years and at an average rate of 1.6 percent per year through 2032. Energy requirements would increase at an average rate of 3.2 percent per year for the next five years, and at an average rate of 2.0 percent per year through 2032. The forecast also established high-growth and low-growth scenarios in which energy requirements were assumed to grow at 4.4 percent beginning in 2015 and 0.5 percent per year respectively over the twenty year period. EGEAS runs were made using both the high- and low-growth load forecasts to determine the least-cost resource plan under those scenarios.

High Combustion Turbine and Internal Combustion Engines Costs

Historically the costs of materials associated with the construction of generation have generally increased at a rate higher than general inflation both in the United States and the rest of the world. The base case costs for all generation options reflect the present price forecasts, but for purposes of risk analysis, Montana-Dakota considered the impact of higher installed and O&M costs of new generation (i.e., combustion turbines) on the resource plan. Therefore, to determine the sensitivity of the base case to increases in combustion turbine costs, a sensitivity scenario was developed that increased the installed cost and O&M costs of combustion turbines by 20 percent over the Optimal Resource Case.

Lewis & Clark natural gas options

Three Lewis & Clark natural gas options were modeled as options for the plant. The Lewis & Clark Station had to be forced into the model as none of the Lewis & Clark natural gas options were least-cost as compared to the Lewis & Clark baghouse option. The least-cost of the three gas options was option 1, which included the construction of a natural gas pipeline to the nearby ONEOK natural gas processing plant.

CHAPTER 6

RESULTS

This section presents the results of the 2013 Integrated Resource Plan, taking into consideration the results of the resource expansion analysis as well as other factors Montana-Dakota deemed critical in evaluating future resources. The additional factors not modeled in EGEAS but considered when determining the final resource plan are as follows.

Economic, Societal, and Customer Issues

Montana-Dakota is committed to providing its customers with competitively priced, highly reliable electricity. The integrated resource planning process must not rely solely on the results of a computer model analysis, but must also consider risks and other factors that are essential to provide the overall best choices for meeting the requirements of customers. The factors considered in the analysis are:

- Fuel price stability,
- Benefits resulting from participation in the MISO market,
- The possibility of unexpected new large load developing in Montana-Dakota's service territory,
- The integration of renewable generation resources and the economic and social benefits that they provide, and
- Public interest programs.

Midcontinent Independent System Operator, Inc. (MISO) Market

Since the beginning of the MISO energy market in 2005 and with the Ancillary Service Market (ASM) and Capacity market startup in 2009, the ability of Montana-Dakota to use its existing resources within these markets has expanded. Therefore, when considering which resources to consider as benefiting retail customers, the presence of the markets available in MISO is a factor.

Montana-Dakota continues to perform integrated resource planning based on the obligation to serve its customers with a stable and reliable power supply. The MISO energy market provides opportunities and benefits to Montana-Dakota, but Montana-Dakota does not rely totally on the market for its power supply requirements.

The MISO market provides a source for energy when prices are lower than Montana-Dakota's generating costs, or when, due to planned maintenance or forced outages, Montana-Dakota needs to purchase energy to maintain reliability. The market also provides a means whereby Montana-Dakota can sell energy into the market from its generating facilities that is not needed by Montana-Dakota customers, with the margins benefiting the customers. Figure 6-1 shows the forecasted MISO market energy prices used within the model. The model included a 30 MW block of energy for off-peak and on-peak periods.

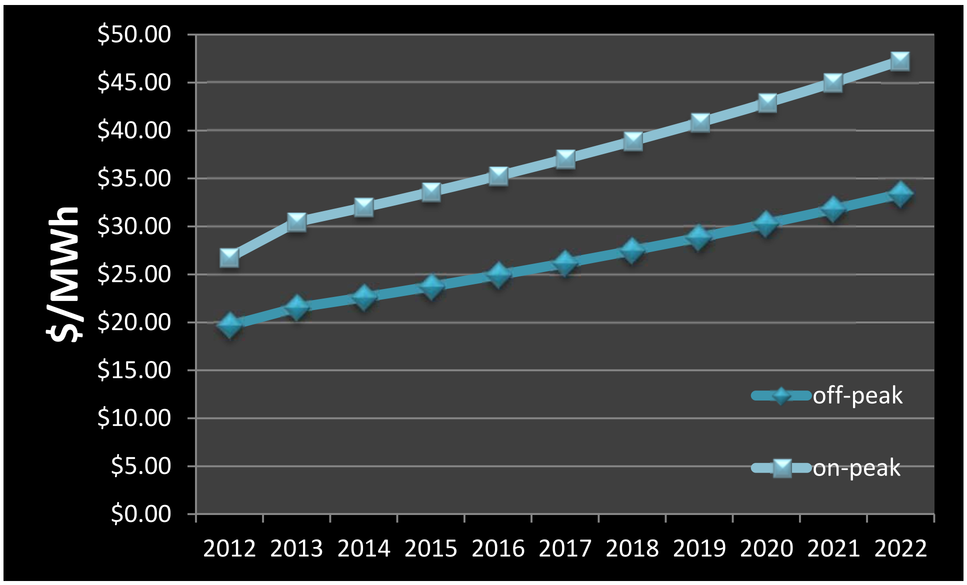


Figure 6-1: Forecasted On-Peak and Off-Peak MISO Market Prices developed by Montana-Dakota

MISO implemented an annual capacity auction starting with the 2013-14 planning year. Montana-Dakota will continue to examine the capacity market as a potential source for meeting future yearly capacity requirements.

<u>Reliance on Natural Gas</u>

About 17 percent of Montana-Dakota's owned generating capacity is natural gas-fired, and increasing to 40 percent with the addition of Heskett 3 in 2015. As shown on Figure 6-2, natural gas prices have been historically volatile. Unlike coal, long-term supply contracts for natural gas are generally not available at competitive prices.

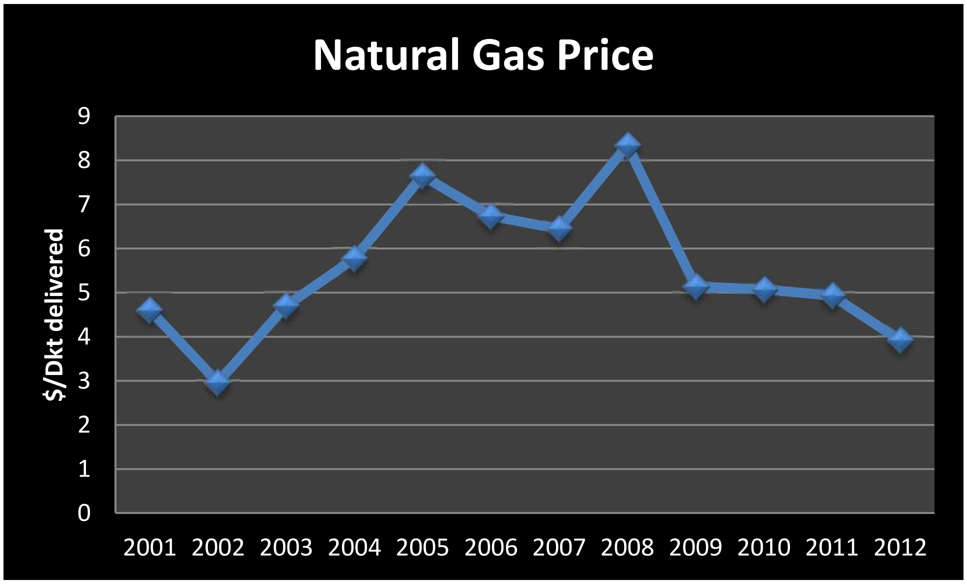


Figure 6-2: Historical Natural Gas Prices of Montana-Dakota's existing combustion turbines (Based on 12-Month Average)

<u>Resource Expansion Analysis Results</u>

The most probable load forecast, fuel prices, and resource installed costs were modeled in the EGEAS Optimal Resource Case. The Optimal Resource Case least-cost plan consists of the following resource additions for the 2015-2020 period:

- Install the Lewis & Clark baghouse by 2015;
- Install 73 MW of Internal Combustion Engines in 2015;
- Contract for 50 to 100 MW of wind energy in 2015;
- Continue the commercial demand response program to achieve 10 MW by 2015 and achieve 13 MW from Montana-Dakota's interruptible rate;
- Install an additional Internal Combustion Engine in 2017; and
- Assuming the retirement of Heskett 1 and Lewis & Clark at the end of 2019, be capable of partnering to take 200 MW from a large Combined Cycle unit in 2020.

For later years a 20 MW self-built wind farm was selected to be installed in 2032. The net present value of the Optimal Resource least-cost plan over the 50-year study period equates to $3,525.11 million in 2012 dollars, as shown in Attachment C Table 3-1.

The “Base Case: Lewis & Clark retire 2014” was assuming nothing was done to meet the EPA Mercury and Air Toxics Standards (MATS) for the Lewis & Clark station and the plant was then retired at the end of 2014 and had to be replaced with new resources in 2015. This case raises the NPV over the 50 year study period by 3.15 percent as compared to the Optimal Resource case. The corresponding Base Case plan, assuming the retirement of the Lewis & Clark Station consists of the following resource additions for the 2011-2015 timeframe:

- Install 146 MW of Internal Combustion Engines in 2015;
- Contract for 50 to 100 MW of wind energy in 2015;
- Continue the commercial demand response program to achieve 10 MW by 2015 and achieve 13 MW from Montana-Dakota’s interruptible rate; and
- Install a 71.6 MW Combustion Turbine in 2019.

For the later years, the combustion turbine would be converted to a 129 MW combined cycle in 2024; an additional 36.6 MW of Internal Combustion Engine would be installed in 2029 and a 20 MW self-built wind project would be added in 2032.

Sensitivity scenarios indicate that the Optimal Resource plan is very robust under all assumptions. However, load growth makes a significant impact on the resource selection. As expected, the low-growth scenario indicates the need for less peaking capacity and energy, while the high-growth scenario shows much more peaking capacity and energy is needed than is shown in the Optimal Resource Case. The high and low gas price scenarios also support the Optimal Resource Case selections for capacity, except that the high gas price case also selected an additional 170 MW of self-built wind throughout the 20 years.

The cost of materials and labor as well as potential environmental costs put upward pressure on the cost estimates for both baseload coal-fired units and combustion turbines. The scenario in which the installed cost of combustion turbines increased by 20 percent also selected the same capacity additions as in the Optimal Resource Case.

The carbon tax sensitivity scenarios show the economic impact of a tax on carbon on Montana-Dakota’s generating system and customers. The total production costs increase significantly, and the resource plan includes the addition of more self-built wind projects to reduce the output of fossil fuel units. However, the capacity resource additions are still needed in the future.

As shown in Figures 6-3 and 6-4, in 2013 approximately 17 percent of Montana-Dakota’s resource capacity comes from natural gas- and oil-fired combustion turbines while in 2015, based on the Optimal Resource plan, approximately 40 percent of the Company's resource capacity would be made up of natural gas and oil-fired combustion turbines. The resource additions were selected mainly to replace the current purchased capacity agreement.

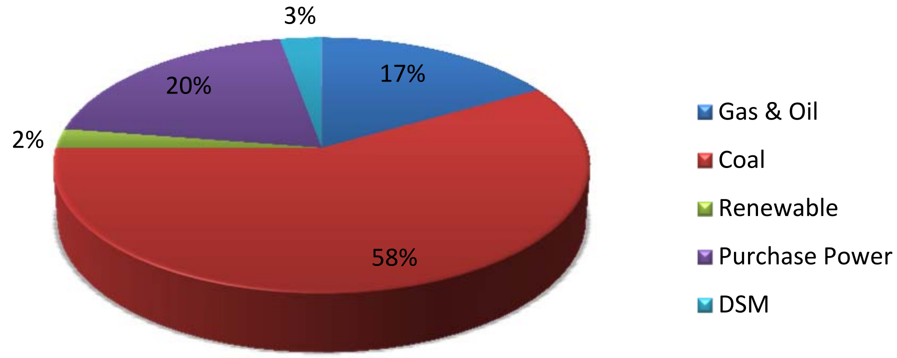


Figure 6-3: 2013 Montana-Dakota Zonal Resource Credits

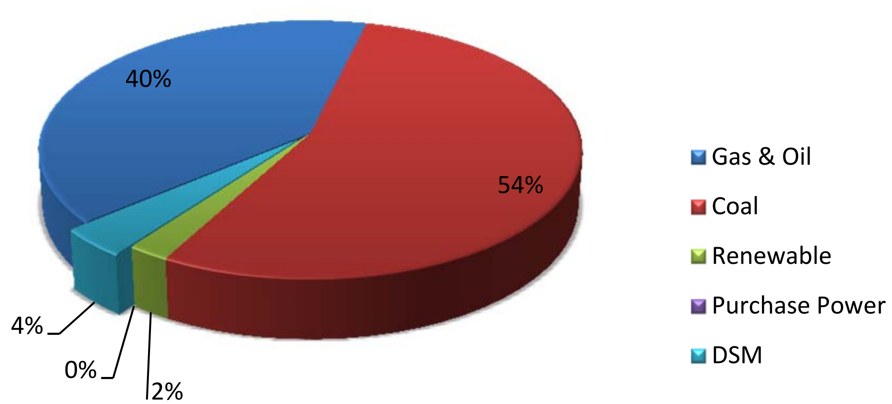


Figure 6-4: 2015 Montana-Dakota Zonal Resource Credits

Future Resource Plan

Based on the analysis of the resource expansion models and the consideration of customer impacts, market availability of capacity and energy, and other factors such as environmental regulations and the balance of its generation mix, Montana-Dakota's recommended resource plan is to pursue the following resources to meet the requirements identified for the 2013-2017 period:

- Proceed with the installation of the baghouse project at Lewis & Clark Station;
- Continue with the installation of the Big Stone Plant AQCS equipment to be completed in 2016; and
- Continue with construction of the Heskett 3 simple-cycle combustion turbine (SCCT) to be operational by 2015.
- Pursue the potential purchase of 50 to 100 MW of wind energy purchase if available at the terms and pricing modeled in the EGEAS analysis.
- Continue the commercial demand response program to achieve 10 MW by 2015 and achieve 13 MW from Montana-Dakota's interruptible rates.

- Begin work on the potential partnership in a large combined cycle resource to be online sometime after 2020. Potential ownership share in this new resource would be 200 MW.

The recommended resource plan is considered to be the best plan to economically and reliably meet customers' requirements over the five-year planning horizon, as explained below. Montana-Dakota issued a new request for proposal for capacity and energy resources on March 25, 2013 to start the process for meeting the additional capacity and energy needed in the 2015-2017 timeframe.

Montana-Dakota's recommended resource plan satisfies future customer requirements through a balance of a new peaking capacity resource addition and pollution control investments in the Big Stone and Lewis & Clark low-cost energy resources. The recommended resource plan does not completely satisfy all customer requirements by 2017. Montana-Dakota issued a request for proposal of capacity and energy resources in 2013 to potentially acquire additional resources to meet its customers' capacity and energy requirements in 2015 and beyond. In addition, Montana-Dakota will continue to monitor MISO capacity auction or bilateral agreements as ways to meet capacity requirements.

In addition, other factors that are considered in confirming the best cost new supply-side resource option include, but are not limited to: site location issues, susceptibility to inclement weather and sustained cold temperature operation, fuel delivery requirements and limitations, transmission interconnection options, transmission upgrade requirements identified through a generator interconnect study, facility maintenance requirements and ability to perform, best fit with company expertise, and overall operation and maintenance costs.

CHAPTER 7

TWO-YEAR ACTION PLAN

This section of the report provides the two-year action plan resulting from this IRP analysis. The plan describes the specific activities that Montana-Dakota intends to implement for its long-range integrated resource plan.

Load Forecasting

- Montana-Dakota will continue to review its load forecasting assumptions and inputs as part of its routine process.
- Montana-Dakota will continue to evaluate ways to improve its seasonal peak demand forecast in order to better respond to the MISO market requirements.
- Montana-Dakota will continue to evaluate the accuracy of its forecasts to determine the areas that need improvements.

Demand-Side Resources

- Montana-Dakota expects to continue to implement the interruptible rate to achieve a total of 13 MW.
- Montana-Dakota expects to achieve 10 MW of demand response by the summer of 2014 through the external contract signed in 2012 with Constellation New Energy.

Supply-Side Activities

- Montana-Dakota will support the installation of the AQCS required to continue operating the Big Stone generator beyond 2016.
- Montana-Dakota will continue to construct the 88 MW combustion turbine near the existing Heskett Stations which is scheduled to be in-service by July 2014.
- Montana-Dakota filed an Advanced Determination of Prudence request in North Dakota June 14, 2013 for the installation of a baghouse at the Lewis & Clark Station with a spring 2016 in-service date.
- Montana-Dakota will pursue a 50 to 100 MW wind purchase power purchase agreement as identified as part of the response to the 2013 Request for Proposals.

- Montana-Dakota will continue to study the need to install generation in the Williston, North Dakota area to support the load growth and mitigate transmission constraints in the Bakken region.
- Montana-Dakota will explore the opportunity of partnering with others on the design and construction of a large combined cycle combustion turbine facility with an anticipated in-service date of 2020.
- Montana-Dakota will continue to monitor the availability and price of energy and short-term capacity in the MISO market or through bi-lateral arrangements and will purchase additional capacity as needed to meet customer demand.

Other Activities

Montana-Dakota will maintain the IRP Public Advisory Group to provide input to and review the Company's future IRPs.

CHAPTER 8

PUBLIC ADVISORY GROUP

This chapter describes the role and the workings of Montana-Dakota's IRP Public Advisory Group (PAG), a broad base advisory board for review and evaluation of the Company's IRP process. The first PAG was established for the 1995 IRP, and the PAGs have assisted with all IRPs since then. The 2011 IRP advisory group was established at the beginning of the 2011 planning cycle and held its first meeting in August 2010.

Objective

The objective of the PAG is to provide Montana-Dakota with input to its integrated resource planning process from a non-utility perspective. This advisory group reviews, evaluates, and recommends modifications to Montana-Dakota's planning process, resource plans, resource acquisition processes, and efficiency programs from the perspective of customers, government agencies, and public interest organizations.

Montana-Dakota considers the PAG's role to be one of providing advice and counsel on the planning process. The Company took input from the PAG under advisement in making planning decisions.

Participants

Participants in the PAG are non-utility personnel from the three states served by Montana-Dakota's integrated system: Montana, North Dakota, and South Dakota. The advisory group is structured to approximately reflect the proportions of Montana-Dakota's load in each state: Montana – 30 percent, North Dakota – 60 percent and South Dakota – 10 percent. The PAG members are also selected to balance representation from consumer advocacy groups, government agencies (including regulatory bodies), business concerns, and academia.

As a result, the PAG consists of three members from Montana, five members from North Dakota, and one member from South Dakota. In addition, the North Dakota Public Service Commission appointed a representative to participate as an observer. The names and affiliations of the 2011 PAG participants are shown in Table 8-1.

Table 8-1

The 2011 IRP Public Advisory Group

Montana

Barbara Roberts
Action for Eastern Montana
Glendive, Montana

Dr. LeRoy M. Moline
Glendive, Montana

Jeff Blend
Department of Environmental Quality
Helena, Montana

North Dakota

Mike Fladeland
North Dakota Department of Commerce
Bismarck, North Dakota

Dr. Patrick O' Neill
Department of Economics
University of North Dakota
Grand Forks, North Dakota

John Klein PE LEED®AP
Apex Engineering Group
Bismarck, North Dakota

Bruce Conway
MEC Services, LLC
Williston, North Dakota

Rich Wardner
North Dakota State Senate
Dickinson, North Dakota

Sara Cardwell
North Dakota Public Service Commission
Bismarck, North Dakota
(Invited as an observer)

South Dakota

Christine Martin-Goldsmith
Goldsmith Heck Engineers, Inc.
Mobridge, South Dakota

Meetings

Input from the PAG to the IRP process occurred through the PAG meetings and communications between the PAG members and Montana-Dakota personnel. The Company funded travel and out-of-pocket expenses for the PAG members to attend the meetings. Their time was absorbed by themselves or by their employers.

At each meeting, the Company presented methods, analysis, and findings to the group. The meetings provided an opportunity for the participants to contribute their comments and concerns about work in progress. In this way, the group could raise issues and discuss them, and the Company could consider incorporation of the group's input into the IRP. The meeting dates and the items discussed at each meeting are contained in Attachment D.

The 2013 IRP public advisory process was designed to make efficient use of the PAG members' time and expertise and provide the members with updated information on the rapidly changing electric utility industry. The Company's presentations at the meetings were more result and policy-oriented, rather than focusing on the technical data. Efforts were made to provide the members discussion of recent changes within the Company and in the electric utility industry, which is moving rapidly toward a market environment. The group's discussions, therefore, tended to concentrate on issues, policies, and overall results. The public advisory process enhances Montana-Dakota's IRP analysis and reports through the information and suggestions provided by the group.

There were four 2013 IRP PAG meetings held in Bismarck, North Dakota. In addition to presenting the topics for discussion and taking feedback from the PAG members, Montana-Dakota served as a facilitator in setting agendas, taking care of meeting logistics such as meeting notices and expense reimbursements, and documenting the presentations at the meetings.

Since the PAG functions in an advisory role, no formal voting procedures were instituted. Montana-Dakota usually strove, however, for a consensus opinion of the PAG on the issues brought before it. The Company was willing to discuss any IRP-related topics that were of interest to PAG members. It also invited participants to provide written comments to document their opinions or concerns.

Conclusions

Montana-Dakota is pleased with its public advisory process. The public involvement resulted in better study assumptions and provided useful information to both the Company and the PAG participants and their constituents.