WAPA IRP

Cooperative Filing

for the cities of:

Beresford, South Dakota

September 1, 2019

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I. MRES Resource Planning

A. Overview

Missouri River Energy Services (MRES) is a member-based joint-action agency, headquartered in Sioux Falls, South Dakota, with 61 member municipalities in the states of Iowa, Minnesota, North Dakota, and South Dakota. Of its 61 members, 58 are S-1 customers, each of whom receives hydroelectric preference power from the Western Area Power Administration (WAPA). These members purchase power from MRES to meet their needs over and above their WAPA allocations. In 2017 all MRES S-1 members took action to extend the S-1 agreements to 2057.

All of the MRES S-1 members receive hydroelectric preference allocations from WAPA and have purchase power agreements with WAPA to deliver power and energy from those allocations. The member cities purchase all supplemental power from MRES. Because of this contractual arrangement, all the supply-side resource planning is conducted by MRES on behalf of its members.

Conversely, the member cities own and operate their own distribution systems and perform all interfacing with the retail customer. Thus the member cities have the lead responsibility for demand-side and customer efficiency programs with assistance being available from MRES.

This document describes the overall process of coordinating the supply-side and demand-side planning into a cohesive, least-cost integrated resource plan.

B. Resource Plan Goals

MRES endeavored to meet the requirements of the applicable state statutes and WAPA standards for integrated resource plans. In the analysis of the scenarios for the capacity expansion modeling, MRES balanced the needs of the members with that of the environment. MRES is committed to maintaining the reliability of power supply, while providing predictability and reasonableness of rates for residential, commercial, and industrial customers. At the same time, MRES is also committed to expansion of its renewable resources and taking an active role in conservation measures. In the analysis of various scenarios, environmental concerns such as emissions were evaluated and also balanced with such considerations as the need for firm base load power and stabilization of energy costs. The analysis of the various scenarios in the context of these goals resulted in a choice of resource mix that is environmentally responsible, cost-effective, and balanced.

More specifically, the resource planning goals of MRES are to:

<u>Study Goal 1: Maintain the Adequacy and Reliability of Power Supply.</u>

To meet this goal, load projections were developed for MRES power supply members, including the amounts required for SPP and MISO planning reserves. The focus of this study goal was to determine the lowest-cost, reliable plan which

optimizes the amount of resources, while meeting capacity requirements. It necessitates the evaluation of a variety of options, including baseload, natural gas combined cycle (NGCC), integrated gasification combined cycle (IGCC), combustion turbine (CT) units, wind turbines, and solar units for the MRES resource mix.

Study Goal 2: Keep Members' Wholesale Rates Competitive.

The primary objective of this goal is to minimize the overall long-term power supply costs to MRES member communities. Capacity expansion modeling was utilized to determine the least-cost resource mix (both demand-side and supply-side) under a number of different scenarios. The analysis examined these resource combinations over the 2019 through 2040 timeframe.

Study Goal 3: Minimize Adverse Socioeconomic and Environmental Effects.

The referenced cases all applied Minnesota Public Utilities Commission-approved environmental externality prices and considered expected costs for mercury and SO_2 allowances when computing the least-cost plan. Various CO_2 emission cost values were explored. Those externalities and emission cost values were calculated using all MRES firm load, not just the Minnesota portion of the MRES loads. Several of the cases and scenarios specifically considered renewable resources, using wind for renewable energy for the purpose of meeting this study goal.

Another specific criterion of this goal was the inclusion of resources to meet the renewable resource objectives established by the MRES board. MRES is committed to achieving the Minnesota RES, supplying 20 percent by 2020, and 25 percent by 2025. MRES presently meets the renewable energy goals for its Minnesota load and has resources in place to meet it for the next several years. MRES also has adequate resources to supply at least 10 percent of its load in the other states with renewable resources.

A major component of minimizing environmental impacts is to fully implement conservation and DSM. As described earlier, MRES commissioned Morgan Marketing Partners to perform a DSM potential study, the results of which were incorporated into this resource plan. MRES is undertaking efforts to implement cost-effective DSM measures throughout its membership. In addition, MRES is assisting its Minnesota members with meeting the CIP (Conservation Improvement Program) requirement, which includes DSM amounts in addition to what was found feasible by Morgan Marketing Partners.

Study Goal 4: Enhance the Ability of MRES to Respond to Changes and to Limit Risks.

In meeting this goal, the resource plan discusses and analyzes several of the potential risks MRES could face. These risks, along with several other significant risks related to resource planning, were addressed with several sensitivity analyses.

C. Load Forecasting

The MRES load forecasts are based upon a short-term forecast blended into a long-term econometric forecast. Each forecast predicts the aggregate total usage for each member city for each month of the forecast horizon. By subtracting the allocated amounts of WAPA demand and energy, the monthly MRES demand and energy sales to each member is obtained.

The following steps were followed to develop a load forecast for each member municipality.

i. Develop Long-Term Forecast

This includes updating the historical files for monthly energy usage and all of the independent variables, forecasting values for independent (explanatory) variables, generating long-term energy models for each member, including any spot load adjustments; and selecting a final long-term energy model for each member.

Annual data for variables believed to be useful in predicting total energy were input into a software package called MetrixND® and regression models were constructed for each city. The city total energy was the dependent variable for each model. Possible independent variables included county census data for the county in which the city is located, weather data from the nearest weather station, national economic statistics, and alternate fuel prices for the region. A number of possible models were tested for each city, and certain criteria were scrutinized in order to find a model that was statistically sound and provided a reasonable expected growth rate. Models were selected primarily based on adjusted R-square, Mean Absolute Percentage Error (MAPE), T-statistics, and Durbin-Watson statistics. The long-term forecast was based on a regression analysis of annual historical data from 1980 through 2016 and created annual energy forecasts through 2040.

ii. Develop Short-Term Forecast

Independent of the long-term modeling process, the short-term forecasts were generated using a multiple regression analysis. For the last five years of the analysis, monthly city total energy was the dependent variable for each model.

The primary independent variables included monthly cooling, heating, and total degree days for the weather station representing the city. The logarithmic transformations of the degree days could also be selected as independent variables. At least one weather variable was used in each model. Additionally, no more than two weather variables could be included per model.

Both the one-month and twelve-month lagged energy variables were included in some models, if necessary, to achieve acceptable statistical results. The logarithmic transformations of one-month and twelve-month lags were made available as independent variables. Only one lag variable or transformation thereof could be included per model.

A linear trend variable and the logarithmic transformation of the linear trend were included in some models, if necessary, to achieve acceptable statistical results. Any long-term growth (or negative growth) realized by the cities should be accounted for by including a trend component. A maximum of one trend or transformation of a trend variable was allowed per model.

Monthly binary variables were used to account for the monthly variation in energy sales. Binary variables take the value of one or zero depending upon a condition occurring or not occurring. There were 11 binary variables, with the first binary variable, d1, being equal to 1 for January, and the other ten binary variables being equal to 0 in January. The second binary variable, d2 is equal to 1 for February, and the other ten binary variables being equal to 0 for February, and so on. It is mandatory in regression modeling that one month does not have a binary variable, in order that some base level is set, and subsequent months are either an addition or a subtraction to that base level. Subsequently, the constant is the 12^{th} binary variable. In this case, December was the month not represented by a binary variable. All 11 monthly binary variables were forced into each regression model.

iii. Blend Short-Term and Long-Term Forecasts

The short-term forecasts were used for each member through the remainder of the current year and one additional year. After that year, each member's annual growth rates from the long-term forecasts were used to extend the forecasted energy into a long-term "blended" base forecast that extends to the year 2040.

iv. Calculate MRES vs. WAPA Loads

Once the forecasted values were obtained, the forecasts for each member were processed by a calculation that splits the energy and demand between WAPA and MRES. The amount of energy and demand that a member receives from WAPA is called the Contract Rate of Delivery (CROD), and is based on a formula specified in the WAPA firm power contracts of each member.

Under the Fixed CROD method, each city is assigned a monthly allocation of demand and a monthly allocation of energy from WAPA. Any amount of demand or energy exceeding that monthly allocation is provided by MRES. The allocations are the same from year to year for each city, although they vary each month within the year. Also, the allocations were reduced by approximately 4% in January 2001 to allow WAPA to create new allocations for certain new customers and Native American loads, and were reduced again by 0.25% in January 2006 to create new allocations for additional WAPA customers. One percent reductions in WAPA allocations are expected in January 2031 and are included in the calculations done for this filing.

Once the WAPA allocations are subtracted from the city loads, the remainder is the amount that MRES supplies to each city.

The load factors of the WAPA allocations do not change from year to year and are different from the load factors of the cities. Because MRES serves the portion of each city's load not supplied by WAPA, the MRES sales also have a different load factor than each city's total load.

v. Calculate MRES Generation Requirements

MRES must also plan to supply reserve capacity for the control areas in which it operates. Currently, MRES is operating in two areas; Southwest Power Pool (SPP), and Midwest Independent System Operators (MISO).

MISO rules specify that adequate capacity be designated to meet forecasted loads plus losses and a Planning Reserve Margin (PRM). The load forecast previously described in this document is reduced by a diversity factor since our loads are not expected to peak at the same time as the MISO peak. These values are then scaled up for losses (losses vary depending on the area), and a 7.9% PRM is applied. The resulting values represent the total load requirement that MRES is responsible for serving.

In measuring the capacity that accrues towards the requirement, the utility first defines each unit's Installed Capability (ICAP) based on annual tests. MISO then discounts the ICAP value to account for historical or typical forced outage rates to obtain the Unforced Capability (UCAP) rating. Only the smaller UCAP amount may accrue towards meeting the capacity requirement.

A utility designates how much of each unit it wishes to designate for the planning year, by converting some or all of each unit's UCAP rating to Planning Resource Credits (PRC). Each PRC is equivalent to 1 MW of UCAP.

In this resource plan, MRES is designating as PRC all of its accredited generating resources that are in the MISO market area. Since that amount is inadequate to meet the total capacity required, MRES has also entered into several capacity purchase contracts, which greatly reduces the MISO capacity deficit. Any projected shortage not covered by generating units or capacity contracts is covered by purchasing PRCs in the annual auction conducted by MISO.

SPP employs a similar method as MISO, with a few key differences. The load forecast previously described in this document is reduced by the historic MRES diversity factor of 2.5%, then scaled up by 4% to include losses. A PRM of 12% is then applied. Units are not derated in SPP as they are in MISO. MRES has excess capacity in the SPP area, and has entered into several capacity sale contracts, using that revenue to offset the expense of capacity purchases in MISO. SPP does not currently provide a market for the auction of capacity credits.

D. Generation Resources

MRES, either directly or through its contracts with Western Minnesota, has the following generation capacity:

- Laramie River Station (LRS): 280 MW
- Exira Station: 140 MW
- Point Beach Nuclear Plant: 42.5 MW under contract with Wisconsin Public Power Inc. through 2030, with reduced amounts through 2033.
- Watertown Peaking Plant (WPP): 50 MW
- Municipal Capacity: 148.5 MW
- Red Rock Hydro Project: Expected to be operational 2021 at 36.5 MW
- Each S-1 member city receives a monthly allocation of WAPA demand and energy, totaling approximately 318 MW during the summer season

In addition to the accredited capacity, MRES has limited unaccredited capacity, as identified in the Resource Plan. MRES continues to receive the output from wind projects located in Worthington, Moorhead, Marshall, and Odin, Minnesota; Rugby, North Dakota; and Hancock County Iowa totaling over 83 MW. MRES also installed a 1 MW solar facility in Pierre, SD.

E. MRES Resource Planning Development

This section includes a summary of the capacity expansion study process. Included is a description of the resource options considered in the resource planning combinations, a summary of the risks to be studied in the scenario analysis, and a summary of the generation and transmission resource planning results.

i. Modeling Method

MRES utilizes ABB Capacity Expansion® capacity expansion software in the development of the resource plan. This methodology allows base load and peaking resources to compete with renewable energy resources, conservation, and energy efficiency in developing the resource plan that minimizes costs. Once the optimal resource mix was identified and the Base Case was developed, several scenarios were analyzed to determine the financial risk associated with unexpected events.

ii. Needs for Additional Capacity and Energy

No thermal units are planned to be installed until 2022, however MRES is currently capacity deficit in MISO and we will continue to make capacity purchases to meet reserve requirements. In addition to future thermal additions our capacity expansion modeling also assumes approximately 85.7 MW of DSM by 2040, and 80 MW of newly installed wind turbines.

iii. Resource Options Considered

Many different resource options were considered for the capacity expansion modeling, but only a subset of the options were chosen for detailed study after considering their relative costs and availability. When selecting potential resources for detailed study, consideration was given to several factors:

- Geographic Diversity – It is desirable for MRES resources to be located across a broad geographic area. This minimizes the chance for a single transmission outage to significantly impact the ability to serve MRES loads.
- Reliability – MRES prefers to add resources that are of a proven technology. This minimizes the severity of unexpected forced outages.
- Dispatchability – With the exception of future wind resources, it is assumed that all future generation should be dispatchable. This is essential for MRES to be able to meet its demand on peak days.
- Other risk factors – Other factors affecting the operation of any future resources were considered, such as the price and availability of fuel.

After this screening process, purchase or build options were considered for these standard types of resources:

1. Base load: An Integrated Gasification Combined Cycle (IGCC)

2. Peaking: Natural Gas-fired Simple-Cycle Combustion Turbine (CT) units.

3. Peaking #2: Reciprocating Natural Gas-fired Combustion Turbine units.

4. Intermediate: Natural Gas-fired Combined Cycle (NGCC) units.

5. Renewable #1: 1000 kW Wind Turbines with a 35% assumed plant factor and 15% accreditation installed in 100 MW farm sizes.

6. Renewable #2: 1000 kW Solar Unites with a 20% assumed plant factor and 27% accreditation installed in 100 MW farm sizes.

7. DSM (Demand Side Management): 85.7 of DSM (coincident with the MRES peak) by 2040 was forced into all of the capacity expansion models.

iv. Future DSM Activities

As part of its ongoing efforts, MRES commissioned Morgan Marketing Partners to perform a DSM Potential Study. The final report for the study was completed in October 2014. This study determined (1) the Technical Potential (Identify measures that are technically feasible); (2) the Economic Potential (Identify measures that are cost-effective); and (3) the Market Potential (Identify level of uptake that can be expected based on a reasonable level of intervention in the market to overcome adoption barriers).

The Technical Potential estimates the amount of DSM that is technically feasible, ignoring any adoption barriers or economic factors. It considers the energy savings, demand savings, number of eligible units or buildings, technology saturation, technology penetration, and measure lifetime.

The Economic Potential reduces those estimates to account for any measures that would be infeasible due to economic or long payback considerations. Besides the factors used for the Technical Potential, it considers incremental cost, the retail values of energy, and the participant's benefit-cost ratio for each measure.

Finally, the Market Potential further reduces the estimates to account for certain adoption barriers. It also considers a market barrier level (based on a diffusion curve for adoption of new technologies), free ridership levels, and a degradation of savings rate.

Once the DSM programs were screened through the above process, MRES staff used the results of the potential study to group the DSM programs into eleven DSM Portfolios. This step reduced the volume to a manageable number to be evaluated in this analysis. Similar programs were grouped together, with the resulting portfolios and the potential MW savings by 2040 listed below:

• Commercial & Industrial Compressed Air	7.0 MW
• Commercial & Industrial Low Load Factor	0.2 MW
• Commercial & Industrial High Load Factor	2.2 MW
• Commercial & Industrial HVAC	6.7 MW
• Commercial & Industrial Lighting	18.6 MW
• Commercial & Industrial Refrigeration	0.5 MW
• Commercial & Industrial Food Service	0.1 MW
• Residential Appliances	0.5 MW
• Residential HVAC	27.8 MW
• Residential Lighting	5.9 MW
• Direct Load Control	16.2 MW
TOTAL	**85.7 MW**

These portfolios were forced into the capacity expansion analysis. As a result, the model built less generating capacity, purchased less energy on the market, and generated less energy. The model also estimated the costs of administering the DSM programs, and providing incentives to customers.

v. Renewable Energy Resources

MRES has existing renewable energy resources and is planning renewable resource additions as an integral part of the resource planning process. The expansion of renewable resources in the MRES portfolio is important to meeting its mission to provide environmentally responsible energy and to make a good faith effort in meeting Minnesota's Renewable Energy Standard (RES), North and South Dakota's Renewable Energy Objectives (REO), and Iowa's Alternative Energy Purchase (AEP). MRES continues to receive the output from wind projects located in Worthington, Moorhead, Marshall, and Odin, Minnesota; Hancock County, Iowa; and Rugby, North Dakota totaling over 83 MW. MRES has also installed a 1 MW solar facility in Pierre, SD. In addition to this existing generation, MRES plans to commission 36.5 MW at the Red Rock Hydro Project by 2021, and construct or contract an additional 80 MW of wind generation by

2037 to comply with the state requirements mentioned above. These future wind and hydro installations were forced into the model as a minimum, with the model being able to voluntarily add more if found to be economical.

vi. Emission Costing

MRES used the emission externality costs for SO2, PM_{10}, CO, NOx, and lead as approved by the Minnesota Public Utilities Commission (PUC) for each case for all new resources. Because all current and future fossil-fuel resources of MRES are located outside of Minnesota, the costs were based on the Minnesota environmental externality values as published by the Minnesota PUC for resources within 200 miles of the state, inflation adjusted. The published Minnesota CO_2 externality price was zero for such resources, but a CO2 costs of $21.50 and $34 per ton were considered in several alternative scenarios.

F. Resource Planning Results

After accounting for all of the details listed above, Capacity Expansion software modeling indicated that the preferred expansion plan for MRES is 167.6 MW of Combustion Turbine (CT) in 2022 and another 83.8 MW CT unit in 2026. Also included in the model is 80 MW of wind for RES compliance and 85.7 MW of DSM by 2040. Multiple alternative scenarios were also evaluated to consider various effects, such as low or high load forecasts, or low or high natural gas prices.

G. Implementation

As a wholesale power supplier, it is the responsibility of MRES to provide all supplemental power supply to MRES S-1 member utilities. Prior to 2006, energy efficiency programs were the responsibility of each individual MRES member since MRES did not have a direct relationship with its members' retail customers and since energy efficiency programs are implemented at the retail level. In an effort to bridge the traditional gap between MRES as a wholesale supplier, and its members as retail DSM providers, the MRES Board of Directors began efforts in early 2006 to develop a program that would strongly encourage additional DSM, would assist and support member implementation of DSM, and would integrate MRES and member efforts. An overview of the DSM progress of MRES and its members is described below.

i. DSM Task Force

In 2006, the MRES Board of Directors created a DSM Task Force to chart a course toward developing and implementing DSM programs to be provided to all the member communities. The Task Force was comprised of 14 representatives from member communities, including 2 members of the MRES Board of Directors. The purpose of the Task Force was to evaluate and recommend energy efficiency and demand management strategies that would allow MRES to achieve the DSM goals identified. The Task Force also determined the respective roles of MRES and its members, and developed implementation and marketing strategies

for the rollout of DSM programs. As the result of the 12 Task Force meetings, MRES developed a portfolio of energy efficiency programs called Bright Energy Solutions® (BES) and developed a Coordinated Demand Response (CDR) program. Both of those programs continue to be enhanced and expanded by MRES over time.

ii. Bright Energy Solutions

One of the recommendations of the DSM Task Force was for MRES to create a brand that encompasses all of the DSM program offerings to the member communities. MRES created Bright Energy Solutions (BES) to assist the members in implementing DSM activities, to provide consistency in programs throughout the membership, and to make programs easily identifiable to customers and regional trade allies.

MRES conducted further study work to design individual measures and programs to be offered through Bright Energy Solutions. Bright Energy Solutions is currently offered to commercial, industrial and residential customers in 60 participating MRES member communities. The Bright Energy Solutions program offers a portfolio of energy efficiency cash incentive programs that will help the member's customers reduce their electric energy costs and operate more efficiently. At the same time, the savings provide MRES with a very cost effective power supply resource.

H. BES Programs Designed to Meet Goals

Under the Bright Energy Solutions banner, MRES member utilities began to offer a limited number of energy efficiency incentives in January 2008, through our member utilities, to commercial and industrial customers. Several residential programs were added in 2009. Since then, the BES offerings have been expanded for all customer classes. The 2019 BES incentive offerings are as follows:

Residential BES Programs:

- ENERGY STAR® Products and Residential Lighting
- Residential Heating and Cooling

Commercial and Industrial BES Programs:

- Commercial Refrigeration
- Compressed Air System Efficiency
- Custom Incentives for Businesses
- Food Service for Businesses
- Heating and Cooling for Businesses
- Lighting - New Construction
- Lighting Retrofits
- New Construction Design Review
- Pumps and VFDs for Businesses

The targeted audience for the BES programs is primarily business customers since commercial and industrial electrical consumption makes up the majority of the MRES members' retail sales. However, it is the goal of the BES program to ensure that all customers have an opportunity to save energy and money.

i. BES Savings Results

The following tables show the BES savings results from inception through 2013:

Year	Incentives Paid	kWh Savings	kW Savings
2008	$ 485,040	6,237,775	1,595
2009	$ 1,242,842	16,737,462	3,762
2010	$ 1,809,139	26,494,210	5,252
2011	$ 1,888,249	29,824,594	6,077
2012	$ 1,617,411	24,325,963	5,190
2013	$ 1,918,485	28,176,376	6,053
2014	$ 1,990,601	32,851,425	6,226
2015	$ 2,385,985	32,384,209	6,734
2016	$ 2,666,278	39,503,342	7,189
2017	$ 2,801,301	44,185,826	8,864
2018	$ 2,616,411	47,227,827	8,296
Totals	**$ 21,421,745**	**327,949,009**	**65,236**

In addition to helping MRES meet its Resource Plan goals, the expansion of the BES program has served to help the MRES Minnesota and Iowa members meet their state energy savings goals as well. Both Minnesota and Iowa strongly encourage energy efficiency through the adoption of state goals for each electric utility. The 2019 goal for MRES Minnesota members is to save 1.5 percent of average retail sales. Although the states of Iowa, North Dakota and South Dakota do not have formal energy saving goals, the MRES members in those states are very actively promoting the BES programs to ensure that their customers have an equal opportunity to save energy and money.

ii. Future Strategies for Savings

The Bright Energy Solutions program is now in its twelfth year of implementation. MRES is finding that as the most cost-effective and most universally applicable efficiency projects (i.e. lighting) are being completed, it becomes increasingly harder to get energy savings. MRES is continually looking for new marketing strategies, new implementation methods, and new technologies to encourage more participation and move projects to fruition. New Construction

Design review has been a popular and successful program, which we intend to continue. An engineering firm is contracted to review potential designs in the early stages of the project. Recommendations for additional energy saving measures are recommended to the project owner. A comprehensive calculation of the demand and energy savings are provided for the final design.

New programs will be evaluated in the future as technology becomes available and market opportunities are identified.

I. Cost-Effectiveness of BES Programs

As part of the development of the Bright Energy Solutions program, a number of steps were taken to analyze the costs, benefits, and applicability of the programs, both from the MRES perspective and the member utility perspective. That evaluation is described below.

i. Economic Analysis of Energy Efficiency

As MRES started developing DSM programs and making decisions about which efficiency measures to rebate and where to set rebate levels, it became apparent that more in-depth economic analysis was needed. MRES worked with consultant Morgan Marketing Partners for guidance in the development of the DSM programs and rebates. The incentive levels set for the measures covered by the program were assessed through a cost-effectiveness analysis using DSMore software, a model that utilizes the Total Resource Cost (TRC), Utility Cost Test (UCT), Ratepayer Impact Measure (RIM), Societal, and Participant test. The cost-effectiveness tests take into account for the energy and demand savings, associated avoided costs, net benefits to MRES members, incremental or installed costs, and the program costs.

The test that is the most applicable, and most important to MRES in determining cost-effectiveness is the UCT. This test compares the costs of DSM to the benefits of the program from the utility perspective. The costs of DSM include the incentives that are paid to the customer, the administrative costs, and the marketing or promotional costs. For MRES, the benefit of DSM is a reduction in future costs to MRES. By achieving savings through DSM, MRES has the opportunity to avoid purchases on the open market virtually every day. MRES chose to offer the energy efficiency measures that were found to be cost-effective using the UCT test. The results of all other tests were reviewed and considered as well. If a measure passed the UCT test, but did not pass one or more of the other Standard Practice Manual tests, those measures were given particular scrutiny to determine whether the measure should be offered by MRES. Factors that were considered included the cost to the participant, the benefits to the participant, the value of environmental benefits, and possible rate impacts to non-participants.

The following is a list of the TRC and UCT test results for different categories of DSM programs. Note that values over 1.0 indicate a passing test:

	UCT	TRC
Commercial & Industrial Compressed Air/Process	5.82	4.47
Commercial & Industrial Custom – Low Load Factor (Plug Load Specialty)	7.52	5.76
Commercial & Industrial HVAC	3.21	2.66
Commercial & Industrial Lighting	6.19	4.76
Commercial & Industrial Refrigeration	6.10	5.06
Commercial & Industrial Food Service	4.22	2.61
Commercial & Industrial Custom High Load Factor	6.60	4.08
Residential Appliances	4.17	4.36
Residential HVAC	1.73	1.56
Residential Lighting	4.03	2.83
Direct Load Control	1.32	3.15

ii. Member Program Selection

MRES offers the menu of Bright Energy Solutions programs to all S-1 members. Members may choose to offer any or all of the programs based on the demographics and needs of their customer base and their own preferences. MRES provides all of the incentives offered through the programs as a reimbursement to the member utility. MRES also provides marketing materials that each member can customize for their own use, as well as technical assistance and field inspection assistance when the incentive is in excess of $20,000 per retail customer for a given project. MRES provides a tracking system to track the savings goals of each member, the incentive amounts paid, and kW and kWh savings from all rebate applications. The information is available to members in real-time through a web portal. MRES members must answer customer questions, review applications, conduct field inspections for rebate applications over $20,000, and issue checks for rebates. Below is the current menu of program offerings, along with the incentives paid by MRES:

BRIGHT ENERGY SOLUTIONS®

INCENTIVE SCHEDULE A - Effective 2019-0101

Measure	Incentive	Unit
Lighting Retrofits		
Low Wattage Replacement Lamps		
Low Watt T8 lamps - per lamp	$ 1.00	EA
LED Signs/Signals/Technologies		
LED Exit Signs Electronic Fixtures (Retrofit Only)	$ 8.00	EA
LED Auto Traffic Signals	$ 25.00	EA

LED Pedestrian Signals	$	22.00	EA
LED Reach-in refrigerated case lighting - per door	$	25.00	EA
LED Reach-in refrigerated case lighting - per door - DLC Premium	$	30.00	EA
LED Recessed Downlights (indoor only)	$	6.00	EA
LED screw-in replacement lamps ≥ 600 lumens - per lamp	$	1.50	EA
LED screw-in replacement lamps < 600 lumens - per lamp	$	1.50	EA
LED screw-in replacement lamps - floods or spots	$	3.00	EA
LED horizontal case lighting - per foot of lamp	$	3.00	EA
LED horizontal case lighting - DLC Premium - per foot of lamp	$	4.00	EA
LED Linear Lamp - 4' T8 Replacement	$	3.00	EA
LED Linear Lamp - 4' T5HO Replacement	$	3.00	EA
LED Pin-Based Replacement Lamp - Replacing Fluorescent	$	4.00	EA

Controls

Occupancy Sensor	$	0.06	per Watt
Daylighting Sensor (continuous)	$	0.07	per Watt
Combo Occupancy and Daylighting Sensor	$	0.10	per Watt
Networked lighting control	$	0.12	per Watt
Occupancy Sensor Controlling LED Case Lighting	$	5.00	per Door

Lighting in New Construction

High Bay LED Fixtures - DLC Listed

LED High Bay Fixtures ≤75 W	$	15.00	EA
LED High Bay Fixtures ≤110 W	$	25.00	EA
LED High Bay Fixtures ≤160 W	$	30.00	EA
LED High Bay Fixtures ≤275 W	$	45.00	EA
LED High Bay Fixtures ≤400 W	$	80.00	EA
LED High Bay Fixtures >400 W	$	105.00	EA

High Bay LED Fixtures - DLC Premium

LED High Bay Fixtures ≤75 W	$	20.00	EA
LED High Bay Fixtures ≤110 W	$	30.00	EA
LED High Bay Fixtures ≤160 W	$	35.00	EA
LED High Bay Fixtures ≤275 W	$	50.00	EA
LED High Bay Fixtures ≤400 W	$	85.00	EA
LED High Bay Fixtures >400 W	$	115.00	EA

LED Troffer - DLC Listed

LED Troffer (<3000 Lumens)	$	4.00	EA
LED Troffer (3000 - 5799 Lumens)	$	6.00	EA
LED Troffer (≥ 5800 Lumens)	$	9.00	EA

LED Troffer - DLC Premium

LED Troffer (<3000 Lumens)	$	6.00	EA
LED Troffer (3000 - 5799 Lumens)	$	9.00	EA

LED Troffer (≥ 5800 Lumens)	$	14.00	EA

Controls and Other Efficient Lighting Technologies

DLC-Listed Networked Lighting Controls	$	0.09	per Watt

LED Technologies

LED Recessed Can Downlights (indoor only)	$	6.00	EA
Occupancy Sensor controlling LED refrigerated case lighting - per door	$	5.00	EA
LED screw-in replacement lamps ≥ 600 lumens - per lamp	$	1.50	EA
LED screw-in replacement lamps < 600 lumens - per lamp	$	1.50	EA
LED screw-in replacement lamps - floods or spots	$	3.00	EA
LED Pin Lamps (Replacing pin CFL)	$	4.00	EA
LED Linear Lamp - 4' T8 size	$	3.00	EA
LED Linear Lamp - 4' T5HO size	$	3.00	EA

HVAC/Cooling Technologies

Packaged Terminal Air Conditioners (PTAC)

High Eff PTAC Electric - all sizes	$	45.00	per ton

Air Conditioning Systems - split systems

AC less than 65 kBTU 5.42 tons - 1 phase	$	100.00	per ton
AC less than 65 kBTU of 18.0 SEER or greater	$	140.00	per ton
AC 65 to 135 kBtu 5.42 to 11.25 tons	$	50.00	per ton
AC 135 to 239 KBTU 11.25 to 20 tons	$	50.00	per ton
AC 240 to 759 kBTU 20 to 63.3 tons	$	50.00	per ton
AC more than 760 kBTU 63.3 tons	$	50.00	per ton
Mini-Split Ductless Air Conditioners any size of 16 SEER or greater	$	250.00	EA
Quality Install less than 65 kBTU 5.42 tons - Adder to Incentives above.	$	80.00	per ton

Air Conditioning Systems - single packaged systems

AC less than 65 kBTU 5.42 tons	$	50.00	per ton
AC less than 65 kBTU 5.42 tons of 18 SEER or greater	$	90.00	per ton
AC 65 to 135 kBtu 5.42 to 11.25 tons	$	50.00	per ton
AC 135 to 239 KBTU 11.25 to 20 tons	$	50.00	per ton
AC 240 to 759 kBTU 20 to 63.3 tons	$	50.00	per ton
AC more than 760 kBTU 63.3 tons	$	50.00	per ton

Split System Air Source Heat Pumps

HVAC HP 65,000 1 Ph	$	100.00	per ton
HVAC HP 65,000 of 18.0 SEER or greater	$	140.00	per ton
HVAC HP 65,000 - 135,000	$	50.00	per ton
HVAC HP 135,000 - 240,000	$	50.00	per ton
HVAC HP 240,000	$	50.00	per ton

Mini-Split Ductless Air Source Heat Pump-any size of 16 SEER or greater	$	250.00	EA
Quality Install less than 65,000 Btu 5.42 tons - Adder to incentives above.	$	80.00	per ton

Variable Refrigerant Flow Multi-Split Air Cooled Heat Pump

Variable Refrigerant Flow Multi-Split Air Cooled Heat Pump (All Sizes)	$	75.00	per ton

Air Source Heat Pumps - single packaged systems

HVAC HP 65,000 1 Ph	$	50.00	per ton
HVAC HP 65,000 for 18.0 SEER or greater	$	90.00	per ton
HVAC HP 65,000 3 Ph	$	50.00	per ton
HVAC HP 65,000 - 135,000	$	50.00	per ton
HVAC HP 135,000 - 240,000	$	50.00	per ton
HVAC HP 240,000 - 760,000	$	50.00	per ton
HVAC HP ≥ 760,000	$	50.00	per ton

Ground Source Heat Pumps

Ground Source HP Closed Loop - various types & sizes	$	200	per ton
Add a desuperheater	$	250.00	EA

Energy Star Window and Wall Air Conditioners

ES Window or wall AC under 14,000 Btu hr	$	25.00	EA
ES Window or wall AC over 14,000 Btu hr	$	25.00	EA

Heat Pump Water Heaters

HP Water Heater Energy Star qualified - residential style ≤55 gallons	$	75.00	EA

Chillers

High Eff Air-Cooled Chiller - all sizes	$	50.00	per ton

Tier 1 Efficiency Water Cooled

Centrifugal Water Cooled Chillers <150 ton	$	40.00	per ton
Centrifugal Water Cooled Chillers 150-300 ton	$	40.00	per ton
Centrifugal Water Cooled Chillers >300 ton	$	40.00	per ton
Scroll or Screw Water Cooled Chillers <150 ton	$	40.00	per ton
Scroll or Screw Water Cooled Chillers 150-300 ton	$	40.00	per ton
Scroll or Screw Water Cooled Chillers >300 ton	$	40.00	per ton

Tier 2 Efficiency Water Cooled

Centrifugal Water Cooled Chillers <150 ton	$	55.00	per ton
Centrifugal Water Cooled Chillers 150-300 ton	$	55.00	per ton
Centrifugal Water Cooled Chillers >300 ton	$	55.00	per ton
Scroll or Screw Water Cooled Chillers <150 ton	$	45.00	per ton
Scroll or Screw Water Cooled Chillers 150-300 ton	$	45.00	per ton
Scroll or Screw Water Cooled Chillers >300 ton	$	45.00	per ton

Other Energy Efficient Cooling Technologies

ECM in residential style furnace/air handler/fan coil	$ 150.00	EA
ECM - HVAC Fan (exhaust or fan powered boxes)	$ 100.00	EA
ECM Hot Water Circulator - less than 100 W	$ 70.00	EA
ECM Hot Water Circulator - 100 - 500 W	$ 350.00	EA
ECM Hot Water Circulator - greater than 500 W	$ 1,000.00	EA
Demand controlled ventilation (carbon dioxide sensors)	$ 35.00	per 1000 sq ft
Guest room energy management - PTACs	$ 50.00	EA
Guest room energy management - PTHPs	$ 50.00	EA
Window Film	$ 0.40	per sq ft
Energy recovery ventilators (ERVs)	$ 0.70	per CFM

Pumps / Variable Frequency Drives (VFDs)

Pumps HP 1.5	$ 60.00	EA
Pumps HP 2	$ 70.00	EA
Pumps HP 3	$ 100.00	EA
Pumps HP 5	$ 100.00	EA
Pumps HP 7.5	$ 200.00	EA
Pumps HP 10	$ 260.00	EA
Pumps HP 15	$ 300.00	EA
Pumps HP 20	$ 400.00	EA
VFDs on HVAC fans & pumps, process pumps all sizes	$ 40.00	per HP
VFDs on new air compressors	$ 35.00	per HP

Compressed Air Efficiency

Compressed Air Leak Detection Survey	40% of audit cost,$5,000 max.	
VFDs on new air compressors	$ 35.00	per HP
Engineered Nozzles for compressed air	$ 20.00	EA
No-air loss drains - each	$ 160.00	EA
Cycling refrigerated dryers	$ 75.00	per 100 CFM
Dew point demand controls	$ 150.00	per 100 CFM
Mist eliminators	$ 4.00	per HP
Adding storage to achieve 5 gal/cfm storage	$ 20.00	per HP
Low pressure blower replacing compressed air blow off	$ 1,500.00	per blower HP

Specialty / Misc. Equipment

High Frequency Battery Charger - Less than 24/7 operation	$ 100.00	EA

High Frequency Battery Charger - 24/7 operation	$ 300.00	EA

Food Service & Commercial Refrigeration Equipment

ES Ice Machines less than 500 lbs per day	$ 50.00	EA
ES Ice Machines 500-1000 lbs per day	$ 200.00	EA
ES Ice Machines greater than 1000 lbs per day	$ 300.00	EA
Commercial Dishwasher - under counter type - $ depends on WH type	$ 100 - 150	EA
Commercial Dishwasher - door type - $ depends on WH type	$ 225 - 500	EA
Commercial Dishwasher - single tank conveyer - $ depends on WH type	$ 225 - 425	EA
Commercial Dishwasher - multi-tank conveyer - $ depends on WH type	$ 525-1000	EA
Commercial Dishwasher - pot, pan, utensil unit - $ depend on WH type	$ 60-150	EA
ES 3 Pan Steam Cooker	$ 600.00	EA
ES 4 Pan Steam Cooker	$ 700.00	EA
ES 5 Pan Steam Cooker	$ 800.00	EA
ES 6 Pan Steam Cooker	$ 900.00	EA
ES Hot Holding Cabinets - Full Size Cabinets	$ 400.00	EA
ES Holding Cabinets - Three Quarter Size	$ 300.00	EA
ES Holding Cabinets - Half Size Cabinets	$ 200.00	EA
ES Commercial Fryers	$ 250.00	EA
ES Commercial Griddles	$ 250.00	EA
ES Convection Ovens	$ 200.00	EA
ES Combination Ovens	$ 1,000.00	EA
LED horizontal case lighting - per foot of lamp	$ 3.00	EA
LED horizontal case lighting - DLC Premium - per foot of lamp	$ 4.00	EA
LED Reach-in refrigerated case lighting - per door	$ 25.00	EA
LED Reach-in refrigerated case lighting - per door - DLC Premium	$ 30.00	EA
Kitchen hood w temp or optical sensor w/ vfd exhaust and vfd makeup air	$ 200.00	HP
Low heat freezer doors - per door	$ 25.00	EA
No heat reach in freezer door	$ 50.00	EA
No heat reach in cooler door	$ 15.00	EA
ECM evap fan motors- walk-in freezers and coolers- excludes new const.	$ 40.00	EA
ECM evap fan motors for compressors and condensors - per motor	$ 50.00	EA
ECM fan motors for reach-in cases - per motor - excludes new const.	$ 20.00	EA
Reach-in cooler/freezer cases with doors replacing multi-deck cases	$ 30.00	per linear ft
Occupancy sensor controlling LED case lighting - per door	$ 5.00	EA

Custom / Audits / Design Review

Custom Base Incentive	$ 270.00	per kW
Retrocommissioning	50 to 100% of study cost	
Design Review Program	Incentives per Custom Program	

Residential Programs

Residential HVAC

Ground Source HP Closed Loop Residential	$ 200.00	per ton
Add a desuperheater	$ 250.00	EA
ECM motor in air handler/fan coil	$ 150.00	EA
ECM motor in natural gas furnace	$ 150.00	EA
Air Source Heat Pump	$ 250.00	EA
Air Source Heat Pump of 18.0 SEER or greater	$ 350.00	EA
Mini-Split Ductless Air Source Heat Pump - 16 SEER or greater	$ 250.00	EA
Central Air Conditioner	$ 250.00	EA
Central Air Conditioner of 18.0 SEER or greater	$ 350.00	EA
Mini-Split Ductless Air Conditioner - 16 SEER or greater	$ 250.00	EA
Electric Heat Pump Water Heater (≤55 Gallons)	$ 75.00	EA
ENERGY STAR® Programmable Thermostat	$ 25.00	EA
Central A/C and Air Source Heat Pump Tuneup	$ 30.00	EA
Central A/C Quality Install - Adder to standard incentives listed above.	$ 200.00	EA
Central Heat Pump Quality Install - Adder to standard incentives listed above.	$ 200.00	EA

ENERGY STAR Products

LED Screw In Lamp	$ 1.50	EA
LED Downlight (Fixture or Retrofit Kit - NOT screw in replacement lamps)	$ 4.00	EA
ES Room AC	$ 25.00	EA
ES Dehumidifier	$ 25.00	EA
ES Clothes Washer	$ 25.00	EA
ES Refrigerator	$ 25.00	EA

iii. Calculation of Savings

The savings calculations for all prescriptive rebates under Bright Energy Solutions are based on the algorithms provided by the Minnesota Division of Energy Resources (MN DER) in its Technical Resource Manual (TRM). If the BES program provides prescriptive rebates for measures that are not included in the MN TRM, those savings are calculated by consultant Franklin Energy of Port Washington, Wisconsin. Franklin Energy uses engineering calculations and the deemed savings from other state TRMs to determine savings. For custom rebates, the kW and kWh savings are determined using engineering calculations. Customers and contractors submit their projects to MRES for review, including estimated kW and kWh savings. MRES staff, and/or its consultant, reviews these

projects and savings estimates and determines the level of incentive to be awarded. For projects where savings of 1 million kWhs or more are anticipated, pre and post-metering is required. This review of the savings analysis helps assure that MRES funds are being cost effectively used to promote efficiency.

iv. Environmental Benefits

In addition to helping customers reduce and manage their energy costs, the Bright Energy Solutions programs provide other societal benefits. These benefits include reduced emissions of CO2, carbon monoxide, SOx, and NOx. The estimated value of the environmental benefits was considered as part of the Societal Test when determining cost-effectiveness of the programs.

J. Coordinated Demand Response Program

On a parallel track with Bright Energy Solutions, MRES also began to develop a Coordinated Demand Response (CDR) program designed to encourage members to install or update load control equipment that would allow MRES and its members to shift customer load during times of peak demand to non-peak periods. Load control/demand response can be achieved through direct load control, interruptible service, building pre-heating/pre-cooling or storage, industrial process load control, or response to market prices. MRES will pay a verification payment based on the number of control points connected to the load management system and an annual verification of such points. The payment amounts are $5.00 per year for each controlled central air conditioner and $1.75 per year for each controlled electric water heater the member controls during the member's summer peak demand period and provides verification of such control.

i. Shared Benefits of CDR

MRES first focused on direct load control of air conditioners and electric water heaters since many MRES members were familiar with that technology and many already had equipment in place that could be used or updated. In 2011, MRES began to offer an incentive for every air conditioner and electric water heater that was controlled during the summer months of June, July, August and September. Testing and reporting requirements were put in place to ensure that the load control system was working properly and that load reduction was actually achieved. The incentive applies to members with existing load control systems as well as new systems that are operated under the CDR program.

Several barriers to the implementation of new direct load control by individual MRES member utilities were uncovered by the DSM Task Force. The primary barrier was that members did not have sufficient staff to install equipment, develop control strategies, monitor, operate, and test a direct load control system. To address this issue, MRES developed a CDR program that could be monitored and operated by MRES staff and/or individual member staff. The CDR program provides the following benefits:

- Lower demand charges for MRES members
- Cost-effective alternative to future peaking capacity for MRES
- Shared software/hardware costs
- Shared expertise/labor in operating the system
- Group pricing on load control devices and software fees
- Less staff time for MRES members

ii. CDR Participation

The development of the CDR program has been fairly slow due to the high capital investment associated with the installation of a load control system and with the time that it takes to install a system. Also, members wanted to coordinate any investment made in load control equipment with their plans to install advanced metering infrastructure (AMI), since both systems could use some of the same technology and communications systems. As of 2018, twelve members of MRES are participating in the CDR program and are at various stages of implementation. One of those members is installing CDR and AMI equipment simultaneously. AMI equipment may allow members to achieve demand response using dynamic price signals in the future.

iii. CDR Results

The following are the 2011 through 2018 direct load control results reported either by members with existing load control systems or through CDR participation:

	AC Points Controlled	**AC Load Reduction kW**	**WH Points Controlled**	**WH Points Reduction kW**
2011	8,732	8,732	8,318	2,911
2012	11,784	11,784	9,083	3,179
2013	11,952	11,952	8,815	3,085
2014	12,383	12,383	9,249	3,237
2015	13,964	13,964	10,883	3,809
2016	14,501	14,501	10,851	3,797
2017	15,302	15,302	11,602	4,060
2018	15,099	15,099	12,218	4,276
Totals	103,717	**103,717**	81,019	**28,354**

II. Beresford, SD Resource Planning

A. City Information

Beresford, located in Union and Lincoln Counties, is a community of more than 2,000 individuals located in southeastern South Dakota. The City has one elementary school, one junior high, and one high school. In 2010, the residential sector included 861 occupied housing units. The median age of the population is 38.5 years. About 19.1% of the population is 65 years of age or older and about 25.4% percent are under 18 years old.

In 2017, the municipal utility had 929 residential customers, 229 commercial customers, and 18 industrial customers. The residential sector's yearly usage averaged 9,988 kWh per customer in 2017. Commercial customers averaged 21,485 kWh. Industrial customers averaged 813,333 kWh. The rates for each type of customer are shown on the rate sheet in Exhibit 1.

The rates for each type of customer are shown in Exhibit 1. Exhibit 2 contains the numerical values used to generate the seasonal graphs in Exhibits 3 and 4, which show the winter and summer peak demand and energy for the seasons 2006 through 2023 with forecasted values after 2018. Exhibits 5 and 6 show the total power purchases on a half hour basis, for the 2017-2018 winter season and the 2018 summer season, respectively.

Exhibits 7 and 8 each show the peak day (along with the day before and the day after) for the summer and winter seasons.

Exhibit 1

BERESFORD, SOUTH DAKOTA
CURRENT RETAIL ELECTRIC RATE SCHEDULE

Customer Class	Rate Component	Current Rate
Residential	Customer Charge	$16.00
	$/kWh (Jun-Aug)	$.1290
	$/kWh (Sept-May)	$.1210
Small Commercial	Customer Charge	$26.00
	$/kWh (Jun-Aug)	$.1250
	$/kWh (Sept-May)	$.1170
Large Commercial	Customer Charge	$48.00
	$/kWh	$.0490
	$/kW (Jun-Aug)	$20.00
	$/kW (Sept-May)	$17.60

Exhibit 2

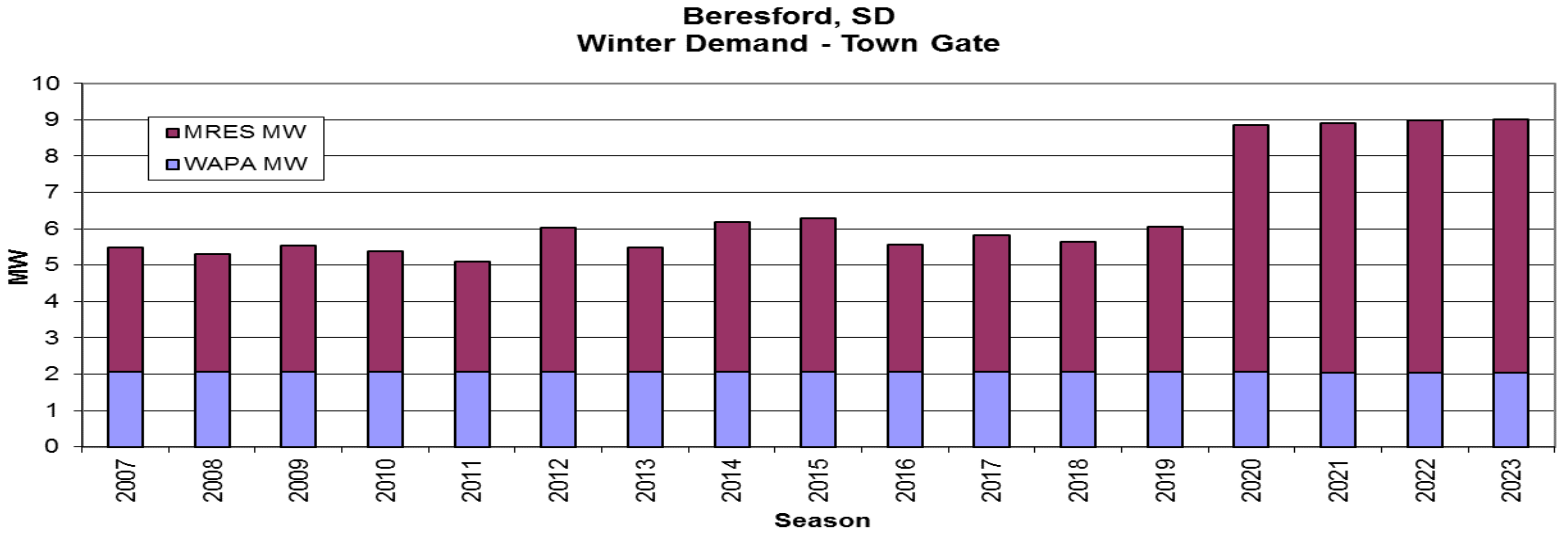
BERESFORD, SD

MRES Seasonal Load Report
Town Gate Load
BASE Forecast

Monthly Splits
Historic Through 4/2019

	Demand (kW)				Energy (kWh)		
Summer	Total	WAPA	MRES	Summer	Total	WAPA	MRES
2006	6,128	2,900	3,250	2006	15,351,112	6,500,000	8,851,112
2007	6,212	2,900	3,413	2007	15,648,478	6,500,000	9,148,478
2008	5,520	2,900	2,653	2008	14,247,745	6,500,000	7,747,745
2009	5,426	2,900	2,695	2009	12,994,581	6,500,000	6,494,581
2010	5,770	2,900	3,039	2010	13,498,680	6,500,000	6,998,680
2011	6,940	2,900	4,209	2011	15,399,888	6,500,000	8,899,888
2012	6,957	2,900	4,079	2012	15,936,607	6,500,000	9,436,607
2013	6,502	2,900	3,771	2013	15,209,643	6,500,000	8,709,643
2014	6,010	2,900	3,790	2014	14,398,392	6,500,000	7,898,392
2015	6,388	2,900	3,536	2015	14,961,741	6,500,000	8,461,741
2016	6,976	2,900	4,245	2016	15,221,319	6,500,000	8,721,319
2017	6,558	2,900	3,680	2017	15,173,571	6,500,000	8,673,571
2018	6,984	2,900	4,106	2018	15,648,547	6,500,000	9,148,547
2019	9,326	2,900	6,595	2019	24,158,265	6,500,000	17,658,265
2020	9,403	2,900	6,672	2020	24,357,125	6,500,000	17,857,125
2021	9,458	2,871	6,754	2021	24,500,625	6,434,000	18,066,625
2022	9,509	2,871	6,805	2022	24,631,413	6,434,000	18,197,413
2023	9,569	2,871	6,865	2023	24,785,806	6,434,000	18,351,806
	Demand (kW)				Energy (kWh)		
Winter	Total	WAPA	MRES	Winter	Total	WAPA	MRES
2007	5,486	2,053	3,439	2007	15,794,834	5,770,000	10,024,834
2008	5,040	2,053	3,263	2008	15,529,323	5,806,000	9,723,323
2009	5,272	2,053	3,495	2009	14,777,339	5,770,000	9,007,339
2010	5,320	2,053	3,335	2010	14,490,007	5,770,000	8,720,007
2011	5,100	2,053	3,053	2011	14,361,028	5,770,000	8,591,028
2012	5,962	2,053	3,977	2012	15,855,202	5,806,000	10,049,202
2013	5,380	2,053	3,431	2013	15,032,613	5,770,000	9,262,613
2014	6,122	2,053	4,137	2014	16,169,863	5,770,000	10,399,863
2015	6,004	2,053	4,227	2015	14,871,343	5,770,000	9,101,343
2016	5,320	2,053	3,509	2016	14,762,829	5,806,000	8,956,829
2017	5,748	2,053	3,763	2017	14,891,409	5,770,000	9,121,409
2018	5,516	2,053	3,593	2018	15,376,373	5,770,000	9,606,373
2019	5,890	2,053	4,003	2019	16,557,694	5,770,000	10,787,694
2020	8,658	2,053	6,802	2020	24,646,735	5,806,000	18,840,735
2021	8,730	2,032	6,872	2021	24,811,812	5,731,000	19,080,812
2022	8,781	2,032	6,941	2022	24,948,995	5,712,000	19,236,995
2023	8,828	2,032	6,988	2023	25,097,370	5,712,000	19,385,370

Exhibit 3


Beresford, SD
Winter Demand - Town Gate
MRES MW
WAPA MW
MW
Season
0
1
2
3
4
5
6
7
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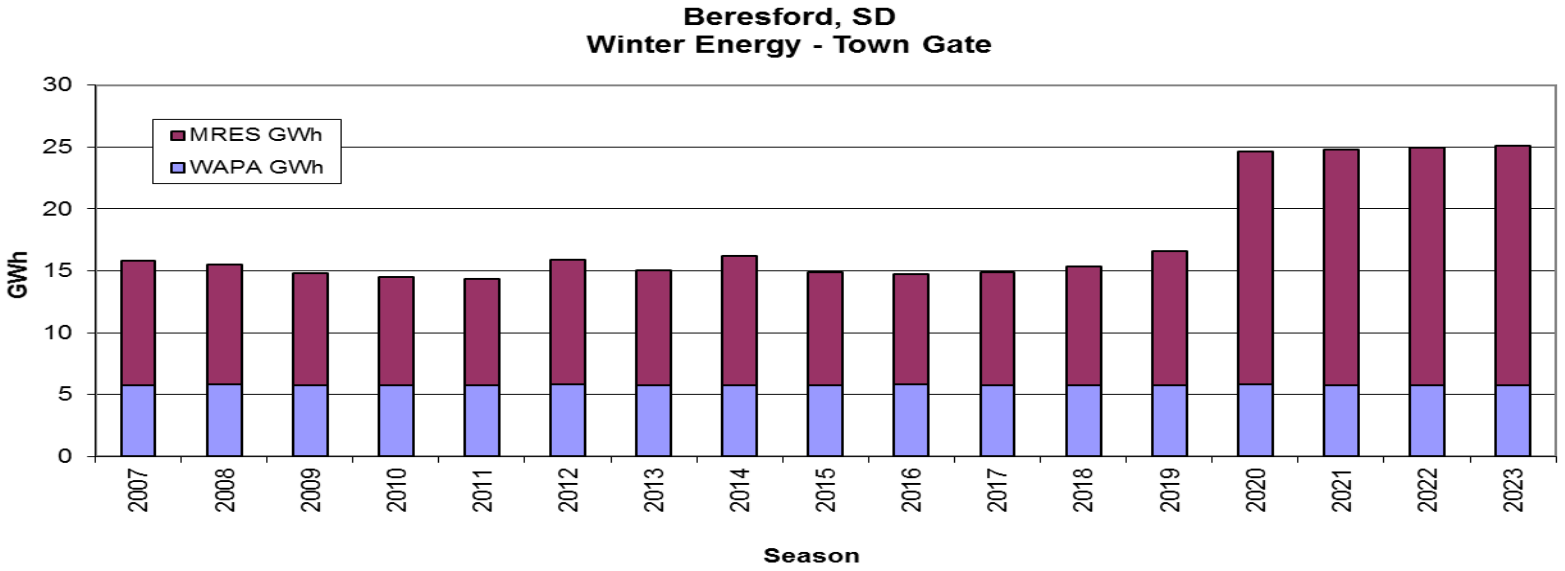
2022
2023


Beresford, SD
Winter Energy - Town Gate
MRES GWh
WAPA GWh
GWh
Season
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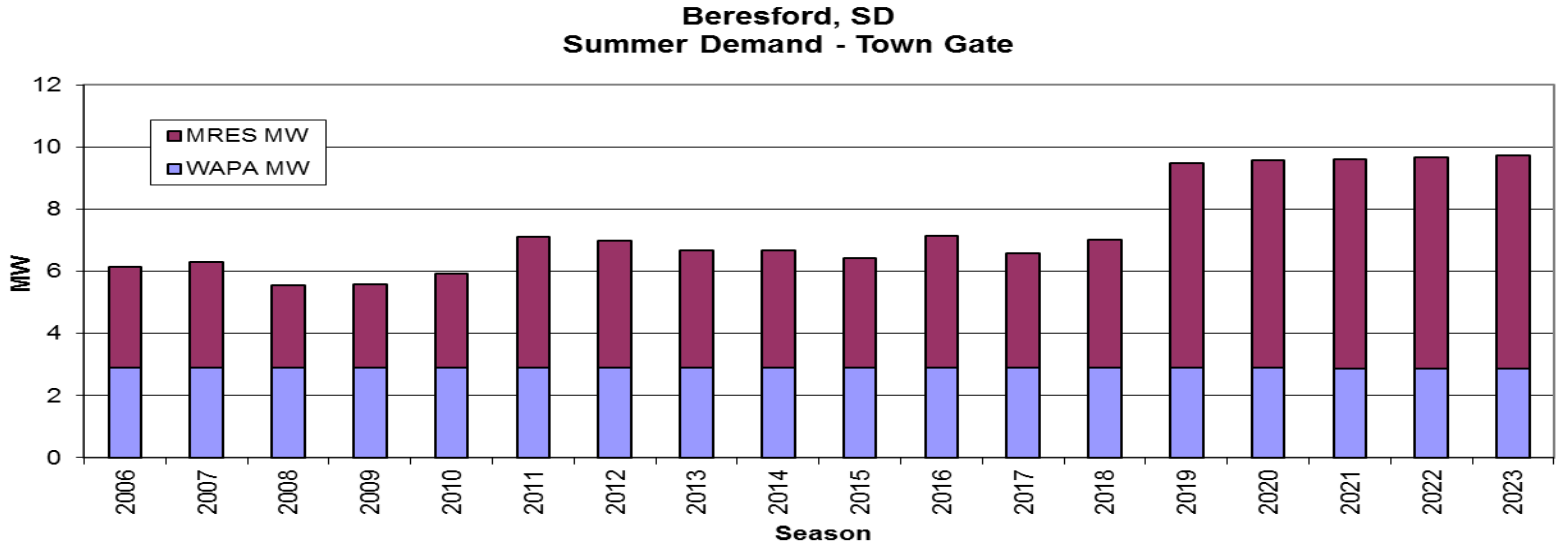
2023

Exhibit 4


Beresford, SD
Summer Demand - Town Gate
MRES MW
WAPA MW
MW
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6
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2006
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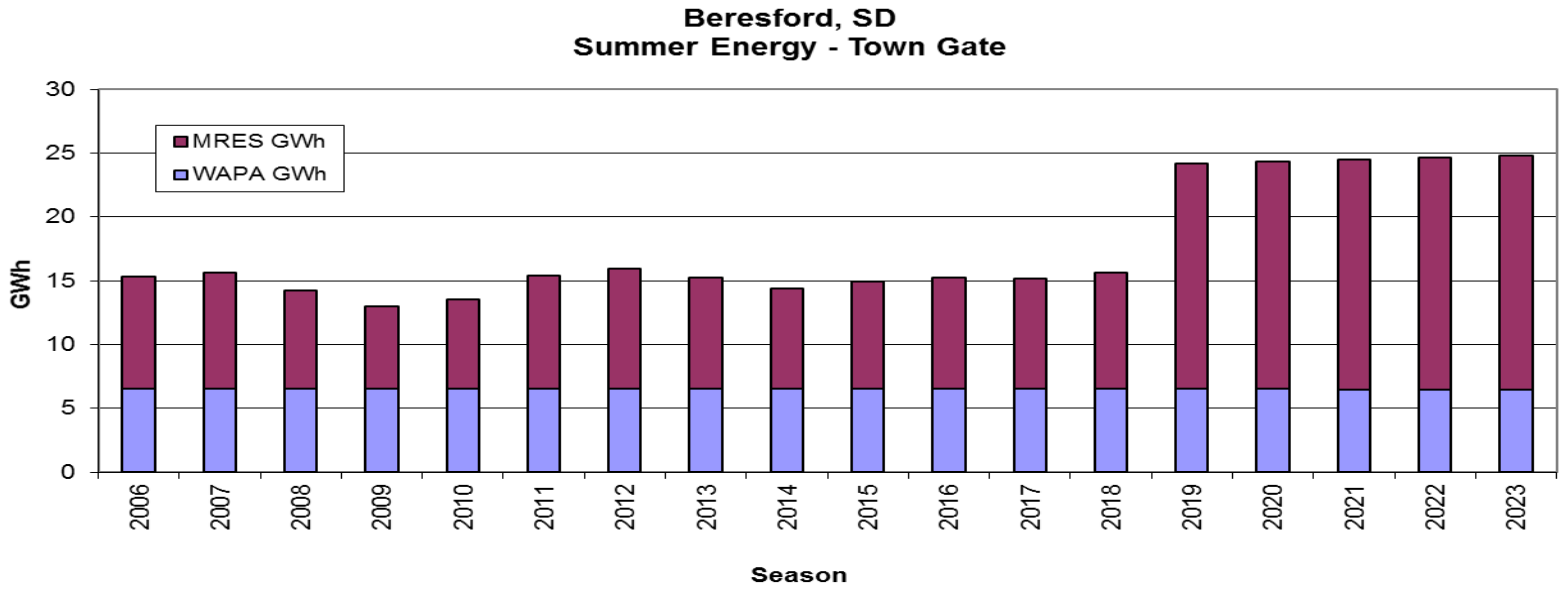
2021
2022
2023
Season


Beresford, SD
Summer Energy - Town Gate
MRES GWh
WAPA GWh
GWh
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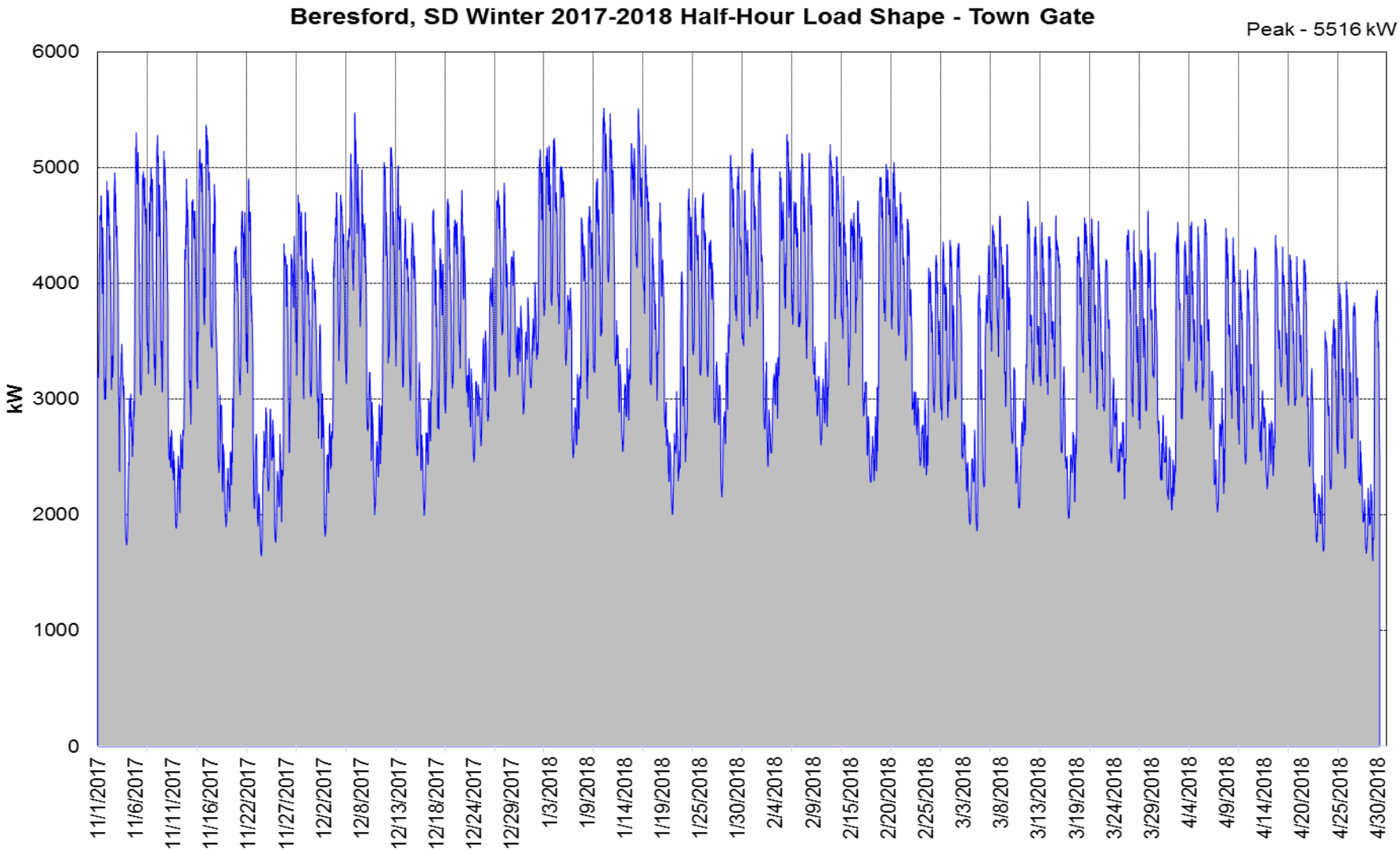
2023
Season

Exhibit 5


Beresford, SD Winter 2017-2018 Half-Hour Load Shape - Town Gate
Peak - 5516 kW
kW
6000
5000
4000
3000
2000
1000
0
11/1/2017
11/6/2017
11/11/2017
11/16/2017
11/22/2017
11/27/2017
12/2/2017
12/8/2017
12/13/2017
12/18/2017
12/24/2017
12/29/2017
1/3/2018
1/9/2018
1/14/2018
1/19/2018
1/25/2018
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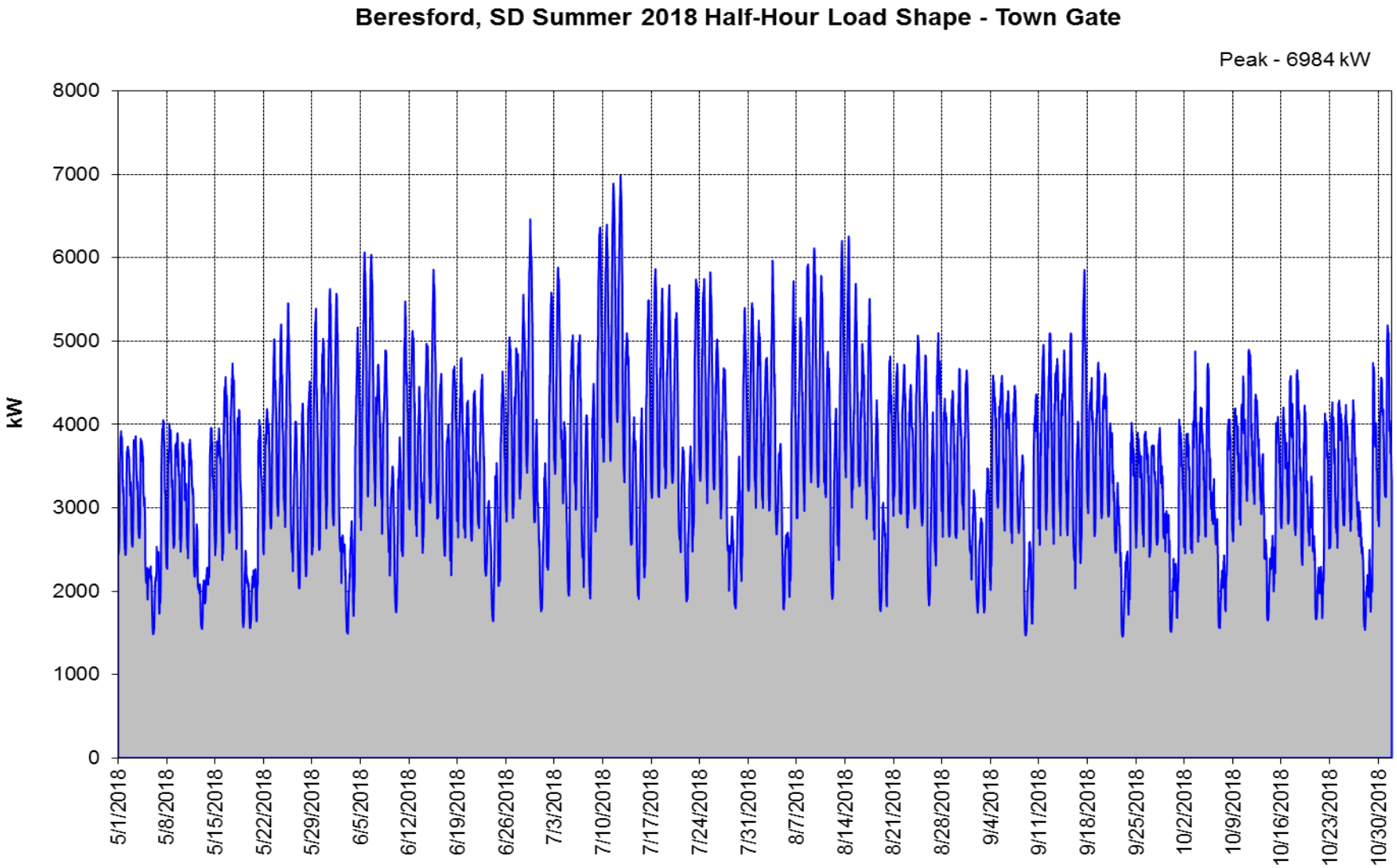
4/30/2018

Exhibit 6


Beresford, SD Summer 2018 Half-Hour Load Shape - Town Gate
Peak - 6984 kW
kW
8000
7000
6000
5000
4000
3000
2000
1000
0
5/1/2018
5/8/2018
5/15/2018
5/22/2018
5/29/2018
6/5/2018
6/12/2018
6/19/2018
6/26/2018
7/3/2018
7/10/2018
7/17/2018
7/24/2018
7/31/2018
8/7/2018
8/14/2018
8/21/2018
8/28/2018
9/4/2018
9/11/2018
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10/30/2018

Exhibit 7

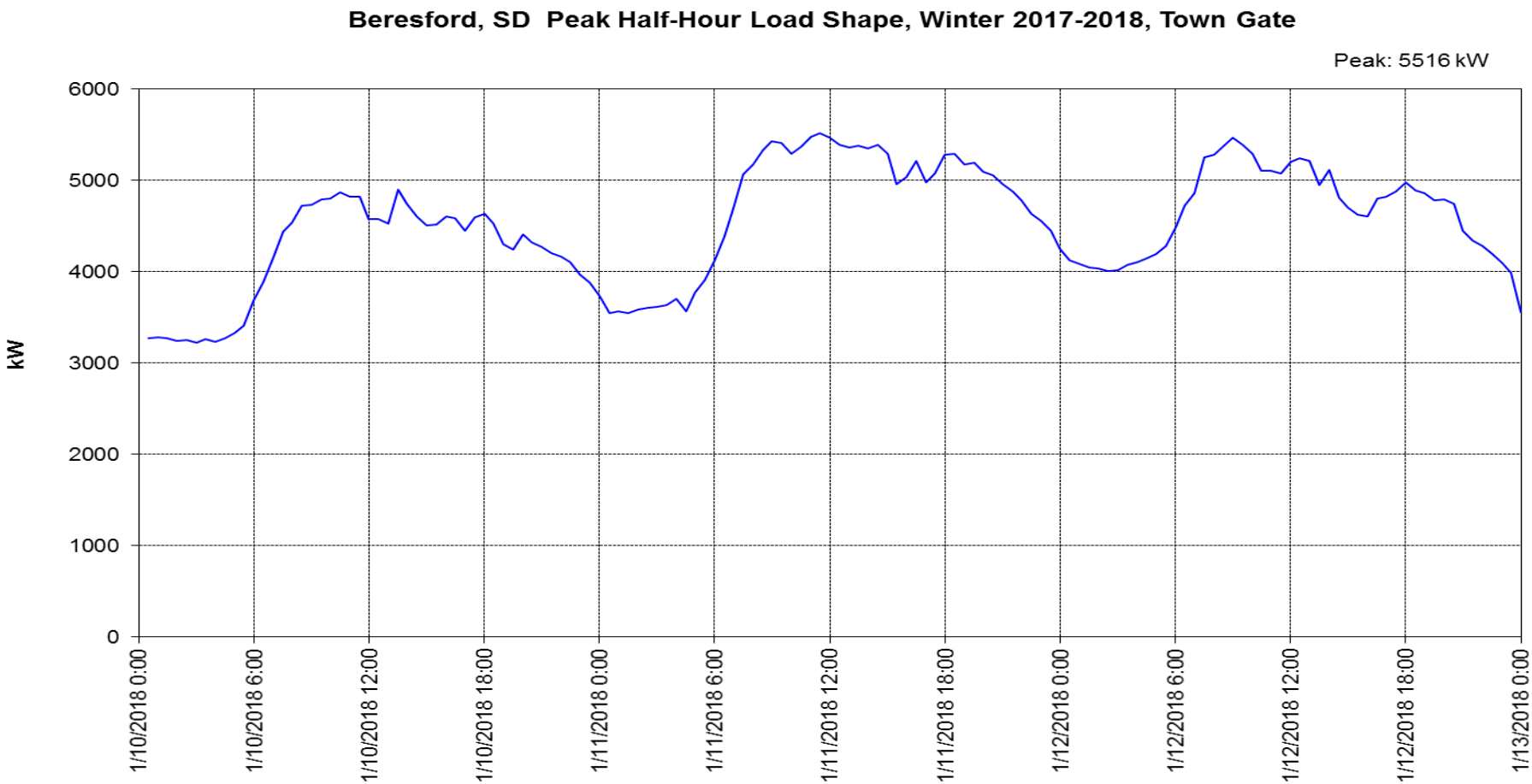
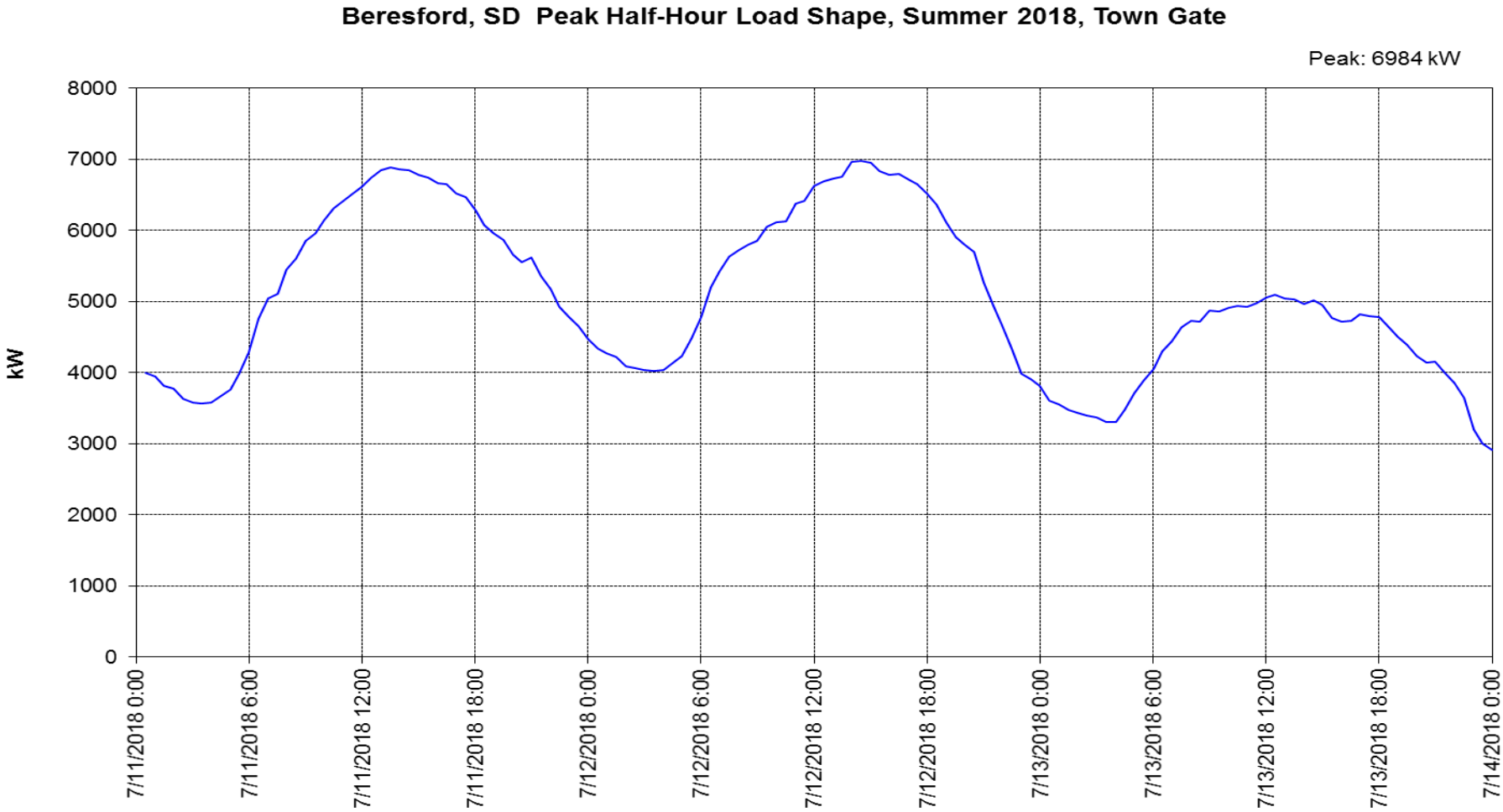

Beresford, SD Peak Half-Hour Load Shape, Winter 2017-2018, Town Gate
Peak: 5516 kW
kW
6000
5000
4000
3000
2000
1000
0
1/10/2018 0:00
1/10/2018 6:00
1/10/2018 12:00
1/10/2018 18:00
1/11/2018 0:00
1/11/2018 6:00
1/11/2018 12:00
1/11/2018 18:00
1/12/2018 0:00
1/12/2018 6:00
1/12/2018 12:00
1/12/2018 18:00
1/13/2018 0:00

Exhibit 8


Beresford, SD Peak Half-Hour Load Shape, Summer 2018, Town Gate
Peak: 6984 kW
kW
8000
7000
6000
5000
4000
3000
2000
1000
0
7/11/2018 0:00
7/11/2018 6:00
7/11/2018 12:00
7/11/2018 18:00
7/12/2018 0:00
7/12/2018 6:00
7/12/2018 12:00
7/12/2018 18:00
7/13/2018 0:00
7/13/2018 6:00
7/13/2018 12:00
7/13/2018 18:00
7/14/2018 0:00

B. Supply-side Efforts

As explained in the section detailing MRES Resource Planning activities, MRES conducts all supply-side resource planning for its members. MRES studied traditional, as well as renewable, energy sources in its resource plan.

All supplemental power for Beresford is supplied through its joint S-1 agreement with other MRES members. All MRES resources are used to supply all of its S-1 members as a group. Therefore, it is neither possible nor necessary for Beresford to individually study supply-side resources as part of this IRP.

C. Historic DSM Efforts

Beresford has been active in pursuing new DSM programs, and participates in the Bright Energy Solutions (BES) Program through MRES. The BES Program offerings were developed after considering the major markets, the saturation of electric and gas appliances, and the characteristics of the customers. The information was analyzed to determine both the technical and cost-saving potential of energy management improvements, any barriers that might be encountered to implementing the improvements, the realistic expectation for program participation, and any net savings that would result from the programs.

The table shown in Exhibit 9 below is a summary of the DSM activities that were installed between 2014 and 2018. DSM activities installed before 2014 can be found in the 2014 IRP filing. The first column indicates the year of installation. The second column indicates the program category. The third column shows the number of measures installed. The fourth column shows the total incentives paid by MRES. The last two columns show the kW and kWh saved on an annual basis by the new installations. For more detailed information showing exact types of measures installed, please see the end of this section.

Exhibit 9 - Summary of DSM Activities 2014-2018

Utility Name	Beresford

Program/Measure	Quan	Incentive	kW	kWh
2014	**193**	**$ 7,867**	**16.7**	**59736**
C&I HVAC	2	$ 100	0.2	1644
Lighting Retrofit	191	$ 7,767	16.4	58092
2015	**67**	**$ 10,145**	**29.0**	**68275**
C&I HVAC	8	$ 6,500	14.6	7988
Compressed Air System	2	$ 1,760	6.5	25948
Lighting Retrofit	55	$ 685	1.8	7889
VFDs and Pumps	2	$ 1,200	6.1	26450
2016	**535**	**$ 4,687**	**11.7**	**69989**
Commercial Refrigeration	5	$ 1,150	1.9	16760
Lighting Retrofit	530	$ 3,537	9.8	53229
2017	**1855**	**$ 9,091**	**28.8**	**138277**
C&I Custom (non-lighting)	0	$ 819	3.4	9724
Food Service	2	$ 100	0.4	3304
Lighting New Construction	130	$ 2,490	6.2	24943
Lighting Retrofit	200	$ 600	1.6	8944
Lighting Retrofit	1523	$ 5,082	17.2	91362
2018	**320**	**$ 8,302**	**36.9**	**274217**
C&I Compressed Air	3	$ 3,195	24.3	213899
C&I HVAC	6	$ 1,150	1.6	2419
Lighting New Construction	79	$ 2,218	6.2	30738
Lighting Retrofit	224	$ 1,189	4.2	20040
Residential Energy Star Products	6	$ 150	0.2	1074
Residential HVAC	2	$ 400	0.4	6047
Grand Total	**2970**	**$ 40,092**	**123.1**	**610493**

- **Load Management Program**

  Description: Load management control on all electric water heaters, central air conditioners, and electric space heaters.

  Energy Savings: Approximately 4 MW on peak.
  Cost: Approximately $4,000 annually.

D. Evaluation of Alternatives

As explained in the section detailing MRES Resource Planning activities, PA Consulting performed a DSM Potential Study for MRES and its members. In this study, many different DSM measures were evaluated for technical, market and economic potential. Once this list of programs and incentives was made available by MRES, Beresford was free to choose from the list of Bright Energy Solutions programs and incentives, or to pursue other measures on their own and without any incentives from MRES.

E. Options Chosen – Development of Action Plan

i. Future Actions

It is assumed that Beresford will continue to participate in the Bright Energy Solutions program. Beresford would have virtually no out-of-pocket costs, as MRES will be paying the incentives for all of these programs. It is planned that Beresford will participate in the all of the Bright Energy Solutions programs to the extent possible. This assumption was made only to obtain more realistic expectations for the five-year plan, and is certainly not considered to be a cap on participation in the event that the program attracts more participants than anticipated.

Representatives from Beresford plan to utilize the MRES marketing materials for all the programs made available in the Bright Energy Solutions program, and take advantage of MRES assistance when possible, and will be working closely with their assigned MRES field representative.

At this time, Beresford is successfully operating their own Load Management program, and it is unknown if they will participate in the MRES Coordinated Demand Response (CDR) program in the future. That decision will be evaluated in years to come.

ii. Milestones

As part of the annual WAPA IRP updates, Beresford will evaluate the progress on these programs. The success will be measured against this 5-year plan, with adjustments made for actual customer participation, and any changes or additions to the Bright Energy Solutions programs.

Measurement and validation of the Bright Energy Solutions programs will be ongoing. Quality control, measurement of savings, verification tracking, and program evaluation are important components of a successful DSM program and they are critical to MRES if DSM is to be relied upon as a power resource. For verification purposes, all incentive applications receive a calculation review. An engineering review of savings calculations is conducted on all custom installations, except for custom lighting. Field inspections are completed on a

minimum of 5% of all installations and on 100% of installations over $20,000 in total incentives and on 100% of custom projects.

For custom projects, MRES requires detailed estimates of kW and kWh savings that will be achieved as a result of the project, along with the sources and references for all values used. This may include certification of savings calculations by a qualified engineer. For projects with estimated savings larger than 1,000,000 kWh per year, or for projects involving new technology, MRES may require that energy savings be verified through metering or energy testing of kW and kWh before and after installation of the proposed equipment.

F. Environmental Effects

The environmental benefits of the DSM programs were not calculated specifically. However, any program that decreases energy consumption will, by definition, decrease the amount of energy generated. Given that a majority of generation is from non-renewable sources, DSM programs will serve to decrease emissions. Additionally, DSM programs that reduce electric demand will mean fewer new generation facilities will need to be constructed in the future.

G. Public Participation

A preliminary draft of this report was produced on April 23, 2014. A notice of public hearing on IRP was published in the local newspaper on July 15, 2014. The public hearing on the IRP was held at the August 4, 2014 City Council meeting. A summary of any comments and responses made during the meeting are included in the Appendix. The City Council approved the resolution on August 4, 2014. A copy of the approved resolution is included in Appendix 2 at the end of this section.

IRP Approval Process	
Preliminary Draft Date	***4/23/2014***
Date Published in Paper	***7/15/2014***
Public Hearing Date	***8/4/2014***
Date Approved by City Council	***8/4/2014***

Appendix 1 – Detailed DSM Measures Installed

Utility Name	Beresford

Program/Measure	Quan		Incentive	kW	kWh
2014	**193**	**$**	**7,867**	**16.7**	**59736**
C&I HVAC	**2**	**$**	**100**	**0.2**	**1644**
Setback/Programmable Thermostats	2	$	100	0.2	1644
Lighting Retrofit	**191**	**$**	**7,767**	**16.4**	**58092**
High Bay Flourescent Occ Sensors	78	$	780	1.8	14731
LED & Induction Tech	7	$	105	0.4	1584
T8 4ft w/Elec Bal	28	$	252	1.1	4300
T8 Hi Bay Fixtures w/ 4ft Lamps Replacing 	78	$	6,630	13.2	37477
2015	**67**	**$**	**10,145**	**29.0**	**68275**
C&I HVAC	**8**	**$**	**6,500**	**14.6**	**7988**
Mini Split Ductless AC	1	$	100	0.4	246
Unitary Air Cooled Split Sys AC 065k - 135k Btuh	1	$	500	0.6	309
Unitary Air Cooled Split Sys AC 241k - 760k Btuh	1	$	2,000	5.5	3016
Unitary Single Pkgd AC <65k Btuh (3ph)	1	$	250	0.5	253
Unitary Single Pkgd AC 065k - 135k Btuh	2	$	900	2.0	1092
Unitary Single Pkgd AC 241k - 760k Btuh	2	$	2,750	5.6	3072
Compressed Air System	**2**	**$**	**1,760**	**6.5**	**25948**
Compressed Air System Leak Survey	1	$	360	2.3	7148
VFD Air Compressor	1	$	1,400	4.2	18800
Lighting Retrofit	**55**	**$**	**685**	**1.8**	**7889**
T8 4ft w/ Bal and Reflectors / Delamping	9	$	225	0.5	2388
T8 4ft w/Elec Bal	46	$	460	1.3	5501
VFDs and Pumps	**2**	**$**	**1,200**	**6.1**	**26450**
Variable Freq Drives	2	$	1,200	6.1	26450
2016	**535**	**$**	**4,687**	**11.7**	**69989**
Commercial Refrigeration	**5**	**$**	**1,150**	**1.9**	**16760**
ES Comm Glass Door Freezers	2	$	500	1.6	14236
ES Comm Glass Door Refrigerators	3	$	650	0.3	2524
Lighting Retrofit	**530**	**$**	**3,537**	**9.8**	**53229**
4' LED Linear Lamps DCL Qual	362	$	1,086	3.3	18656
LED & Induction Tech	164	$	2,431	6.4	34284
LED 2 or 4 Pin-Based Repl Lamps	4	$	20	0.1	289
2017	**1855**	**$**	**9,091**	**28.8**	**138277**
C&I Custom (non-lighting)	**0**	**$**	**819**	**3.4**	**9724**
Lighting: Custom	0	$	819	3.4	9724

Food Service	**2**	**$**	**100**	**0.4**	**3304**
ES Ice Machines	2	$	100	0.4	3304
Lighting New Construction	**130**	**$**	**2,490**	**6.2**	**24943**
LED Energy Star Recessed Downlight	86	$	2,150	4.6	18332
LED Energy Star Screw-in Replacement Lamp	28	$	196	1.2	5002
T8 4ft Reduced Wattage System	16	$	144	0.4	1609
Lighting Retrofit	**200**	**$**	**600**	**1.6**	**8944**
4' LED Linear Lamps DCL Qual	200	$	600	1.6	8944
Lighting Retrofit	**1523**	**$**	**5,082**	**17.2**	**91362**
4 Ft. LED Linear Lamps Repl T12 Fluorescent	172	$	1,032	3.3	16442
4 Ft. LED Linear Lamps Repl T8 Fluorescent	438	$	1,314	5.0	24650
4' LED Linear Lamps DCL Qual	912	$	2,736	8.9	50270
LED & Induction Tech	1	$	-	0.0	0
2018	**320**	**$**	**8,302**	**36.9**	**274217**
C&I Compressed Air	**3**	**$**	**3,195**	**24.3**	**213899**
Compressor Air Leak Survey	1	$	1,635	19.6	192982
No-Loss Condensate Drains	1	$	160	0.5	2117
VFD Air Compressor <= 200-HP Replacing Load/No-Load	1	$	1,400	4.2	18800
C&I HVAC	**6**	**$**	**1,150**	**1.6**	**2419**
Res StyleFurnace w/ECM	2	$	300	0.4	1440
Smart Thermostat (Natural Gas Furnace With/AC)	2	$	100	0.2	374
Split System Air Conditioning < 65000 BTUH - 15 SEER or Higher	2	$	750	0.9	605
Lighting New Construction	**79**	**$**	**2,218**	**6.2**	**30738**
LED High Bay Fixtures, DLC Premium 111-160 W	28	$	1,960	5.4	26625
LED Linear Replacement Lamps	16	$	48	0.2	966
LED Troffer 3000 - 5799 Lumens	35	$	210	0.6	3147
Lighting Retrofit	**224**	**$**	**1,189**	**4.2**	**20040**
4 Ft. LED Linear Lamps Repl T8 Fluorescent	224	$	672	2.6	15133
Custom - Lighting	0	$	517	1.7	4907
Residential Energy Star Products	**6**	**$**	**150**	**0.2**	**1074**
ENERGY STAR Clothes Dryer (Electric)	1	$	25	0.0	183
ENERGY STAR Clothes Washer W/ Elec WH and Elec Dryer	1	$	25	0.0	198
ENERGY STAR Clothes Washer W/ Elec WH and Gas Dryer	1	$	25	0.0	95
ENERGY STAR Dehumidifier	3	$	75	0.1	599
Residential HVAC	**2**	**$**	**400**	**0.4**	**6047**
Air Handler/Fan Coil W/ECM	1	$	150	0.2	720
Air-Source Heat Pump (15 SEER)	1	$	250	0.2	5327
Grand Total	**2970**	**$**	**40,092**	**123.1**	**610493**

Appendix 2 – Beresford Resolution

RESOLUTION NO. 2014-05

WHEREAS, the City of Beresford purchases a significant portion of its power supply from the Western Area Power Administration (Western); and

WHEREAS, Western has recently published its Energy Planning and Management Program Rules specifying the requirements for preparing and filing of an Integrated Resource Plan (IRP); and

WHEREAS, the municipal utility staff has prepared an IRP Summary Report describing the IRP process used and the information and assumptions used to develop the IRP; and

WHEREAS, our customers were informed of our IRP and resulting Action Plans through various means including a public meeting where public questions and comments were encouraged; and

WHEREAS, any public comments received have been addresses in order to strengthen the city's Integrated Resource Plan; and

WHEREAS, the IRP Summary Report included 5-year and 2-year action plans outlining actions to be taken by the Municipal utility during the next several years

NOW THEREFORE BE IT RESOLVED BY the City of Beresford City Council as follows:

That the "Integrated Resource Plan Summary Report for the City of Beresford dated September 1, 2014 shall be approved for filing with Western under the Energy Planning and Management Program."

Passed and approved this 4th day of August, 2014.

(SEAL)

K. James Feddeŕson, Mayor

ATTEST:

Kathy Moller, Finance Officer