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February 1, 2021

VIA E-FILING
Will Seuffert
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

Re: In the Matter of an Investigation into Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities
Docket No. E999/CI-19-704
COMPLIANCE REPORT

Dear Mr. Seuffert:

Minnesota Power respectfully submits its Compliance filing in response to the Order issued on January 11, 2021 (January Order), by the Minnesota Public Utilities Commission, in the above referenced Docket.

On January 15, 2021, the Commission issued a Notice approving Minnesota Power's partial extension request.

Included in this compliance filing is Minnesota Power's complete report covering July 2018 through December 2019 which also includes the barriers, limitations and transition plans with regards to economic dispatch strategy for Boswell Energy Center Units 3 and 4. The January through December 2020 analysis will be included as part of the Company's annual March 1, 2021 Compliance Filing.

Please contact me at (218) 355-3455 or hcreurer@allete.com if you have any questions regarding this filing.

Yours truly,

Hillary A. Creurer
Regulatory Compliance Administrator

HAC:
Attach.

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STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

In the Matter of an Investigation into Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities	Docket No. E999/CI-19-704 **MINNESOTA POWER'S COMPLIANCE REPORT**

I. INTRODUCTION

On February 7, 2019, the Minnesota Public Utilities Commission ("Commission") issued an Order in the Annual Automatic Adjustment ("AAA") docket[1] requiring Minnesota Power, Otter Tail Power, and Xcel Energy to provide a complete analysis and discussion of the consequences of self-commitment and self-scheduling of their generators in future AAA reports. In the 2017-2018 AAA[2] ("FYE 18 AAA") Order the Commission opened a separate docket[3] for the Self-Commitment and Self-Scheduling investigation to provide a more focused forum for these issues and provided more clarity in the information to include in the analysis. Minnesota Power (or the "Company") provides this compliance filing in response to the Commission Order dated November 13, 2019 ("November 2019 Order").

On January 11, 2021, the Commission issued an Order ("January 2021 Order"), in the above referenced docket.

II. REQUEST FOR EXTENSION

On January 13, 2021, Minnesota Power requested an extension on a portion of Order Point 3 of the January 2021 Order. Per the Order, Minnesota Power is required to include a complete report covering the period July 2018 through December 2020; however, the January through December 2020 analysis will not be completed prior to the February 1, 2021, required filing date. Therefore, Minnesota Power requested an extension until March 1, 2021 to provide the January through December 2020 analysis.

[1] Docket No. E999/AA-17-492, Order dated February 7, 2019
[2] Docket No. E999/AA-18-373, Order dated November13, 2019
[3] Docket No. E999/CI-19-704

On January 15, 2021, the Commission issued a Notice approving the partial extension request.

Included in this compliance filing is Minnesota Power's complete report covering July 2018 through December 2019 which also includes the barriers, limitations and transition plans with regards to the economic dispatch strategy for Boswell Energy Center ("Boswell") Units 3 and 4 as required by Order Point 8 and found in section V below. The January through December 2020 analysis will be included as part of the Company's annual March 1, 2021 Compliance Filing.

III. INFORMATION REQUESTED FROM THE UTILITIES

On November 13, 2019, the Commission issued an Order Accepting the FYE 18 AAA and Setting Additional Requirements. The following FYE 18 AAA Order Points detail out the requirements for the annual self-commitment and self-scheduling analysis:

Order Point 8 states:

> *"Minnesota Power, Otter Tail, and Xcel shall submit an annual compliance filing analyzing the potential options for seasonal dispatch generally, and potential options and strategies for utilizing "economic" commitments for specific coal-fired generating plants. The utilities shall include a specific explanation of barriers or limitations to each of these potential options, including but not limited to technical limits of the units and contract requirements (shared ownership, steam offtake contracts, minimum fuel supply requirements, etc.) as relevant, on March 1, 2020, and each year thereafter."*

Order Point 9 states:

> *"The Commission will open an investigation in a separate docket and require Minnesota Power, Otter Tail, and Xcel to report their future self-commitment and self-scheduling analyses using a consistent methodology by including fuel cost and variable O&M costs, matching the offer curve submitted to MISO energy markets."*

Order Point 10 states:

> *"In the investigation docket, Minnesota Power, Otter Tail, and Xcel shall provide stakeholders with the underlying data (work papers) used to complete their analyses, in a live Excel spread sheet, including, at minimum, the data points listed below for each generating unit, with the understanding that this may include protected data.*
>
> *Hourly data for all units:*
>
> *a. Date and hour*
> *b. Commit status (Null / Economic / Emergency / Must Run / Outage / Not Participating)*
> *c. Dispatch Status for Energy (Null / Economic / Self Schedule)*
> *d. Cleared MW*
> *e. Day ahead locational marginal price at unit node*
> *f. Real time MW adjustment*
> *g. Real time locational marginal price at unit node*
> *h. Day ahead dispatch minimum*
> *i. Real time dispatch minimum*
> *j. Fuel cost ($/MWh)*
> *k. Variable operations and maintenance costs ($/MWh)*
> *l. Day ahead locational marginal price representative of utility load zone*
> *m. Real time locational marginal price representative of utility load zone*
> *n. Whether Day Ahead Cleared = Day Ahead Dispatch Minimum (0 or 1)*
> *o. Actual production in MWh (for all 8,760 hours of the year)*
> *p. Day ahead MISO payment*
> *q. Real time MISO payment*
> *r. Net MISO energy payment*
> *s. Production costs ((J+K) * O)*
> *t. Net cost or benefit (R-S)*
>
> *Monthly or annual data for all units:*
>
> *u. Revenue from ancillary services (monthly)*
> *v. Fixed operations and maintenance costs (preferably monthly) or reasonable estimates in approximation thereof*
> *w. Capital revenue requirements (annual) or reasonable estimates in approximation thereof*
> *x. Average heat rate at economic minimum*
> *y. Average heat rate at economic maximum"*

IV. COMPANY ANALYSIS

Minnesota Power appreciates the Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities inquiry from the Commission to provide a better understanding of how the utilities operate their steam generation in the Midcontinent

Independent System Operator ("MISO") market and the corresponding benefits the customers receive.

Minnesota Power optimizes its resource portfolio within the MISO market structure to ensure efficient utilization of its generation portfolio. The Boswell Energy Center is an approximate 1,000 MW[4] baseload generation facility that provides reliable, efficient, low cost energy to customers. Minnesota Power utilizes the self-commitment[5] provisions in the MISO tariff to ensure this resource is utilized to serve customer energy needs reliably and cost effectively all hours of the year as part of its broader resource plan and based on its physical capabilities to produce energy.

The Company evaluates its energy market strategy and market performance for its generation portfolio on a regular basis to ensure the assets are providing value to customers within the MISO market construct. If the Company receives a signal that the current market strategy is no longer providing value to customers, then the strategy is reevaluated.

When a significant change occurs on the transmission system, such as a change in the operational characteristics of a transmission line, generator, or an extended outage of a facility, it is important that the Company and the regional reliability coordinator, MISO, coordinate to have a plan and procedures in place to address risks to operational reliability. The Company works closely with MISO staff to develop an understanding of what type of real-time operating procedures and criteria are currently in place and what would be needed to ensure both regional and local reliability are preserved to manage the changes in the system. As new operational alternatives are considered for Boswell, Minnesota Power will be consulting with MISO to support the consideration of these factors.

[4] The "approximately 1,000 MW" includes WPPI Energy's ("WPPI") 20 percent ownership of Boswell Unit 4.

[5] Minnesota Power defines Self-Commitment (also known as "Must Run") as a resource that has been committed in the market and available for dispatch by MISO. Self-Scheduling is defined as MW amount scheduled in the market.

As provided in the analysis and descriptions below, the Boswell facility provided $32.0 million in net energy benefit to customers for the period of July 1, 2018 through December 31, 2019. The analysis evaluated all the hours in each year where the unit was online producing energy and self-committed, and compares the fuel and variable Operations and Maintenance ("O&M") costs to operate versus the payments Minnesota Power received from the MISO market during these same periods. On an annual basis, the Boswell facility realized a net positive benefit for customers when operating in both the on-peak and off-peak hours. The customers benefited from the flexible operations at Boswell that includes backing down during lower market conditions, but being available to increase generation to avoid purchasing higher cost energy in the market. The analysis demonstrates Minnesota Power is utilizing the MISO tariff and the self-commitment provisions at the Boswell facility to serve its customers in an effective manner.

It is important to highlight Minnesota Power's wind generation, although not part of the analysis, experiences an immaterial level of curtailment, resulting in zero cost renewable energy available to serve customer load. Minnesota Power is committed to transforming its generating fleet and is currently providing 50 percent renewable energy to its customers.

A. MISO Energy Market Offer

Minnesota Power participates in the MISO Day-Ahead and Real-Time energy markets by offering its power supply for dispatch in the MISO energy market. The generation resources Minnesota Power offers into the Market include coal, biomass, wind, hydro, and natural gas. Each generating unit has different operating parameters, such as cost to produce energy, start up, ramp rate, minimum down time, minimum time online, and other parameters that are taken into consideration as part of the energy offer. To help ensure least cost supply for customers, Minnesota Power continuously evaluates its offer parameters to ensure the latest fuel cost is used, the appropriate MISO energy products are being utilized, and the operating parameters reflect current capability. By optimizing Minnesota Power's generation fleet in the MISO market, customers benefit by receiving the market benefits of the resources.

On a daily basis, Minnesota Power must also comply with MISO's Resource Adequacy requirements by offering its capacity resources that either clear the annual Planning Resource Auction or are used in the annual Company Fixed Resource Adequacy Plan. This offer ensures the energy needed each day to maintain reliability is available to MISO for dispatch. The Boswell units are used to meet Minnesota Power resource adequacy requirements and, therefore, are required to offer the available energy for dispatch each day.

The self-commitment status combined with allowing MISO to dispatch the Boswell facility economically between its minimum and maximum capability is currently the least cost strategy for Minnesota Power customers as demonstrated by the evaluation contained in this filing. The self-commitment designates the resource as committed to being online and producing energy for the region at its minimum levels. It also ensures the resource is online and available to increase dispatch to avoid purchasing higher cost energy for customers or to maintain reliability in the region.

B. Boswell Operating and System Considerations

Boswell Units 3 and 4 are the backbone of Minnesota Power's power supply that serves customers' energy needs and provide essential reliability services to the region when online and producing energy. The facility is the single largest generating source in the upper half of Minnesota, eastern North Dakota and Northern Wisconsin. The Boswell facility is also among the largest employers in Itasca County. The energy from Boswell Units 3 and 4 is an essential part of the power supply (providing over 30 percent of customer energy in 2019) that provides low cost, reliable energy for our high level of 7x24 customers. When evaluating moving Boswell Units 3 and 4 to economic dispatch or seasonal operations, there are several factors that need to be taken into consideration including replacement power supply, market risk, as well as local and regional reliability. Depending on the severity of these factors, there is a potential need for capital investment in the transmission system infrastructure or at the generation facilities as well as a need to develop new operating procedures to change operating modes at the Boswell facility.

Minnesota Power no longer has multiple baseload facilities to call upon if Boswell Units 3 and 4 are not producing energy. Currently, the majority of the resources in this region require several hours to start-up (such as Laskin and Hibbard) or are resources that rely on the intermittent availability of wind, solar, and hydro. To rely significantly on importing energy from the MISO market into the region at an unknown energy cost creates additional economic and reliability risk for customers as these smaller units take time to bring online if prices increase or are needed for reliability, nor could Laskin and Hibbard replace all of the combined energy from Boswell 3 and 4 if intermittent wind, solar, and hydro were unavailable.

Furthermore, in a situation where an event occurs on the system, such as one or more transmission lines are unexpectedly out of service, Boswell Units 3 and 4 would not be readily available to provide reliability benefits as it could take up to a day or two to bring generation back online and available for generation.[6]

V. PLAN FOR ECONOMIC DISPATCH

In the March 2, 2020 Compliance Filing Minnesota Power stated it was in the process of investigating the potential operating conditions that exist at each Boswell unit and to identify potential solutions that would facilitate economic dispatch instead of Minnesota Power committing the units in a Must Run dispatch. At that time, it was too early in the investigative phase to report on conditions and potential solutions with any certainty. However, Minnesota Power recognizes that market conditions are continually changing with increasing renewables and its strategy for the Boswell facility operations in the MISO market must continue to evolve as needed.

This submittal identifies Minnesota Power's plan to address economic dispatch operations at the Boswell facility. Minnesota Power has continued its evaluation on the impact of economic dispatch on facilities and customers and is targeting July 1, 2021, for Boswell Unit 3 to transition to economic dispatch. This timing will follow the Boswell Unit 4 major outage which is currently scheduled from **[TRADE SECRET DATA**

[6] Except in a situation where the unit is on outage.

BEGINS [redacted] **TRADE SECRET DATA ENDS]**. Minnesota Power also intends to invest approximately $3.0 million into Boswell Unit 3 to reduce the operational minimums of the unit from 175 MW to 75 MW creating significantly more flexibility for the unit in its daily dispatch. This project is planned to be implemented by January 2022. Minnesota Power plans to retire Boswell Unit 3 by 2030.[7]

Transitioning the last unit at the facility, Boswell Unit 4, to economic dispatch is more complex than Boswell Unit 3. However, Minnesota Power has identified the core milestones for Boswell Unit 4 that need to be addressed and is diligently working with its co-owner, WPPI, to address options for each as described below. Minnesota Power and WPPI will consider each of these items and will take into consideration the impact to their respective customers and the facility in order to identify a transition plan that is acceptable for each entity.

A. Market Readiness

The ability of MISO market tools to properly evaluate the need and duration of baseload generation facilities is a key component of being ready to transition the Boswell units to economic dispatch. Currently MISO's existing Day Ahead commitment process does not provide assurance that the units will be operated economically across multiple days. In particular, while the economics of a single day may not indicate economic dispatch for Boswell (which have relatively high start-up costs and relatively long lead time), the economics over two or more days are more likely to favor commitment of the Boswell units. This leaves the individual utilities in a position of having to actively manage and create additional internal procedures for operating the units in the MISO market environment when MISO is determining whether to commit the units. To gain additional understanding of this, Minnesota Power worked to refine the offer parameters for Boswell Unit 3 in order to perform a trial using the economic commitment status. Minnesota Power was able to perform the trial on Boswell Unit 3 in May 2020. The unit was committed and dispatched by the market one time during the trial period, which

[7] https://www.mnpower.com/CarbonFreeEnergyVision

provided minor insights into how the unit will operate and additional procedures that will be needed. As Boswell Unit 3 transitions to economic dispatch in July 2021, the Company will continue to refine its processes and procedures for working with the market. The Company will work closely with MISO to manage the economic dispatch on a daily basis and, based on daily operating and facility conditions, may need to move in and out of economic commitment status to manage all aspects of the plant, including its continued economic operation.

The transition of Boswell Unit 3 to economic dispatch will help the Company gain better insights on market operations for Boswell Unit 4 as well.

Currently MISO's existing Day Ahead dispatch process does not provide assurance that the units will be operated economically across multiple days. As a result, the Company has been offering the Boswell units with a Must Run commitment status. MISO has improved tools such as the Multi-Day Operating Margin (MOM) and Maintenance Margin reports which provide some insight into the balance of supply and demand in MISO that may help Market Participants forecast the market economics of their long-lead units across multiple days. The tools may assist Market Participants in determining whether to Must Run their units, making the units available for MISO dispatch across multiple days, but forecasts cannot provide assurance that the decision to Must Run or not will maximize units economics. Minnesota Power continues to advocate as a MISO stakeholder for operating alternatives within the current market construct such as a multi-day commitment mechanism that is financially binding for long lead time generators.

The Company will continue to use its current planning process to help predict and plan expected mid-term and longer-term energy production at the facility as the Company completes its transition plans into economic dispatch for Boswell Unit 3 and 4. These projections help inform the Company how these units are expected to operate for the upcoming year. They are also used to inform the fuel procurement strategy and procurement of materials, such as reagents for the environmental controls. Outputs from the evaluation are then used to track and forecast Boswell Units 3 and 4 generation production.

B. Joint Ownership

The Company is currently working with WPPI, co-owner of Boswell Unit 4, on an economic dispatch transition plan for Boswell Unit 4. One of the main areas the Company and WPPI are trying to understand is market coordination and customer impact for a jointly owned unit.

In the MISO Market jointly owned units are viewed as individual, distinct generators and each ownership share has its own generator node. Under a Must Run dispatch Minnesota Power coordinates with WPPI on the energy market parameters to ensure a consistent dispatch of Boswell Unit 4 that optimizes the unit's economics. Under economic dispatch there is a potential for only one generator node (either Minnesota Power or WPPI) to be dispatched. To the extent Minnesota Power and WPPI come to have different views on which commitment status (Economic or Must Run) best optimizes Boswell Unit 4 economics, there will be many issues to address, including MISO market participation and settlement as well as fuel and materials procurement.

C. Transmission Reliability

Currently Boswell provides essential reliability services that give the operational flexibility needed to ensure continuous reliable operations of the power system and energy supply to a unique geographic area. The energy and reliability needs of this area include both energy intensive large industrial loads and sprawling rural community areas. These two very different customers must be served while also balancing bulk regional power transfer impacts, particularly as regional renewable energy production varies on a minute-by-minute basis and the transmission grid operates with lines coming in and out of service due to maintenance, storms and unexpected events.

Minnesota Power, in coordination with MISO, has operated and maintained the Northern Minnesota transmission system for several decades relying on the around-the-clock Must Run baseload operations and dispatchability of the Boswell units. In order to monitor reliability concerns for a vast Northern Minnesota region under a possible future with nearly no local generation operating and energy requirements and instead reliability services being provided from remote resources, Minnesota Power has been working with MISO to develop new operational tools and system criteria to ensure that reliability

would be maintained. MISO is aware of the potential issues and committed to working with Minnesota Power to find the appropriate solutions. Minnesota Power expects processes and procedures will be in place by late spring 2021 to accommodate the transition of Boswell Unit 3 to economic dispatch, which will ensure reliability of the system is preserved. Minnesota Power and MISO will work together to ensure the transition occurs only after the necessary processes and procedures are in place to effectively manage the reliability of the grid and electric service.

D. Environmental Emission Compliance

Boswell deploys advanced air quality control technology equipment on both Boswell Units 3 and 4 which is designed to significantly reduce pollutant emissions to ultra-low levels of nitrogen oxides, carbon monoxide, sulfur dioxide, particulate matter, and mercury. To meet the required permit limits under economic dispatch operations, emission controls need to normalize over an operating period, as start-up and shut down cycling can lead to higher emission rates than baseload operation and ultimately impact the capability to operate within allowed permit limits.

In order to operate within permit levels Boswell Units 3 and 4 may periodically need to be offered using the Must Run dispatch status for approximately three to five days to ensure that proper margin to emission limits can be maintained for the next shut down/start-up cycle. Shorter runs could be accommodated; however, every third to fifth start-up may require a longer run time to maintain margin to comply with the 30-day rolling average permit requirement. Additional use of reagents could help with emission limit margin; however, they would have a cost impact. Long-term predictability of emission rates is unknown, but as Boswell Unit 3 transitions to economic dispatch, the Company will continue to gain better insights and will operate to stay within its allowed permit limits.

E. Generating Facility Impacts

Auxiliary Heat

During winter operations, Boswell Unit 3 and/or Unit 4 provide heating steam and process steam (e.g. air preheating steam) to the entire Boswell facility. In order to ensure the Boswell facility maintains a protected temperature, currently, at least one of

the Boswell units needs to be operating during the cold winter months. The heating season in Northern Minnesota runs from September through May with the critical heating months being December through February. Loss of heating steam for any reason in the December through February range needs to be corrected within 72 hours to prevent the plant from freezing.

Current options the Company has to address the plant heating are 1) continue to seasonally Must Run one of the Boswell units during cold weather months or 2) invest in a backup heat source.

A backup heat source at Boswell, consisting of two natural gas fired heating boilers and balance of plant systems and structures, costs **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** and requires a three-year schedule for permitting, design, procurement, and construction. The Company is further investigating this option to develop a backup heat source.

Operating a backup heat source in the form of natural gas heating boilers will also change the Company's fuel procurement strategy and commitment for natural gas firm capacity. As Boswell Units 3 and 4 move to economic dispatch there would be an incremental cost to purchase firm natural gas transportation capacity. This would apply to both fuel for the heating boilers as well as fuel for startup of the power boilers on a more frequent basis.

Boiler Chemistry

Boiler cycle water chemistry programs are designed to protect the boilers and turbines from deposits due to impurities in the feedwater and steam systems. By moving to economic dispatch, it is very likely that each of the Boswell units may experience more frequent starts, resulting in the inability to stabilize boiler chemistry before the unit is shut down. This could increase the level of deposits and shorten the interval between required boiler cleanings. The estimated cost of boiler cleaning including disposal is $1.5 million per boiler. Potential solutions include evaluating preventative chemical treatment to address the issue.

Cycle chemistry holds may be a barrier to quickly and reliably return a unit to service. The more impurities that are present in the feedwater and steam systems, the longer the water lab holds take, and the longer it takes to get the unit to a dispatchable load range during a start-up. A potential solution is to evaluate re-piping Unit 3 to the Unit 4 polisher, which would likely be in the range of $1 million.

A sustainable water program is necessary so the units are flexible to meet the changing market demand and protect the asset from physical degradation and loss of reliability that would jeopardize their ability to come on-line for either a hot or cold start.

Auxiliary Equipment

Auxiliary equipment such as large electric motors, coal pulverizers, large fans, boiler feed pumps and boiler circulating water pumps were designed to be operated in a baseload manner. During economic dispatch the equipment will very likely experience more frequent starts and stops. The Company will train operators for the frequent starts and stops and adjust Preventative Maintenance and Predictive Maintenance programs accordingly.

Published data from plants that have moved from baseload operation to economic commitment on a seasonal or annual basis have experienced widely variable effects to their operations. The variability is related to frequency and number of starts, operating time while running, size and operating temperature/pressure. The Company is unable to know definitively what the effect of economic dispatch will have on operating costs.

To maintain reliable operations, the Company will re-evaluate capital and O&M expenses based on experience with a new operating profile.

F. Fuel Procurement and Fuel Operations

The Company's fuel procurement process consists of three components: coal procurement, rail transportation, and inventory management. Current coal procurement practices are a key attribute to ensuring low cost energy for Minnesota Power customers. The following outlines the considerations and consequences, regarding coal procurement practices, under a significant change in Boswell Energy Center operations.

Coal Commodity Impact

Minnesota Power has coal commitments under contract until **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** as part of layered purchase strategy designed to secure competitive pricing as well as guarantee a portion of forecasted need per year in supply availability as shown below.

Table 1: Contracted Coal

Contract Year	Coal Contract Tonnage	Approximate MWh's Associated with Coal Contract Tonnage Commitment
[TRADE SECRET DATA BEGINS		
[redacted]	[redacted]	[redacted]
		TRADE SECRET DATA ENDS]

2021 coal contracts were entered into in the fall of 2019 or earlier as submitted in the Fuel Adjustment Clause ("FAC") forecast filing May 1, 2020 with actual coal commitments being **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** of planned need, leaving a **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** open position. Minnesota Power has not secured additional tonnages since well before the beginning of COVID-19 given uncertainty of customer load and energy pricing to protect customers from potential liquidated damages or increased inventory costs. With pandemic impacts to energy markets, Minnesota Power now has enough current inventory and coal committed in **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** to meet the forward-looking FAC forecasted burn levels. Deviation from the MPUC approved FAC forecast in **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** could either limit economic dispatch ability, incur liquidated damages or increase inventory.

Even with a reasonable preparation period, procuring competitively priced coal becomes challenging under conditions of economic/seasonal operations. Volume requirement uncertainty requires a conservative procurement approach in an effort to avoid potential liquidated damages due to over-commitment. Competitive commodity pricing is often directly proportional to higher volume commitments so, in turn, a conservative volume approach would likely cause pricing to be in line with higher market

pricing versus a volume incentivized price point. There is also risk that coal mines will already be fully committed and no longer have immediately available supply by the time Minnesota Power is ready to enter into additional contracts leaving the options of no supply, alternate mines with lower quality, and/or higher pricing, particularly if additional tonnages are needed within a current calendar year.

Rail Transportation Impact

Minnesota Power is a captive shipper on the BNSF railroad, which means that no other rail transportation provider has the ability to deliver coal to the Boswell. Minnesota Power's rail transportation binding tonnage nomination is due several months prior to the effective contract year. Transportation needs cannot be accurately determined with unknown generation demand during economic/seasonal operations which would result in significant liquidated damages due to over-commitment. Conversely, under-commitment would result in low inventory levels requiring potential unit idling during strong economic periods and ultimately purchasing energy at a higher cost within the energy market. Reducing transportation tonnage commitments in preparation for economic/seasonal dispatch would also negatively impact transportation contract price negotiation as economies of scale will be lost.

Tariff rail transportation rates are an alternative to binding contract tonnages but, with respect to customers, is not a financially responsible option as tariff rates are **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** than negotiated contracted rates and also does not provide delivery performance certainty from the railroad. As a captive shipper, there is no substitute transportation supplier available to mitigate current rail transportation disruption risk.

Inventory and Fuel Operation Impacts

The rail transportation contract has an obligation of ratable deliveries throughout the year. Economic/seasonal operations will lead to wide physical inventory fluctuations by accepting deliveries when the units are at a low/no generation level and failing to deliver enough coal to keep inventory levels constant during high generation demand. Physical inventory levels would likely need to be maintained at a higher volume than

current to handle generation volatility which equates to higher carrying costs and expense that is not aligned with the Company's financial guidance.

Inconsistent inventory levels translates to higher O&M costs for Fuel Operations by having to either push coal to or from the stockpile versus maintaining a consistent inventory level. Inventory management practices will need to be revised to ensure proper staffing and dozer capabilities to effectively mitigate increased operational costs of controlling wide inventory fluctuations.

Balancing coal commodity, rail transportation, coal inventory and operational risks are all challenges Minnesota Power will have to navigate in a more conservative procurement strategy with Boswell Unit 3 on economic dispatch and coal burn levels unknown.

VI. COST ANALYSIS

A. Average Heat Rate

Per the requested data in order point 10, Table 2 shows the average heat rate at economic minimum and average heat rate at economic maximum for Boswell Units 3 and 4.

Table 2: Average Heat Rates

	Average Heat Rate at Economic Minimum (Btu/kWh)	Average Heat Rate at Economic Maximum (Btu/kWh)
	[TRADE SECRET DATA BEGINS	
Boswell Unit 3		
Boswell Unit 4		
		TRADE SECRET DATA ENDS]

B. Fixed Operation and Maintenance Costs

Fixed O&M costs are defined as direct O&M expenses not related to fuel, reagents, fuel handling equipment incremental wear-and-tear, and ash handling costs. Table 3 below shows the fixed O&M costs for July 2018 through December 2019 attributed to Boswell Units 3 and 4.

Table 3: Fixed O&M

	Boswell Unit 3	Boswell Unit 4
	[TRADE SECRET DATA BEGINS	
July-18	[redacted]	
August-18		
September-18		
October-18		
November-18		
December-18		
2018 Fixed O&M Cost		
January-19		
February-19		
March-19		
April-19		
May-19		
June-19		
July-19		
August-19		
September-19		
October-19		
November-19		
December-19		
2019 Fixed O&M Cost		
	TRADE SECRET DATA ENDS]	

C. Capital Revenue Requirements

Capital Revenue Requirements are a financial estimate of the total amount of money Minnesota Power must collect from customers to pay all costs including a reasonable return on investment in the assets. The revenue requirement for Boswell Units 3 and 4 is based on the capital investment in the facility and the financial metrics of the Company such as debt rate, return on equity, taxes, and depreciation. The estimated Capital Revenue Requirements for Boswell Units 3 and 4 as of December 31, 2019 were **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** respectively.

D. Ancillary Services

Eligible generation has the opportunity to make ancillary services available to the MISO market and receive payment for these services. These ancillary service products are required to ensure energy is compensated financially for being able to respond to

imbalances between generation and load. The Boswell facility received $1.0 million in revenue for providing several ancillary service products for the period of July 1, 2018 through December 31, 2019, as shown in Table 4 below. The majority of the ancillary service revenue came from providing Regulation, which requires these units to increase or decrease generation within seconds to respond to small imbalances due to generation and load variation. This is a critical reliability service provided by these units. It is important to note that Boswell can only provide these ancillary services if the units are online and generating at minimum levels.

Table 4: Monthly Revenue from Ancillary Services

	Boswell Unit 3			Boswell Unit 4		
	Regulation	**Spinning Reserve**	**Supplemental Reserve**	**Regulation**	**Spinning Reserve**	**Supplemental Reserve**
	[TRADE SECRET DATA BEGINS					
Jul-18						
Aug-18						
Sep-18						
Oct-18						
Nov-18						
Dec-18						
2018 Total						
Jan-19						
Feb-19						
Mar-19						
Apr-19						
May-19						
Jun-19						
Jul-19						
Aug-19						
Sep-19						
Oct-19						
Nov-19						
Dec-19						
2019 Total						
Total Jul-18 to Dec-19						
						TRADE SECRET DATA ENDS]
					Total Ancillary Service Revenue (July 1, 2018 – December 31, 2019)	**$ 1,014,389**

E. Self-Commitment and Self-Scheduling Analysis

Minnesota Power evaluated the financial impact of self-commitment and self-scheduling for Boswell Units 3 and 4 for the requested time period. Since Boswell Units 1 and 2 were retired as of December 31, 2018, those units were excluded from the analysis. As shown in Table 5 below, Minnesota Power's self-commitment of the units resulted in a $32.0 million net energy benefit for customers for the time period of July 1, 2018 through December 31, 2019. There was a net benefit during both on-peak and off-peak hours, with the greatest net energy benefit occurring in the on-peak hours.

The analysis evaluated all the hours in each year where the unit was online producing energy and self-committed, and compares the fuel and variable O&M cost to operate versus the payments Minnesota Power received from the MISO market during these same periods. The net cost/(benefit) was calculated in accordance with Order Point 8. If the culmination of the times the Boswell Units were self-committed created value for the customer, then the self-commit strategy is beneficial for the customer (shown as a negative value in Table 5).

Table 5: Customer Net Cost / (Benefit) When Boswell Units are Self-Scheduled*

			NET Customer Cost/(Benefit)		
		Time Period	**All Hours**	**On-Peak /1**	**Off-Peak /2**
(A)	BEC 3 Hours	7/1/18 - 12/31/18	$ 758,446	$ 136,300	$ 622,147
(B)	with Cost	1/1/19 -12/31/19	$ 1,983,293	$ 612,622	$ 1,370,670
(C)	BEC 3 Hours	7/1/18 - 12/31/18	$ (7,893,950)	$ (5,876,858)	$ (2,017,092)
(D)	with Benefit	1/1/19 -12/31/19	$ (8,496,321)	$ (6,259,495)	$ (2,236,826)
(E)	**BEC 3 Net Cost / (Benefit) (A+B+C+D)**		**$ (13,648,532)**	**$ (11,387,431)**	**$ (2,261,101)**
(F)	BEC 4 Hours	7/1/18 - 12/31/18	$ 1,216,209	$ 191,378	$ 1,024,831
(G)	with Cost	1/1/19 -12/31/19	$ 4,246,213	$ 1,041,917	$ 3,204,296
(H)	BEC 4 Hours	7/1/18 - 12/31/18	$ (11,108,485)	$ (8,324,359)	$ (2,784,125)
(I)	with Benefit	1/1/19 -12/31/19	$ (12,771,945)	$ (9,734,865)	$ (3,037,079)
(J)	**BEC 4 Net Cost / (Benefit) (F+G+H+I)**		**$ (18,418,007)**	**$ (16,825,930)**	**$ (1,592,077)**
	BEC 3 and 4 Net Impact (E+J)		**$ (32,066,539)**	**$ (28,213,361)**	**$ (3,853,178)**

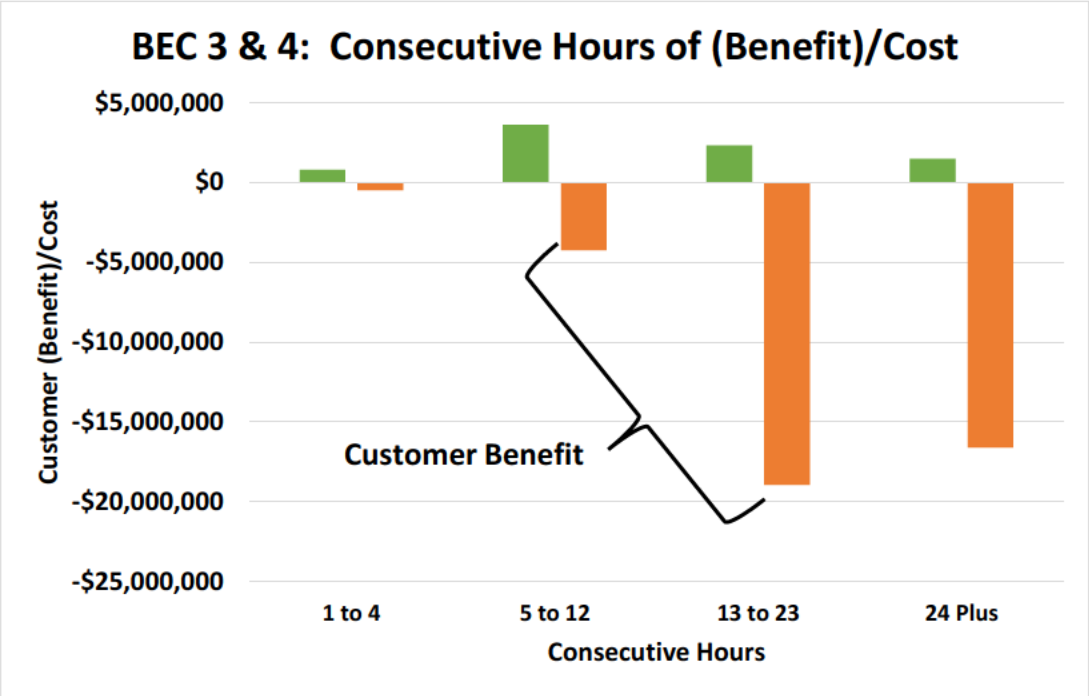
*Note: a positive value indicates there was a customer cost for the time period; a negative value indicates a benefit for customers over the time period.

/1 On-Peak: HE 7-22 Monday-Friday
/2 Off-Peak: HE 23-24, 1-6 Monday-Friday and HE 1-24 Saturday-Sunday

As shown in Table 5 above, there are periods where the analysis showed a cost to customers due to the self-commitment process. However, it is important to also consider the profile of these time periods to determine the operational impact. The Company evaluated the data set accompanying this compliance filing to see which consecutive hour segments the costs are occurring. The results of the analysis show that most of the cost incurred were during periods of less than 12 consecutive hours, as seen in Figure 1 below.

With the cost occurring in short blocks of time, it would be operationally difficult and not cost effective for the coal units to try to capture these savings by starting-up and shutting down multiple times in a week to try to capture these short time periods. In contrast, the savings customers receive with the units self-committed is greater than the cost incurred during those short periods of time (as shown in Figure 1 below). This demonstrates that given current market conditions, it is more cost effective for customers to back down Boswell units to their minimums than to shut down over these short periods.

Figure 1: Comparison of Boswell Energy Market Costs and Benefits for Continuous Periods



Furthermore, if the units operations were changed to shut down more frequently to try to capture these particular time periods, the additional start-up costs (i.e. fuel cost and wear and tear) and operational limitations would need to be considered and the value identified would decrease. The analysis for this time period continues to identify that the units are beneficial to be on-line and connected to the grid through the self-commitment process as allowed through the MISO tariff. Minnesota Power will continue to monitor its MISO operational strategies to determine if changes are needed as the system and market continues to evolve. The overall impact to customer will be paramount as we evaluate future time periods and transition our operations further.

Hourly Data, including the calculations noted above, are included in Attachment 1. Due to the information contained in Attachment 1 it has been Trade Secreted in its entirety.

VII. CONCLUSION

Minnesota Power recognizes that market conditions are changing and has demonstrated its commitment and leadership to transforming its coal generating fleet by being the first Minnesota utility to provide 50 percent renewable energy to its customers and more recently a commitment to be carbon free by 2035. The transformation at Boswell will continue as the Company will transition Boswell Unit 3 to economic dispatch by July 1, 2021 and will continue to coordinate with WPPI on solutions and milestones for Boswell Unit 4. The Company will continue to provide updates, as available, on the remaining barriers in the annual self-commitment and self-scheduling compliance filing.

Dated: February 1, 2021

Respectfully Submitted,

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STATE OF MINNESOTA	)	AFFIDAVIT OF SERVICE VIA
	) ss	ELECTRONIC FILING
COUNTY OF ST. LOUIS	)	

Susan Romans of the City of Duluth, County of St. Louis, State of Minnesota, says that on the **1st** day of **February, 2021**, she served Minnesota Power's Compliance Filing in **Docket No. E999/CI-19-704** on the Minnesota Public Utilities Commission and the Energy Resources Division of the Minnesota Department of Commerce via electronic filing. The persons on E-Docket's Official Service List for this Docket were served as requested.

Susan Romans

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Alison C	Archer	aarcher@misoenergy.org	MISO	2985 Ames Crossing Rd Eagan, MN 55121	Electronic Service	No	OFF_SL_19-704_Official
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1400 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_19-704_Official
Brooke	Cooper	bcooper@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022191	Electronic Service	No	OFF_SL_19-704_Official
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 280 Saint Paul, MN 551012198	Electronic Service	No	OFF_SL_19-704_Official
Bruce	Gerhardson	bgerhardson@otpco.com	Otter Tail Power Company	PO Box 496 215 S Cascade St Fergus Falls, MN 565380496	Electronic Service	No	OFF_SL_19-704_Official
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Kim	Havey	kim.havey@minneapolismn.gov	City of Minneapolis	350 South 5th Street, Suite 315M Minneapolis, MN 55415	Electronic Service	No	OFF_SL_19-704_Official
Holly	Lahd	holly.lahd@target.com	Target Corporation	33 South 6th St CC-28662 Minneapolis, MN 55402	Electronic Service	No	OFF_SL_19-704_Official
Douglas	Larson	dlarson@dakotaelectric.com	Dakota Electric Association	4300 220th St W Farmington, MN 55024	Electronic Service	No	OFF_SL_19-704_Official
Leann	Oehlerking Boes	lboes@mnpower.com	Minnesota Power	30 W Superior St Duluth, MN 55802	Electronic Service	No	OFF_SL_19-704_Official

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Generic Notice	Residential Utilities Division	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012131	Electronic Service	Yes	OFF_SL_19-704_Official
Isabel	Ricker	ricker@fresh-energy.org	Fresh Energy	408 Saint Peter Street Suite 220 Saint Paul, MN 55102	Electronic Service	Yes	OFF_SL_19-704_Official
Will	Seuffert	Will.Seuffert@state.mn.us	Public Utilities Commission	121 7th Pl E Ste 350 Saint Paul, MN 55101	Electronic Service	Yes	OFF_SL_19-704_Official
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Laurie	Williams	laurie.williams@sierraclub.org	Sierra Club	Environmental Law Program 1536 Wynkoop St Ste 200 Denver, CO 80202	Electronic Service	No	OFF_SL_19-704_Official