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March 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
2020 Annual Compliance Filing

Dear Mr. Seuffert:

Minnesota Power respectfully submits its annual compliance filing in pursuant to the Minnesota Public Utilities Commission Order dated November 13, 2019, in Docket No. E999/AA-18-373 and January 11, 2021 in Docket No. E999/CI-19-704.

Attachment 1 to this filing contain information Minnesota Power considers Trade Secret. The Company believes this filing comports with the Minnesota Public Utilities Commission's Notice relating to Revised Procedures for handling Trade Secret and Privileged Data, pursuant to Minn. Rule 7829.0500. As required by the revised procedures, a statement providing the justification for excising the trade secret data is attached to this letter.

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

Yours truly,

Hillary A. Creurer
Regulatory Compliance Administrator

HAC:th
Attach.

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 2020 COMPLIANCE FILING**

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.

The following Order Points detail out the requirements for the annual self-commitment and self-scheduling analysis:

Order Points from the November 13, 2019 Order in Docket E999/AA-18-373:
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."*

[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

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.*

<u>Hourly data for all units:</u>

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)*

<u>Monthly or annual data for all units:</u>

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"*

Order Points from the January 11, 2021 Order ("January Order") in Docket E999/CI-19-704:

Order Point 4 states:

> *"Minnesota Power, Otter Tail, and Xcel Energy shall file in their March 1, 2021 filing a complete analysis of the costs and benefits of economic or seasonal dispatch relative to self-scheduling at the following facilities:*
>
> a. *Boswell 3 and Boswell 4 – Minnesota Power*
> b. *Coyote Station – Otter Tail*
> c. *Sherco 1 and Sherco 3 – Xcel Energy*
> d. *Big Stone – Otter Tail"*

Order Point 5 states:

> *"The Commission carries forward all requirements from prior orders in Docket No. E999/AA-18-373 and E999/CI-19-704, and includes the following changes and additions:*
>
> a. *Include ancillary services revenues and any other make-whole payments as a separate column in all reporting on revenue from generation.*
> b. *Utilities should provide Unit Fuel Costs and Unit Variable Cost as separate line items.*
> c. *If a utility excludes any fuel costs from its MISO offer curves, the utility should also provide an analysis that includes all fuel costs, including those currently treated as fixed costs due to contractual terms.*
> d. *Utilities should include all preventative maintenance in O&M costs for reporting purposes.*
> e. *Any hours with unavoidable self-commitment should be labeled as such, with a cause listed for the self-commitment in that hour. (Testing, contract, dispatch of co-owned generation, etc.)*
> f. *Future analyses of self-commitment and self-scheduling should include all production costs including fuel, variable O&M, and other variable costs associated with the plant.*
> g. *To the extent not already provided, utilities should provide the following:*
> i. *Length of minimum decommit time for each unit;*
> ii. *Number of times in the analysis period that each unit incurred losses over a duration greater than or equal to its minimum decommit time;*

iii. Of the periods identified in (ii), the number of period when losses were greater than the relevant startup cost (warm or cold startup costs, depending on the length of the period); and

iv. Sum of losses in excess of startup costs that were incurred during period identified in (iii).”

Order Point 7 states:

“Utilities with co-ownership of baseload generating units shall discuss options of economically committing those units within the terms of their partnership in the March 1, 2021 compliance report.”

Order Point 8 states:

“Minnesota Power, Otter Tail and Xcel Energy shall evaluate whether reducing minimum operating levels would benefit customers and include that evaluation and discussion in the March 1, 2021 compliance report.”

II. 2020 SELF-COMMITMENT ANALYSIS

2020 was an unprecedented year as the global COVID-19 pandemic brought loss of customer load due to the closure or temporary idling of many businesses. Minnesota Power experienced a customer load loss of about 13 percent, roughly equivalent to its entire residential customer class, while MISO’s load loss was closer to 5 percent.

As the pandemic evolved Minnesota Power evaluated coal commitments and tried to understand what the potential cost would be if liquidated damages were incurred due to a change in operations. It is important to note that coal commitments for 2020 were entered into in the fall of 2019 or earlier and Minnesota Power has not secured additional tonnages since the fall of 2019 to protect customers given the uncertainty of customer load and energy market pricing. In order to manage to the least cost impact for customers Minnesota Power started to work with its coal and rail providers to adjust expectations for the year and to re-negotiate contracts as the impacts of the COVID-19 pandemic recession became more known. Although generation levels at Boswell Units 3 and 4 were lower than planned, the Company successfully avoided incurring any liquidated damages. The Company expected to receive additional liquidated damage costs if further reduction in generation occurred.

Boswell Unit 4 is a co-owned unit with WPPI Energy ("WPPI") and currently the operating agreement does not allow for a change in how the unit is operated without prior approval. However, as discussed below in the Economic Dispatch section, the Company is currently in discussion with WPPI on an economic dispatch transition and with MISO on transmission reliability concerns.

As directed by the Commission, Minnesota Power evaluated the financial impact of self-commitment for Boswell Units 3 and 4 for the period of January 1, 2020 through December 31, 2020. As shown in Table 1 below, Minnesota Power's self-commitment of the units resulted in a net cost of **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]**. This number does not include reliability and other customer benefits from self-commitment. The analysis evaluated all the hours during the year where the unit had a commitment status of must run and compared the fuel and variable O&M cost to operate versus the net energy payments Minnesota Power received from the MISO market during these same periods. The net (cost)/benefit was calculated in accordance with Order Point 9 of the November Order.

Table 1: (Cost) / Benefit When Boswell Units are Self-Committed

	Cost/(Benefit)		
	All Hours	**On-Peak /1**	**Off-Peak /2**
	[TRADE SECRET DATA BEGINS		
Boswell Unit 3 Hours with Cost	[redacted]	[redacted]	[redacted]
Boswell Unit 3 Hours with Benefit	[redacted]	[redacted]	[redacted]
Boswell Unit 3 (Cost) / Benefit	[redacted]	[redacted]	[redacted]
Boswell Unit 4 Hours with Cost	[redacted]	[redacted]	[redacted]
Boswell Unit 4 Hours with Benefit	[redacted]	[redacted]	[redacted]
Boswell Unit 4 (Cost) / Benefit	[redacted]	[redacted]	[redacted]
Combined Boswell Units 3 and 4	[redacted]	[redacted]	[redacted]
	TRADE SECRET DATA ENDS]		

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

Hourly data required from Order Point 10 of the November Order as well as Order Point 5 from the January Order are included in Attachment 1 for Boswell Units 3 and 4 for the period of January 1, 2020 through December 31, 2020. Due to the information contained in Attachment 1, it has been Trade Secreted in its entirety.

In accordance with Order Point 5.f, Table 2 below includes an analysis of all hours during the year where the unit had a commitment status of must run and compared the total production costs to the net payments Minnesota Power received from MISO. Total production costs as defined in the January Order includes unit fuel, variable O&M, and preventative maintenance. The net MISO payment includes the energy payment plus ancillary service and make-whole payments.

It is important to note the preventative maintenance data included in Attachment 1 is the best information the Company was able to obtain utilizing its accounting and budget system. However, it is not inclusive of all preventative maintenance and could include predictive maintenance costs as well. Minnesota Power does not track generation maintenance costs by predictive, preventative, or corrective maintenance. Instead the accounting for generation maintenance costs is tracked consistent with FERC requirements. It is also important to note that preventative maintenance is not utilized in the MISO offer curve.

Table 2: Net (Cost) / Benefit including Preventative, Ancillary Services and Make-Whole Payments

	(Cost) / Benefit
	[TRADE SECRET DATA BEGINS
Boswell Unit 3 Net MISO Payment	[redacted]
Boswell Unit 3 Production Costs	[redacted]
Boswell Unit 3 (Cost) / Benefit	[redacted]
Boswell Unit 4 Net MISO Payment	[redacted]
Boswell Unit 4 Production Costs	[redacted]
Boswell Unit 4 (Cost) / Benefit	[redacted]
Boswell Unit 3 and 4 Impact	[redacted]
	TRADE SECRET DATA ENDS]

Net (Cost)/Benefit Analysis with Operational Dynamics Included

Minnesota Power thought it would be informative for the Commission and stakeholders to augment the net (cost)/benefit analysis shown in Table 1 above by incorporating the Boswell Units 3 and 4 operational dynamics into the analysis. The intent of the exercise is to improve the net (cost)/benefit calculation by continuing to include cost that "hypothetically" could have been avoided if Boswell Units 3 and 4 were economically dispatched in 2020, when the enhancement is excluding costs that could not have been

avoided because of operating dynamics. For example, a coal unit could be economically dispatch by MISO on a Monday, but be required to operate on Tuesday and Wednesday to meet emission targets regardless of economics – this analysis takes this operational dynamic into consideration. Minnesota Power intentionally used the word "hypothetically" above, because several of the milestones discussed later that need to be met prior to moving to economic dispatch are still in progress – avoiding these cost was not achievable in 2020. Furthermore, this analysis did not capture changes in ancillary service revenue, changes to market prices if these units were offline for economics, or situations where the units were needed for reliability or for supplemental heat to prevent the power plant from freezing up. The analysis started with the workbook used in the net (cost)/benefit analysis shown in Table 1 and layered on when Boswell Units 3 and 4 would have hypothetically been dispatched by MISO economically based on actual data such as hourly Locational Marginal Prices ("LMPs"), fuel costs, planned/forced/economic outages, as well as reagent and wear and tear adders, along with factoring in minimum run times and minimum times offline.[4] The result is a more realistic representation of the costs/benefits calculation.

As shown in Table 3 below, the net (cost)/benefit is reduced to **[TRADE SECRET DATA BEGINS [redacted] TRADE SECRET DATA ENDS]** when compared to the net (cost)/benefit shown in Table 1.

Table 3: Net (Cost)/Benefit with Operational Dynamics Included

	(Cost) / Benefit
	[TRADE SECRET DATA BEGINS
Boswell Unit 3	[redacted]
Boswell Unit 4	[redacted]
Total (Cost) / Benefit	[redacted]
	TRADE SECRET DATA BEGINS]

Minnesota Power observed in the hypothetical economic dispatch used in the "Net (cost)/benefit with Operational Dynamics" evaluation that there was a substantial reduction in Boswell Units 3 and 4 energy production compared to actuals in 2020. The hypothetical reduction in energy was over 50 percent. As stated earlier, Minnesota

[4] A production cost model was used to determine when MISO might have dispatched Boswell Units 3 and 4 for economics using historical data for 2020.

Power was successful re-negotiating rail and coal contracts to avoid liquidated damages that would have occurred due to the lower than projected generation levels caused by the recessionary impacts from the COVID-19 pandemic. However, Minnesota Power believes that further reductions in energy production at Boswell Units 3 and 4 in 2020 would have resulted in significant liquidated damages being incurred. The magnitude of the liquidated damages could have been up to **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** based on the lower energy generation observed in the hypothetical economic dispatch. With Minnesota Power adjusting its fuel procurement strategy to better align with economic dispatch operations going forward, the Company does not anticipate those levels of liquidated damages going forward.

Order Point 5.g Analysis

Minnesota Power provided, as part of Attachment 1, the number of times in the analysis that each unit incurred losses over a duration greater than its minimum de-commit time and the associated costs. Boswell Unit 3 and 4 have a de-commit time of **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]**.

However, this analysis does not take into consideration that the minimum run time for Boswell Units 3 and 4 is **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]**. Provided below, in the Economic Dispatch section, Minnesota Power includes a future economic dispatch production cost model which looks at the potential average annual savings when Boswell Unit 3 transitions to economic dispatch and Boswell Unit 4 has an operation status of economic dispatch for a portion of the year. This production cost model provides a more realistic savings potential since it is able to capture the operational limitations.

III. ECONOMIC DISPATCH

Future Economic Dispatch Impacts

Minnesota Power evaluated the future impacts of shifting Boswell Units 3 and 4 self-commitment statuses to economic dispatch operations. Using a production cost model, the company expects to see a customer economic benefit by shifting Boswell Unit 3 and 4 to economic dispatch. Over a time period of January 1, 2021 through December 31,

2023, two operational scenarios were analyzed as provided in Table 4 below. In the second scenario, Boswell Unit 4 was set to must run during the winter months as the need for supplemental heat is a critical component of operations.

Table 4: Operational Scenarios

	Boswell Unit 3	Boswell Unit 4
First Scenario	Must Run Status	Must Run Status
Second Scenario	Economic Dispatch	Economic Dispatch (Apr-Oct) Must Run (Jan-Mar & Nov-Dec)

A comparison of the second scenario to the first scenario provided annual average power supply cost savings of approximately **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** over the course of the identified time period.

While the cost savings are apparent, the Company also identifies various milestones that need to be reached in order to transition both units to economic operations. These milestones, discussed below, were not taken into consideration in the analysis. If the timing of meeting these milestones were incorporated into the analysis, it would have an impact on the results. It is Minnesota Power's perspective that the forward looking analysis confirms that Minnesota Power should move Boswell Unit 3 to economic dispatch and continue to work towards meeting the milestones to move Boswell Unit 4 to economic dispatch.

Economic Dispatch Plan

On February 1, 2021, Minnesota Power submitted a compliance filing in this Docket which identified Minnesota Power's plan for economic dispatch operations at Boswell. Minnesota Power is currently 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 BEGINS** [redacted] **TRADE SECRET DATA ENDS]**.

As stated in the February 2021 Filing, transitioning Boswell Unit 4 to economic dispatch is more complex; however, Minnesota Power has identified the core milestones that need to be addressed and is diligently working with its co-owners, WPPI, to address options for each as described below in the Economic Dispatch Section under Joint Ownership. 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.

Economic Dispatch Milestones

At this time Minnesota Power does not have any additional updates to the milestones provided below; however, the Company continues to work diligently with WPPI and MISO.

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 a 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.

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 the 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.

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.

Minnesota Power 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 terms of the Operations, Ownership and Power Sales Agreement between Minnesota Power and WPPI states, **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** The Company is currently working with co-owner, WPPI, 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 and after the retirement of Boswell Units 1 and 2 in 2018, 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.

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.

IV. Miscellaneous Cost, Revenue and Operating Parameters

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 almost **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** in revenue for providing several ancillary service products, as shown in Table 5 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 renewable 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 5: Monthly Revenue from Ancillary Service

	Boswell Unit 3			Boswell Unit 4		
	Regulation	**Spinning Reserve**	**Supplemental Reserve**	**Regulation**	**Spinning Reserve**	**Supplemental Reserve**
	[TRADE SECRET DATA BEGINS					
January 2020	[redacted]					
February 2020						
March 2020						
April 2020						
May 2020						
June 2020						
July 2020						
August 2020						
September 2020						
October 2020						
November 2020						
December 2020						
2020 Total						
Total Ancillary Service Revenue (January 1, 2020 – December 31, 2020)						[redacted]
TRADE SECRET DATA ENDS]						

Make-Whole Payments

Resources that are dispatched economically by MISO in either the Day Ahead or Real Time markets are basically guaranteed recovery of their production costs (offer, start up and no load costs) by way of the market, either through the LMPs or with a Make Whole Payment. If the LMPs do not adequately compensate the units over the commitment period, then MISO will provide a Make Whole Payment to the unit through the Day Ahead or Real Time Revenue Sufficiency Guarantee Make Whole Payment charge types. Additionally, if market conditions erode the margin that would have been earned in the Day Ahead Market due to a lower dispatch in the real time, the units might be eligible for a Price Volatility Make Whole Payment in the real time.

Capital Revenue Requirements

Capital Revenue Requirements is 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, 2020

were **[TRADE SECRET DATA BEGINS** [redacted] **TRADE SECRET DATA ENDS]** respectively.

Average Heat Rate

Table 6 below shows the average heat rate at economic minimum and average heat rate at economic maximum for Boswell Units 3 and 4.

Table 6: 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	[redacted]	[redacted]
Boswell Unit 4		
		TRADE SECRET DATA ENDS]

Operation and Maintenance Costs

Fixed Operations and Maintenance

Fixed Operations and Maintenance (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 7 below shows the fixed O&M costs attributed to Boswell Units 3 and 4.

Table 7: Fixed O&M

	Boswell Unit 3	Boswell Unit 4
	[TRADE SECRET DATA BEGINS	
January 2020	[redacted]	[redacted]
February 2020		
March 2020		
April 2020		
May 2020		
June 2020		
July 2020		
August 2020		
September 2020		
October 2020		
November 2020		
December 2020		
2020 Fixed O&M Cost		
		TRADE SECRET DATA ENDS]

Variable O&M

Minnesota Power defines variable O&M as the changes in reagents, fuel handling equipment incremental wear-and-tear, and ash handling costs. These costs will increase or decrease depending on the production level of the generating unit. Below are the variable O&M costs in $/MWh we use in our offer into the MISO Energy Market during 2020.

Table 8: Dispatch Variable O&M ($/MWh)

	1/1/2020-4/30/2020	5/1/2020-12/31/2020
	[TRADE SECRET DATA BEGINS	
Boswell Unit 3	[redacted]	[redacted]
Boswell Unit 4	[redacted]	[redacted]
		TRADE SECRET DATA ENDS]

Preventative Maintenance

Minnesota Power does not track generation maintenance costs by predictive, preventative, or corrective maintenance. Instead the accounting for generation maintenance costs is tracked consistent with FERC accounting rules.

In order to comply with Order Point 5.d of the January Order the preventative maintenance data included in Attachment 1 is the best information the Company was able to obtain utilizing our Maximo system. However, is not inclusive of all preventative maintenance and could include predictive maintenance costs as well. The methodology Minnesota Power used to determine the hourly rate in Attachment 1 was based on actual costs available divided by generation output. Costs on a $/MWh basis vary greatly based on production, outages, and shared resources.

It is also important to note that preventative maintenance is not utilized in the MISO offer curve.

Table 9: Estimated Preventative Maintenance ($/MWh)

	[TRADE SECRET DATA BEGINS
Boswell Unit 3	[redacted]
Boswell Unit 4	[redacted]
	TRADE SECRET DATA ENDS]

Preventative maintenance is a runtime or calendar based activity recommended by the manufacturer or by experience where a maintenance technician has hands-on activity with the piece of equipment. This would include inspections, tests, repairs and

replacement of components in critical equipment. It may also include lubrications and minor adjustments. If inspection turns into repair or replacement, it becomes a corrective work order. Preventative maintenance costs also fluctuate from year to year based on outage schedules.

Predictive maintenance is a program that uses diagnostic and performance data, maintenance histories, design data and operating history to determine the condition of equipment. It utilizes the latest in technology such as vibration, thermography, motor testing to monitor equipment while it is operating. These activities do not significantly change based on incremental changes in production.

Unit Fuel Cost

Fuel as used in the offer curve for dispatch is the MISO energy market is defined as the actual monthly average cost of inventory on hand for the generating station.

V. MINIMUM OPERATING LEVELS

Minnesota Power 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.

A production cost model was used to evaluate the cost impact of reducing minimum operating levels at Boswell Unit 3. The company evaluated two operational scenarios for the time period of January 1, 2022 through the proposed retirement date for Boswell Unit 3 of December 31, 2029[5]. The first scenario had Boswell Unit 3 operating at a minimum level of 175 MW during the full time period and the second scenario reduced the operating minimum to 75 MW starting January 1, 2022. The analysis identified savings in power supply costs of approximately $3.2 million (net present value, 2022-2029) when reducing minimum operating levels in this scenario. When taking into consideration the $3.0 million capital costs required for reducing Boswell Unit 3 operating levels, the net present value of power supply savings is slightly greater than

[5] In the Matter of Minnesota Power's Application for Approval of its 2021-2035 Integrated Resource Plan, Docket No. E015/RP-21-33

the project cost. Along with cost savings, the lower minimum operating levels at Boswell Unit 3 will have a lower carbon emission profile. Given these benefits, Minnesota Power will move forward with this project as scheduled in January 2022.

In 2018 Minnesota Power reduced the operational minimums for Boswell Unit 4 from approximately 300 MW to 210 MW. At this time there have been no other projects identified; however, Minnesota Power will continue to explore other opportunities.

VI. COAL OPERATIONS

On February 1, 2021, Minnesota Power submitted its 2021-2035 Integrated Resource Plan which announced its vision to deliver 100 percent carbon-free energy to customers by 2050. As part of this vision Boswell Unit 3 will retire by 2030 and Boswell Unit 4 will cease coal operations by 2035.

VII. CONCLUSION

2020 was a pivotal year with a global pandemic, depressed market prices, and lost customer load. Despite those challenges, Minnesota Power is committed to evolving and providing reliable and cost effective energy as the Company works through the transition of Boswell Unit 3 in July 2021.

Dated: March 1, 2021

Respectfully Submitted,

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PUBLIC DOCUMENT
TRADE SECRET DATA EXCISED
IN ITS ENTIRETY

STATEMENT REGARDING JUSTIFICATION FOR EXCISING TRADE SECRET INFORMATION

Pursuant to the Commission's revised Procedures for Handling Trade Secret and Privileged Date in furtherance of the intent of Minn. Stat. § 13.37 and Minn. Rule 7829.0500, Minnesota Power has designated portions of its attached compliance filing as Trade Secret.

Minnesota Power has excised material from this Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities compliance filing ("Report") because the format of the Report requires Minnesota Power to compile and provide information regarding its operating parameters, power supply, and fuel costs. This is highly confidential information relating to Company financial and planning information; Minnesota Power's competitors and vendors would acquire highly confidential commercial information about Minnesota Power if this information were publicly available. In addition, unauthorized disclosure of this information may violate certain federal securities regulations.

Minnesota Power follows strict internal procedures to maintain the secrecy of this information in order to capitalize on economic value of the information to Minnesota Power on behalf of its customers. Minnesota Power respectfully requests the opportunity to provide additional justification in the event of a challenge to the trade secret designation provided herein.

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

Tiana Heger of the City of Duluth, County of St. Louis, State of Minnesota, says that on the 1st day of March, 2021, she served Minnesota Power's 2020 Annual 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.

Tiana Heger