

**STATE OF MINNESOTA
PUBLIC UTILITIES COMMISSION**

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April 30, 2021

In the Matter of an Investigation into Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities

Docket No. E999/CI-19-704

COMMENTS OF FRESH ENERGY

Fresh Energy submits these comments in response to the Commission’s March 16, 2021 *Notice of Extended Comment Period* regarding the Investigation into Self-Commitment and Self-Scheduling of Large Baseload Generation Facilities.

I. Introduction

The compliance filings Xcel Energy (“Xcel”), Minnesota Power (“MP”), and Otter Tail Power (“OTP”) made on March 1, 2021 are the third such filings each utility has made on the issue of self-commitment and self-scheduling of their baseload generators. Thanks to the Commission’s leadership in beginning this investigation, over the past 2.5 years, Minnesota’s public utilities have made significant progress through this proceeding. Seven of the eight coal units that have been the focus of this proceeding have transitioned to economic commitment or now have the ability to do so, and most have set a specific timeline for making this operational change.¹ Cumulatively, this Commission investigation and progress by Minnesota’s utilities has made it abundantly clear that economic commitment is now a best practice for coal plant operations.

The change from self-commitment to economic commitment is creating significant benefits for Minnesotans. Customers are saving millions in reduced electricity production costs and all Minnesotans are benefiting from significant emission reductions. We estimate that aggregate

¹ For an explanation of plant commitment and dispatch statuses, see Fresh Energy’s June 8, 2020 [Initial Comments](#) in this docket.

emissions from the Sherco plant, Allen S King, and Big Stone Plant in 2020 were **more than 7 million tons lower** than average annual emissions from 2017-2020 at these facilities. **This represents a roughly 27 percent reduction in statewide emissions from coal and a 17.5% reduction in electric sector emissions compared to 2018.**² On an individual plant basis, emissions reductions ranged from 30% (Big Stone) and 34% (Sherco) to 69% (King).³ Achieving these results in under three years is laudable. Fresh Energy greatly appreciates the work done by the utilities, the Commission, and stakeholders on this issue. We commend Xcel, Otter Tail, and Minnesota Power for taking this issue seriously and for developing and implementing new operational tools that have enabled these changes.

Chart 1: Status of Economic Commitment at Minnesota IOU Coal Plants

	Unit	Economic Commitment Process Established	Utility Utilizing Economic Commitment in MISO Market Offers?
Xcel	Sherco 1	Yes ⁴	Not currently
	Sherco 2	Yes	Yes
	Sherco 3	Yes	Yes
	Allen S King	Yes	Yes
MP	Boswell 3	Yes	Starting July 1
	Boswell 4	No	No
OTP	Big Stone Plant	Yes	Yes, unless a co-owner requests self-commitment
	Coyote Station	Yes	Not currently, due to co-owner requests for self-commitment through Q1 2022

Boswell 4 is currently the only unit that does not have a process in place to enable it to use economic commitment, but Minnesota Power describes several operational and equipment solutions that are likely to make it possible. Two other units, Sherco 1 and Coyote Station, have the technical and operational ability to be offered economically to the MISO market, but are using self-commitment (at least for approximately the next year) primarily due to contractual constraints.

² Estimated aggregate reduction in emissions at these three facilities compared to [MN Pollution Control Agency data](#) for electric sector 2018 emissions.

³ These estimates were calculated using publicly available data from the [Energy Information Agency](#), specifically historical MWh generation and annual tons of CO2 emissions by plant. We calculated average emissions and the average annual emissions rate at each facility for 2017-2019. We then applied the average emissions rate to 2020 MWh generation reported in this docket to estimate 2020 emissions and then compared that number to the three-year historical average.

⁴ As discussed below, Xcel offered Sherco 1 on an economic basis for parts of the year starting mid-2019. When Xcel began to offer Sherco 3 on an economic basis, it began using must-run again at Sherco 1 to provide a firm source of steam for the facility and the Liberty Paper, Inc. steam contract.

II. Summary of Changes to Minnesota IOU Coal Unit Operations

Xcel

Xcel began making changes to its coal fleet operations in 2019, which demonstrated that coal units do not have to be self-committed and that these operational changes have huge ratepayer and carbon benefits. Xcel began using economic offers at Sherco 1, Sherco 2 and Allen S King in mid-2019, and then moved Sherco 2 and King to seasonal idling (with economic commitment in summer and winter) in 2020 after approval by the Commission.⁵ Sherco 1 continued to be offered on an economic basis off-and-on throughout 2020.

Xcel's recent compliance filing indicates it has reached a new agreement with SMMPA to operate Sherco 3 on behalf of both owners, which enables that unit to utilize an economic commitment status.⁶ Fresh Energy applauds Xcel and SMMPA for designing this solution and putting the agreement in place this spring, reducing customer costs and reducing emissions by changing the plant's offer status early in the spring shoulder season.

However, Xcel notes that as a result of moving Sherco 3 to economic commitment, Sherco 1 can no longer be offered on an economic basis – at least until a different source of steam is available at the facility. According to Xcel, steam is needed at the Sherco facility for cold-start conditions, to provide building heat, and satisfy the steam contract with Liberty Paper, Inc. (“LPI”).⁷ Xcel is currently replacing the auxiliary boilers at the Sherco site, which could also be used to satisfy the LPI steam contract.⁸ Xcel states the boiler replacement project will be complete by the end of 2021. We hope that, when the boiler project is complete, Xcel will be able to resume offering Sherco 1 on an economic basis and will be able to do so year-round.

Fresh Energy recommends that Xcel make brief compliance filings in this docket to update the Commission and stakeholders when milestones in this project are reached, including completion of the auxiliary boiler project at the Sherco site; approval, denial, or delay of the Air Emission Permit Amendment; decisions made by Xcel and/or LPI relating to the source(s) of steam used by LPI; and updates to the feasibility of economic commitment at Sherco 1.

Otter Tail

In 2020, OTP and the co-owners⁹ of Big Stone worked out a method for shifting that unit to

⁵ Minnesota Public Utilities Commission, *Order Approving Plan and Requiring Filing*, July 15, 2020 in Docket No. E002/M-19-809

⁶ Xcel, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, p. 7

⁷ *Id.*, p. 9

⁸ *Ibid.*

⁹ Big Stone is co-owned by: Otter Tail Power (53.9%), Montana Dakota Utilities (22.7%), and Northwestern Energy (23.4%). Northwestern Energy participates in the Southwest Power Pool (SPP), while the other two co-owners participate in the Midcontinent Independent System Operator (MISO) market.

economic commitment. This is a relatively innovative agreement and demonstrates that multiple plant owners, even in two different wholesale markets, does not provide an insurmountable barrier to economic commitment. The agreement *enables* the plant to use economic offers, but practice is somewhat more limited. Due to the co-ownership arrangement putting Big Stone in two different wholesale power markets, if any share of the plant is committed by either the Midcontinent Independent System Operator (MISO) or Southwest Power Pool (SPP), each co-owner's share must operate at least at economic minimum. There are times when pricing in one market warrants committing the unit, while pricing in the other market would not – but due to the co-ownership arrangement it must be committed. This dynamic has occurred more frequently with higher pricing in SPP and lower pricing in MISO. During these times, OTP has been obliged to operate their share of the plant at a loss.

In its 2021 Compliance Filing, OTP indicated that it has been working on a similar agreement with the co-owners of Coyote Station.¹⁰ In response to an Information Request, OTP confirmed that on March 8, 2021, the co-owners approved a motion to allow the unit to be offered on an economic basis, depending on market and operating conditions. However, OTP explained that the plant is likely to be self-committed until spring 2022:

“Otter Tail currently advocates for immediate implementation of strategic applications of economic dispatch. However, it is expected the economic dispatch at Coyote will be implemented in the second quarter of 2022, based upon current plant co-owner dispatch requests, unless changes in conditions cause the co-owners to implement earlier.”¹¹

OTP notes that Coyote Station updated its minimum operating level (also called the economic minimum) in May 2020 [TRADE SECRET DATA BEGINS ██████████
██████████ TRADE SECRET DATA ENDS].¹² This change will also help improve operational flexibility at the plant and may reduce losses from future self-commitment periods.

Minnesota Power

In its compliance filing, Minnesota Power announced that it will use economic commitment at Boswell 3 starting in July 2021 and until the unit retires, currently planned for 2030.¹³ This is an exciting announcement and a big step forward for Minnesota Power and the Boswell plant. With this change, all three of Minnesota's public utilities have recognized the benefits of economically offering coal units – and all will soon have implemented this change at one or more coal units.

¹⁰ *Ibid.* Coyote Station is co-owned by: Otter Tail Power (35%), Minnkota Power Cooperative (30%), Montana Dakota Utilities (25%) and Northwestern Energy (10%).

¹¹ Otter Tail Power, *Response to Fresh Energy IR 5*

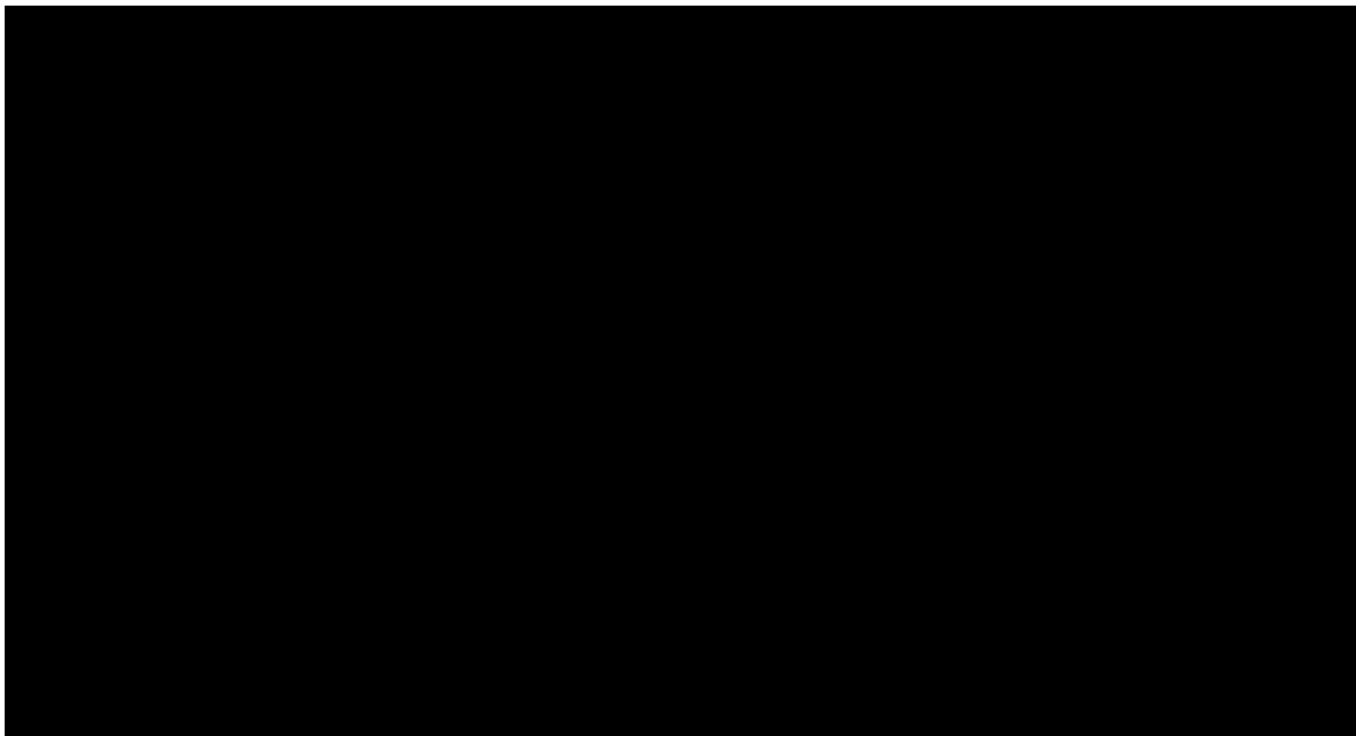
¹² Otter Tail Power, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, p. 8

¹³ Minnesota Power, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, p. 9

Fresh Energy estimates that economic operations at Boswell 3 will reduce the unit's carbon emissions by an average of [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS] per year over the next three years compared to business-as-usual projections.¹⁴ Chart 2 below compares historical carbon emissions at each unit to the business-as-usual and economic offer scenarios MP modeled in this compliance filing. Note that MP modeled Unit 3 shifting to economic operations year-round and Unit 4 shifting to economic operations except for winter months (November-March), when it would be self-committed to provide heat to the facility. If economically committed as MP modeled, we estimate that emissions from both units would drop approximately [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS] compared to historical levels.¹⁵

Chart 2: Boswell Carbon Emissions: BAU vs. Economic Scenario

[TRADE SECRET DATA BEGINS



TRADE SECRET DATA ENDS]

¹⁴ CO₂ emissions reductions were estimated using historical annual MWh generation, CO₂ emissions data, and annual capacity factor for each unit (*MP Response to Fresh Energy IR 11*). Fresh Energy calculated an average annual emission rate per MWh using this historical data. We used the capacity factors MP modeled for each scenario in RTSim (*MP Response to Fresh Energy IR 10*) to estimate expected annual generation over the next three years. We then applied the historical emissions rate to future expected generation to arrive at estimated future CO₂ emissions. See *Attachment B for detail*.

¹⁵ We calculated this using the method described in footnote 13. See *Attachment B for detail*.

MP also describes a plan to reduce minimum operating levels at Boswell 3 from 175MW to 75MW by January 1, 2022.¹⁶ This is a significant reduction (57 percent) from current levels and a valuable achievement for a plant its size. MP estimates the project will have a net benefit for lowering production costs while further reducing carbon emissions through the remaining life of the unit.

MP has not yet made changes to operations at Boswell 4 but identifies several milestones it will work through to shift operations at Boswell 4 to utilizing economic offers. These include operations and maintenance changes, contractual issues, and reliability concerns. We discuss each of the noted milestones at more length below.

III. Net Revenues of Minnesota IOU’s Coal Fleet in 2020

The efforts described above to improve coal unit flexibility are generating significant cost savings and emissions benefits for Minnesotans. However, it is important to keep the larger picture of coal plant operations and costs in mind. Six of the eight coal units covered by this proceeding lost money on an operational basis in 2020. Only Sherco 3 and King did not have significant operational losses in 2020. King operated minimally due to the shift to economic offers and seasonal idling at that plant, demonstrating that coal plants can be *more* profitable when operating *less*. Losses at the majority coal units was not unexpected given the market conditions that resulted from COVID-19 in 2020: lower electricity usage, especially among commercial and industrial customers, historically low natural gas prices, and extremely low prices in wholesale electricity markets. Low wholesale prices make plant economics more challenging, especially for those with higher marginal costs like many coal plants.

Chart 3: 2020 Coal Unit Net Operational Revenue Summary

	Unit	2020 Overall Operational (Cost) / Benefit ¹⁷	2020 Operational (Cost) / Benefit During Discretionary Self-Commit
[TRADE SECRET DATA BEGINS]			
Xcel	Sherco 1	[REDACTED]	[REDACTED]
	Sherco 2	[REDACTED]	[REDACTED]
	Sherco 3	[REDACTED]	[REDACTED]
	Allen S King	[REDACTED]	[REDACTED]
MP	Boswell 3	[REDACTED]	[REDACTED]

¹⁶ *Id.*, p. 21

¹⁷ Cost and benefit in this table are calculated using the utilities’ provided data for net MISO revenues including ancillary service market and make whole payment revenues, compared to all unit production costs including unit fuel, variable operations and maintenance, and predictive maintenance costs.

	Boswell 4		
O/P	Big Stone Plant		
	Coyote Station		
TRADE SECRET DATA ENDS]			
	Total	\$(13,022,545)	\$(5,004,624)

These net losses are just operational losses – meaning the figures above represent the net revenue of each unit on a marginal basis (comparing all MISO revenue and all production costs),¹⁹ but do not include any fixed costs (aside from fixed fuel cost), or revenue requirements for each unit. As Fresh Energy has shown in previous comments in this docket, fixed operations and maintenance costs tend to be quite significant. Even in years when MISO revenues were significantly higher than in 2020, most units show significant net losses when fixed O&M is included.

IV. Minnesota Power’s Operational Changes at Boswell

As discussed above, Minnesota Power has made significant progress on this issue over the past year. MP has responded to the Commission’s directives to model operations at Boswell using economic offers and to evaluate the cost and benefit of reducing operating minimums. MP is now planning to move Boswell 3 to economic commitment in July, and to reduce the unit’s operating minimum by this coming January. Fresh Energy appreciates the work Minnesota Power has done to enable these announcements.

MP’s compliance filing notes that it is not able to offer Boswell 4 on an economic basis at this time, but that it is working toward this in coordination with co-owner WPPI Energy (“WPPI”) and MISO. Given heating needs at the site, MP states that economic commitment will not be feasible during winter months unless an axillary heating system is installed. However, MP suggests that economic commitment could be feasible in seven months of the year without a backup heat source.

A. Benefits of Economic Commitment at Boswell

Minnesota Power completed several new modeling exercises for this compliance filing which are extremely helpful for evaluating the potential costs or benefits of economic commitment at

¹⁸ This figure represents the net revenue for Boswell 4 during all must run hours. MP asserts that there was no discretionary must run at this unit in 2020, and that all hours the plant operated were unavoidable must run due to co-ownership or testing.

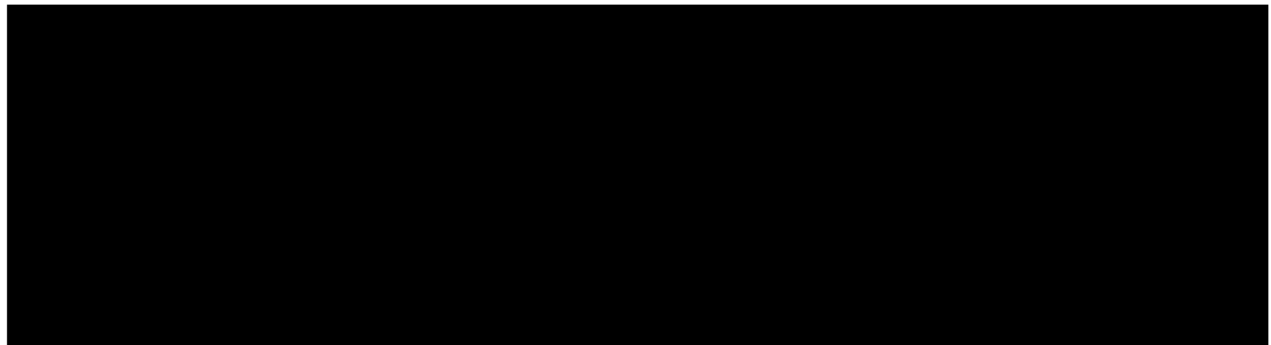
¹⁹ MISO revenue represented includes payments from the day ahead and real time energy markets, ancillary serve markets, and make whole payments. Unit production costs represented include all unit costs, variable operations and maintenance cost, and utility-provided preventative maintenance costs.

Boswell in a more precise and forward-looking manner. MP used a production cost model (RTSim) to model how both units would have operated in 2020 if they had been offered economically the entire year. In this scenario, both units would have run significantly less than they actually ran in 2020. The actual capacity factors for unit 3 and 4 in 2020 were 51 percent and 52 percent, respectively. In the modeling run simulating economic commitment, capacity factors were just [TRADE SECRET DATA BEGINS ██████████
██████████ TRADE SECRET DATA ENDS]. MP notes that these results are hypothetical since the units have operational constraints that were not incorporate into this run, which limit flexibility and the ability to follow market prices.

MP's second modeling exercise was to model both units operating economically within operational constraints over the period 2021-2023. These include a minimum run time, which MP set at [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS] for each unit to approximate run times that may be required to stay within air pollution permits,²⁰ and a requirement that unit 4 operate during the winter months to provide heating to the facility. In these modeling runs, capacity factors range from [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS], compared to [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS] in the scenario where both units operate on year-round self-commit. This represents a [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS] reduction in capacity factor, as illustrated in the charts below. This modeling demonstrates that even when MP's imposed operational characteristics are accounted for, the Boswell units are running significantly more than is financially reasonable when they are operating on year-round self-commit.

Chart 4: Simulated Annual Boswell Capacity Factors 2021-2023²¹

[TRADE SDECRET DATA BEGINS



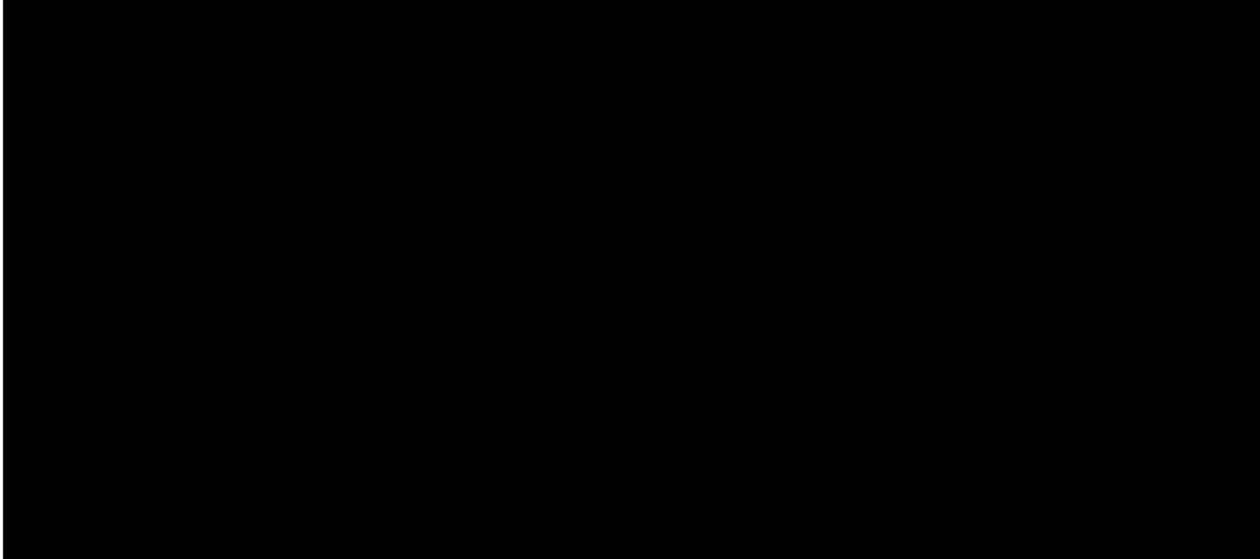
TRADE SECRET DATA ENDS]

²⁰ Minnesota Power, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, pp 12-13 and Minnesota Power, *Response to Fresh Energy IR 18*

²¹ From Minnesota Power, *Response to Fresh Energy IR 10*

**Chart 5: Historical vs. Simulated BAU and Economic Operations
Capacity Factor at Boswell 2016-2023**

[TRADE SSECRET DATA BEGINS



TRADE SECRET DATA ENDS]

Using these results from MP’s modeling, Fresh Energy estimates that moving Boswell 3 to economic commitment in 2021 will reduce emissions from that unit [TRADE SECRET DATA BEGINS [REDACTED] TRADE SECRET DATA ENDS] over the next three years compared to year-round self-commitment. MP’s economic and seasonal scenario for unit 4 would reduce emissions from that unit [TRADE SECRET DATA BEGINS [REDACTED] TRADE SECRET DATA ENDS] on average over the next three years compared to year-round self-commitment. Using the Commission’s current environmental cost values for CO₂, we estimated the public health and environmental cost benefits these operational changes could have. The results are significant: moving both Boswell units to economic operations could save Minnesotans \$60-80 million annually in avoided public health and environmental damage from avoided CO₂ emissions alone.

**Chart 6: Estimated Annual Social Cost of Carbon Benefit
of Shifting Operations at Boswell**

	2021	2022	2023
Environmental Cost (high end, \$/ton)	48.39	50.38	52.43
Boswell 3 Value of CO2 Reduction	\$45,272,232	\$23,567,008	\$24,525,968
Boswell 4 Value of CO2 Reduction	\$37,542,363	\$36,079,627	\$40,676,712

B. Milestones for Moving Boswell to Economic Commitment

MP cites a number of milestones they are working through to enable both Boswell units to shift to economic operations throughout the spring, summer, and fall. Fresh Energy appreciates that MP is not characterizing these milestones as barriers that prevent the units from becoming more flexible, but rather as operational, contractual, and engineering issues that need to be considered, and may need to be addressed in the future depending on physical impacts to the plant from more frequent cycling. Fresh Energy understands that MP believes it can address all of these milestones at unit 3 before July 1, when it plans to change the commitment status of that unit.

The Company does not provide a timeline for addressing milestones for Boswell 4, but notes that it is actively working on them. Many of the milestones are issues that fall within the Company's purview to address and can be worked through in the coming months. It would be ideal for MP to reach solutions to these milestones at unit 4 before the fall, when prices in the market are likely to be low and the potential customer benefits of the unit shifting to economic offers are likely to be significant.

Summary of milestones as characterized by Minnesota Power:²²

- **Market Readiness** – the lack of multi-day-ahead commitment process in MISO, which would help plants with long start up times operate more efficiently across multiple days.
- **Joint Ownership with WPPI** – working to come to a common understanding of how to utilize economic offers and address potential mismatches between commit or dispatch status of each share of unit 4.
- **Transmission Reliability** – potential concerns when both units are offline. See further discussion below.
- **Environmental Emission Compliance** – short periods of must-run may be required to stay within 30-day rolling average permit limits.
- **Generating Facility Impacts**
 - **Auxiliary heat** – currently one unit is needed for winter heat, until or unless MP installs auxiliary natural gas boilers. According to MP, auxiliary boilers would cost [TRADE SECRET DATA BEGINS ██████████ TRADE SECRET DATA ENDS] and would take three years to complete.
 - **Boiler Chemistry** – frequent cycling can impact boiler water chemistry and require additional cleanings, preventative treatment, or re-piping.
 - **Auxiliary Equipment** – potential changes to operations and maintenance process and costs as a result of more frequent cycling.
- **Fuel Procurement and Fuel Operations**

²² Minnesota Power, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, pp. 10-17

- **Coal Commodity Impact** – economic and seasonal operations can increase uncertainty in coal volume to purchase, with potential price and risk impacts.
- **Rail Transportation Impact** – Boswell is only served by one railroad. Greater uncertainty in coal transportation needs may increase risk and/or cost.
- **Inventory and Fuel Operation Impacts** – inventory practices may need to change to mitigate other fuel risks, which could result in higher O&M costs.

The milestones relating to environmental emission compliance, generating facility impacts, and fuel procurement and fuel operations are important operational considerations, but are all items that are fully within Minnesota Power’s ability to manage prudently and/or quantify and weigh against the operational losses from continued must-run operation. The market readiness milestone is a MISO market issue, but it is clearly not necessary to have a multi-day market before changing plant operations to utilize economic commitment. This milestone may fall into the “nice to have” rather than the “need to have” category. Fresh Energy understands that MP, as well as Xcel and other utilities are working with MISO to develop a multiday market offer.

Similarly, the joint ownership milestones are not fully within MP’s authority, as they require coordination with WPPI, but are not barriers. We have seen from several other coal units that co-ownership does not have to hinder use of economic commitment. Big Stone and Coyote have three and four co-owners each, and both units have agreements and processes in place that enable economic offers. Sherco 3 has two co-owners and recently began using economic commitment. Otter Tail and Xcel have taken different approaches to establishing economic offers at shared plants, proving that there are multiple avenues for this to work.

i. Transmission Reliability

The transmission reliability milestones are potentially more complex to resolve but appear to be surmountable. MP’s compliance filing & responses to information requests to-date indicate that MP has identified two main areas of reliability concerns that may occur when changing operations at one or both Boswell units: (1) System Strength & Voltage Support²³ and (2) Local and Regional Power Delivery.

Most reliability concerns can be at least partially resolved through MISO’s security constrained economic dispatch process, which will commit and dispatch any units in the day ahead market that may be needed to mitigate an identified reliability concern. (Units with long start up times may need to be picked up a day or more in advance of the expected issue, but these needs are identified through MISO’s reliability assessment process, which models one, two, and three

²³ Voltage support and grid strength are related but require different mitigations. Voltage support is not a new concept or issue to manage for utilities, while grid strength is more of a recently emerging concern.

days in advance of real-world conditions.²⁴) Notably, “system strength is not a metric that MISO currently monitors or has the ability to monitor.”²⁵ MISO, utilities, and reliability organizations are increasingly focused on this issue, but in the meantime, MP is developing new tools to ensure that sufficient system strength and voltage support are maintained.

Fresh Energy is working to better understand the reliability issues MP has identified, and the solutions underway, through ongoing information requests and aided by our expert transmission reliability consultants at Telos Energy. We hope to work collaboratively with MP to find solutions to each of the reliability concerns that will allow both Boswell units move to economic commitment significantly before their retirement dates.

MP states that it is still working to understand some of the system needs identified, and is working to develop solutions, operational guides, and processes with MISO to mitigate the issues.²⁶ Fresh Energy discusses each issue and the solutions MP has identified in more detail below. Our primary concern is that little work appears to have been done to quantify the actual grid strength requirements of MP’s system. MP discusses its concern about grid strength and voltage support at length in its recent Integrated Resource Plan (IRP) Appendix F and in response to Fresh Energy IRs 13, 14, and 20-24, but has not, as far as we can tell, quantified this need. We recommend that MP provide the Commission and stakeholders with more specific information about the work ongoing in this area, as discussed further below.

1. Grid Strength and Voltage Support

In the IRP Appendix F discussion of transmission reliability, MP describes how grid strength, including sufficient fault current and voltage support, can be impacted by the transition from local thermal generators, like coal plants, to renewable generators that may be more dispersed regionally. MP is concerned that a scenario with “extended periods of time without any local generators online providing fault current and voltage regulation” will make “differentiating between normal and abnormal system conditions become[s] increasingly complex” and “protection and control system mis-operations become increasingly likely.”²⁷ MP describes a few scenarios where this could happen. The most relevant scenarios for this docket are a) if one Boswell unit is being offered economically and is decommitted when there is an unintended loss of the other unit; and b) both Boswell units are using economic offers and are decommitted.

²⁴ Minnesota Power, *Response to Fresh Energy IR 21*

²⁵ Minnesota Power, *Response to Fresh Energy IR 20*

²⁶ Minnesota Power, *Response to Fresh Energy IR 20*

²⁷ Minnesota Power, *Integrated Resource Plan* filed February 1, 2021 in Docket No. E015/RP-21-33, Appendix F, p 52

Voltage support and grid strength do require local solutions but can be mitigated without generating electricity. The grid-strength benefit that Boswell brings to the system is provided when Boswell is merely *synchronized* to the grid. These are reliability issues that are not sufficiently addressed by inverter-based resources today, although that is changing with growing maturity of grid-forming inverters. To address the grid strength concern that arises from shifting Boswell 3 to economic operations, MP is planning to add one synchronous condenser which can be a “continuous source of voltage support and system strength.”²⁸ If Boswell 4 also shifts to economic operations, MP proposes to add a second synchronous condenser. We agree that synchronous condensers may be a good option for addressing this issue, but there may be additional, more cost-effective solutions in the near or mid-term.

For example, the Bowell units may be able to provide voltage support and grid strength before coming fully back online, due to the need to be synchronized, not necessarily generating power. Fresh Energy requested additional information from MP on this question in IRs 22 and 23. Based on this information, it appears minimum synchronization time is lower than startup time but is variable.²⁹ MP has done or is considering some projects that could reduce minimum synchronization time³⁰ although it is not yet clear what the expected impact on synchronization time range would be.

MP is also working with MISO on offline studies to inform system operations. It will use these results to develop an operating guide “to ensure that the required combinations of short circuit sources are online to maintain the minimum required short circuit level.”³¹ Such an operating guide will indicate how much short circuit capability is being provided by other resources on the system under various conditions, and will indicate when a generator or synchronous condenser may need to come online – in other words, it may indicate times when Boswell 3 needs to be self-committed to ensure sufficient short circuit capability.

MP notes in its compliance filing that it “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.”³² MP recently confirmed that this work is underway and expected to be complete prior to July 1.³³

The key criteria in this operating guide will be the minimum required short circuit level. MP has “concluded as a foundational starting assumption that, at a minimum, local short circuit capability similar to what has been provided by Boswell unit 3 is required at all times on the

²⁸ Minnesota Power, *Response to Fresh Energy IR 20*

²⁹ Minnesota Power, *Response to Fresh Energy IR 22*

³⁰ Minnesota Power, *Response to Fresh Energy IR 23*

³¹ Minnesota Power, *Response to Fresh Energy IR 20*

³² Minnesota Power, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, p. 12

³³ Minnesota Power, *Response to Fresh Energy IR 14*

Minnesota Power transmission system.³⁴ This conclusion is based on past experiences in the North Shore Loop and Grand Rapids after local generation went offline and on a preliminary screening study. Fresh Energy is concerned that the minimum short circuit threshold will be based, at least in part, on historical conditions and not on a quantitative analysis of actual system need. The utility should take a bottom-up approach to setting a minimum grid-strength threshold rather than assuming the existing generator is providing the optimal amount.

According to our consultants at Telos Energy, there are industry best-practices in metrics quantifying the needs of the protection system and of customers, as well as best-practices in methods for determining the gap between available capability and system need under different contingencies. MP should commission such a study, if they have not already, and share the scope of work and study results with the Commission and stakeholders.

2. Local and Regional Power Delivery

There are two potential concerns about power delivery: a local constraint that can be mitigated through reconductoring two lines, and regional constraint(s) that require working with MISO to define the Northern Minnesota (NOMN) voltage stability interface and develop real-time monitoring and management tools. MISO has not historically monitored the area for voltage stability concerns. The NOMN interface tools in development will provide MISO the ability “to identify if or when the voltage stability limit is being approached and order the necessary mitigation.”³⁵ It appears that these mitigations – reconductoring two short local transmission lines and working to establish the NOMN interface with MISO – are sufficient to address power delivery concerns in the case of one or both units moving to economic operations.³⁶

MP also notes that in developing solutions to long-term regional power delivery issues, they are considering alternatives including local clean energy generation and load management resources.³⁷ Resources would need to be available in sufficient quantity during the relevant time periods in order to meet this need. Fresh Energy is encouraged that the power delivery constraints MP has identified as potential reliability concerns from economic commitment can be mitigated with relatively simple solutions. We look forward to continuing to work with MP on the longer-term solutions that may become necessary as the Boswell units approach retirement.

³⁴ Minnesota Power, *Response to Fresh Energy IR 24*

³⁵ This will occur as part of MISO’s Forward Reliability Engineering and Support (FRES) process.

³⁶ Minnesota Power, *Response to Fresh Energy IR 20*

³⁷ Minnesota Power, *Response to Fresh Energy IR 13*

3. Differentiation Between Grid Services

Finally, Fresh Energy recommends that MP work to differentiate between specific grid services when discussing reliability concerns or mitigations going forward in this proceeding. For example, MP discusses voltage support and grid strength together throughout its filings and responses to information requests. These are related concerns but are different in important ways and require different mitigations. Voltage support is a function that utilities and grid planners are experienced in managing, while grid strength is more recently emerging concern. Voltage support issues have many potential mitigations, including installing shunt capacitors, STATCOMs (as MP has done in the North Shore Loop), and renewable energy projects. Traditional generators and synchronous condensers are the mitigations commercially available today to improve grid strength. As discussed earlier, new technologies like grid-forming inverters are evolving to enable renewable energy facilities to provide this service in the future. Traditional generators and synchronous condensers can also provide voltage support but are expensive sources of this grid service. If voltage support is the primary concern, synchronous machines are not typically the most prudent solution.

To ensure that the Commission and stakeholders in this proceeding have the information needed to evaluate the cost-effectiveness the reliability solutions being proposed or implemented, we recommend that MP provide in Reply Comments a simplified list of the grid services that are impacted by economic operations at one or more Boswell units, under which contingencies each service would be needed, potential mitigation options for each, MP's proposed mitigation, and the estimated cost of the proposed mitigation.

V. Compliance Filing Completeness

The Commission's March 16, 2021 *Notice of Extended Comment Period* asked, "are the March 1, 2021 filings by the utilities adequate and in compliance with the January 11, 2021 and November 13, 2019 orders by the Commission?" and additionally, "is the February 1, 2021 filing by Minnesota Power, covering July 1, 2018 to December 31, 2019, in compliance with Commission orders?"

Fresh Energy believes Minnesota Power's February 1, 2021 compliance filing is adequate and complete. MP provided an analysis of the costs and benefits of economic operations versus self-commitment for the period ending December 31, 2019 and used a production cost model to quantify the trade-offs at the MP-system level of shifting to economic operations. MP also provided significantly more information about the feasibility and relative cost of solutions to the prior-identified barriers to using economic commitment at the Boswell facility in this filing.

There are a few areas in the three utilities' March 1, 2021 Compliance Filings that could have

been more complete:

1. Order Point 4

This Order Point asked Minnesota Power, Otter Tail, and Xcel Energy to file a complete analysis of the costs and benefits of economic or seasonal dispatch relative to self-scheduling at the following facilities:

- Boswell 3 and Boswell 4 – Minnesota Power
- Coyote Station and Big Stone – Otter Tail
- Sherco 1 and Sherco 3 – Xcel Energy

Minnesota Power completed a production cost modeling exercise comparing business-as-usual (year round self-commitment at both units) to an economic operations scenario, within the current operating constraints of the units. While Fresh Energy takes no position on the modeling tool or all inputs used, we believe it is a robust modeling analysis that provides an evidence-based foundation for making operational changes at Boswell.

Xcel completed a similar analysis using PLEXOS to model the impacts on customer fuel charges and Xcel system-wide carbon emissions from shifting Sherco 3 from year-round self-commitment to economic operations.³⁸ Xcel did not, to our knowledge, complete a similar exercise to examine the cost impact of shifting operations at Sherco 1. We understand that this choice was likely made as a result of the current requirement for Sherco 1 to be operational to provide steam. We recommend that Xcel complete this modeling exercise – quantifying the fuel clause and system emissions impact from 2022-2025 that would result from changing Sherco 1 to economic commitment – for the March 1, 2022 compliance filing.

Otter Tail Power did not complete production cost modeling for this compliance filing. We understand that OTP has been leading the work with plant co-owners at Big Stone and Coyote to put agreements and processes in place that enable plant economic commitment. However, we do not yet have robust forward-looking analysis of the potential impacts on the fuel charge or OTP emissions that could be expected if the plant were to operate economically year-round. Fresh Energy appreciates that this analysis may be complex to model due to the plants' dispatch into both SPP and MISO, and the uncertainty of other owners' commitment choices. We recommend that Otter Tail engage with stakeholders in this docket to discuss modeling methodologies that could be used to approximate the impact of economic operations at both units from 2022-2025.

³⁸ Xcel, *Compliance Filing*, March 1, 2021 in Docket No. E999/CI-19-704, pp. 6-8

2. Order Point 6

This Order Point asked Otter Tail to provide a discussion of the options and costs of changing its current coal contract at Coyote Station and an evaluation of how potential costs of changing the contract compare to Coyote Station's past and forecast operating losses in Docket No. E-999/CI-19-704. Otter Tail provided additional detail on the processes that would be required for modifying the existing Lignite Sales Agreement (LSA) and recent work to identify cost savings at the Coyote Creek mine. Fresh Energy believes it would be reasonable and in the interest of OTP's Minnesota customers to also evaluate if early termination would be prudent. An evaluation of the early termination fee compared to what OTP's Minnesota customers would pay for electricity production without the unit could quantify the value of remaining in the contract or identify a point at which early termination may be beneficial. We encourage OTP to engage with stakeholders in this docket to discuss how to complete such an analysis.

VI. Conclusion

Fresh Energy appreciates the Commission's ongoing interest in the issue of plant self-commitment and self-scheduling. Over the past 2.5 years, the investigation and work by utilities in response to it has resulted in significant cost savings for electric customers and carbon reductions that benefit all Minnesotans. Thank you for the opportunity to provide comments on this most recent round of the proceeding, and for your consideration.

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