Before the North Dakota Public Service Commission
State of North Dakota

In the Matter of the Application of Otter Tail Power Company
For Advance Prudence on the Astoria Station Onsite
Fuel Inventory System in North Dakota

Case No. PU-23-

Exhibit___

ASTORIA STATION PROJECT

Direct Testimony

RYAN D. RETZLAFF

February 8, 2023

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Prefiled Direct Testimony of Ryan D. Retzlaff
Otter Tail Power Company
Cary Stephenson, Assoc. Gen. Counsel

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I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND EMPLOYER.

A. My name is Ryan D. Retzlaff. I am employed by Otter Tail Power Company (Otter Tail or Company) as its Manager of Power Services.

Q. PLEASE SUMMARIZE YOUR CURRENT RESPONSIBILITIES.

A. The primary responsibility of Power Services is to implement wholesale energy market strategies that optimize Otter Tail's generation resources with other resource alternatives to meet customer needs in a low-cost, reliable manner, all while maintaining an appropriate level of risk tolerance. I oversee the Company's wholesale energy market functions, including daily submission of generation offers and load bids, procurement of natural gas fuel for our generation resources, oversight of the Company's Auction Revenue Rights and Financial Transmission Rights portfolios, procurement of forward energy, capacity, and natural gas contracts, and accounting of wholesale energy market financial settlements.

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have a Bachelor of Science degree in physics from Carleton College and Master's degrees in electrical engineering and business administration from North Dakota State University. I have worked for Otter Tail for over 23 years in various positions, including as an Electrical Engineer, Senior Energy Engineer, Senior Energy Marketer, Principal Energy Marketer, and Manager of Power Services. I have served in my current position as Manager of Power Services since June 2014.

II. PURPOSE AND OVERVIEW OF DIRECT TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my testimony is to provide support for Otter Tail's request for an Advanced Determination of Prudence (ADP) for the Company's proposed development of onsite liquefied natural gas (LNG) fuel storage at Astoria Station (Project). In my testimony, I discuss the need and justification for the Project, focusing on the following:

- Natural gas market volatility;

- Net benefits of onsite LNG fuel storage at Astoria Station; and
- The impact of Winter Storm Elliot on Astoria Operations demonstrating the value of onsite fuel storage.

III. NEED & JUSTIFICATION FOR THE PROJECT

Q. DO YOU MONITOR FORWARD ENERGY AND GAS MARKETS?

A. Yes, we continuously monitor natural gas and energy markets to mitigate price risks for our customers.

Q. WHAT IS THE RELATIONSHIP BETWEEN NATURAL GAS AND ENERGY MARKETS?

A. As noted by Mr. Nathan R. Jensen in his Direct Testimony natural gas units tend to be the marginal units in the MISO energy market. This means that they set the price based on their variable energy cost. High market price situations are usually accompanied (or caused) by high natural gas prices. That is why relying on natural gas units to serve load during volatile markets conditions is difficult unless those generation units can switch to an alternate fuel source or stored fuel when natural gas prices are elevated.

Q. IS ENERGY AND GAS MARKET PRICE VOLATILITY A CONCERN?

A. Yes, the current forward energy purchase market is more volatile and has seen considerably higher prices than recent years. Current winter pricing (December, January, and February) at the Otter Tail load zone is projected to be $59 on peak and $51.50 off peak for the 2023/2024 Winter. For the 2024/25 winter, prices are projected to be $60.50 on peak and $52.50 off peak. This compares to on-peak average pricing of $30/MWh and off-peak average pricing of $23.50/MWh for the 2022/23 winter period from our initial IRP filing.

Since our initial IRP filing, natural gas and market energy pricing have experienced a period of heightened volatility. The natural gas forecast in our initial IRP filing included a $3.00 per MMBtu average price for 2022. The actual 2022 historical Ventura Hub average timely natural gas price per MMBtu was $6.10/MMBtu. Similarly, our 2022 market energy forecasts in our nitial IRP filing included peak energy of approximately $28.50 and off-peak energy of

$21.00. The actual 2022 peak and off-peak pricing for Otter Tail's load zone were approximately $54.50 and $37.00, respectively.

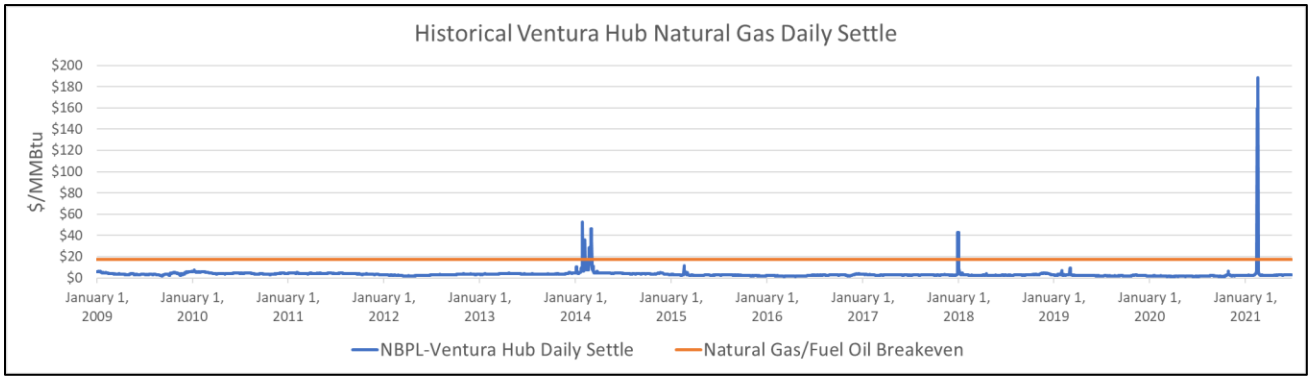
Q. HAS OTTER TAIL ASSESSED WHETHER ONSITE FUEL STORAGE AT ASTORIA STATION WILL MITIGATE NATURAL GAS PRICE VOLATILITY?

A. Yes, in our Application, which incorporates key parts of our initial IRP filing, we noted the connection between extreme weather events and natural gas price volatility and intra-day price risk. Central to our review was Winter Storm Uri in 2021, which highlighted more than ever natural gas volatility and intra-day price risk; risk that onsite fuel storage capabilities at a peaker would protect against.

Q. HAS OTTER TAIL UNDERTAKEN A REVIEW OF NATURAL GAS PRICE VOLATILITY?

A Yes, [IRP] Figure 3-11 and ADP Figure 3-11 collectively depict natural gas market prices at the Ventura Hub since January 2009 up to those most currently available when the figures were made as identified on the horizontal date axis.[1] The extraordinary pricing variability during the 2021 Winter Storm Uri event caused Otter Tail to assess the intra-day pricing variability exposure of a natural gas generator without a secondary fuel source backup. Over the past decade, there have been three events that caused high gas prices, the most recent of which was Winter Storm Uri. [IRP] Figure 3-11 below depicts the gas market prices since January 2009.

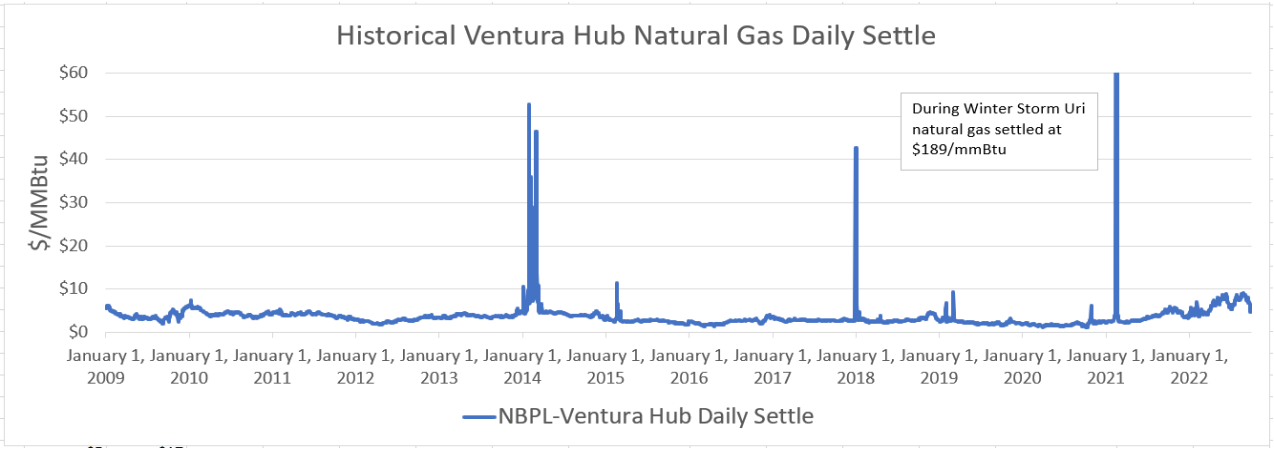
[IRP] Figure 3-11: Historic Ventura Hub Natural Gas Prices



[1] These figures do not include or reflect Winter Storm Elliot which occurred in late December 2022.

ADP Figure 3-11 below depicts gas market prices since January 2009 up to those most currently available. Note also that the "Y" axis values have been reduced to better illustrate the market variability over the period. Note also that during the January 2022 event, gas settlements were above the highest point of the "Y" axis of ADP Figure 3-11.

ADP Figure 3-11: Historic Ventura Hub Natural Gas Prices



Q. HAVE YOU ANALYZED THE NET ECONOMIC BENFITS OF ONSITE FUEL STORAGE AT ASTORIA STATION IN LIGHT OF NATURAL GAS MARKET VOLATILITY?

A. Yes. Our analysis focused on: (1) protection against intraday natural gas pricing deltas, (2) energy hedge value, and (3) the changing MISO capacity construct.

Q. PLEASES EXPLAIN INTRADAY PRICING DELTAS.

A. During volatile pricing conditions the natural gas market can vary dramatically between the time a generation offer is given to MISO and when MISO clears the offer. If the quantity of MWs cleared varies from expectations, and the price to procure or liquidate additional natural gas fuel supply varies from expectations, the generator can be exposed to significant pricing risk. Onsite fuel inventory mitigates if not eliminates this risk by providing a known and stable fuel supply during extreme natural gas pricing events.

Q. PLEASE EXPLAIN ENERGY HEDGE VALUE.

A. The ability to call on Astoria Station using stored fuel (and therefore run the facility at a pre-determined energy price), provides a hedge against volatile market spot pricing and against potential unavailability of pipeline fuel.

Q. PLEASE EXPLAIN THE MISO CAPACITY CONSTRUCT.

A. On August 31, 2022, FERC approved MISO Tariff revisions that include the adoption of a seasonal resource adequacy construct and capacity requirements. MISO has since adopted seasonal capacity auctions with each season having its own capacity requirement based on seasonal coincident peak loads and a seasonal reserve margin. The changes also allow MISO to accredit resources based on their historic availability during Resource Adequacy (RA) hours rather than on the forced outage rate methodology where all hours are treated equally. These changes will be implemented in the 2023/2024 planning year.

Q. PLEASE DESCRIBE YOUR ANALYSIS.

A. Please refer to [IRP] Table 3-12 and ADP Table 3-12 in our Application. ADP Table 3-12 (provided below) updates the analysis included in our initial IRP filing. The analysis assumes Astoria operations during Winter Storm Uri as an example, and it provides an estimated value of having onsite fuel available at Astoria Station during such an event. It should be noted Astoria was not commercially operational during Winter Storm Uri, and therefore did not operate. This analysis examines the financial implications if Astoria would have been operational and under a must offer commitment requirement, varying timely gas nominations and Locational Marginal Pricing (LMP.)

ADP Table 3-12: February 2021 LMP Pricing Scenario

				Gas Only		LNG Dual Fuel Integration (5 Day Invty)			Net Benefit Delta	
LMP Pricing Scenario	Timely Gas Purchase: % of Daily Capacity	Timely MMBtu Purchase (MMBTu)	Intraday Purchase (MMBTu)	Net Benefit: Average Gas Case	Net Benefit: Worst Gas Case	LNG Dispatch (MWh)	Net Benefit: Average Gas Case	Net Benefit: Worst Gas Case	Net Benefit: Average Gas Case	Net Benefit: Worst Gas Case
Historical Astoria LMPs	0%	0	70,950	($840,795)	($5,346,120)	31,350	$3,862,028	$3,826,553	$4,702,823	$9,172,673
	10%	74,923	(3,973)	($2,313,096)	($6,226,902)	31,350	$3,962,974	$3,892,932	$6,276,069	$10,119,834
	15%	112,385	(41,435)	($3,102,458)	($7,240,915)	31,350	$4,013,447	$3,926,121	$7,115,905	$11,167,036
	25%	187,308	(116,358)	($4,943,698)	($12,246,128)	31,350	$4,100,203	$3,953,336	$9,043,901	$16,199,464
	50%	374,616	(303,666)	($9,678,766)	($25,815,180)	31,350	$4,256,076	$3,860,743	$13,934,842	$29,675,922
	100%	749,232	(678,282)	($19,194,308)	($53,047,505)	31,350	$4,522,414	$3,581,333	$23,716,723	$56,628,838
Historical Astoria LMPs X2	0%	0	337,722	($3,727,217)	($28,119,827)	34,200	$10,403,895	$10,276,185	$14,131,112	$38,396,012
	25%	187,308	150,414	($6,957,434)	($25,620,066)	34,200	$11,075,987	$10,990,847	$18,033,421	$36,610,913
MISO LMP Price Cap $3,500/MWh	0%	0	749,232	$208,816,344	$127,252,224	34,200	$245,272,001	$245,101,721	$36,455,656	$117,849,497
	25%	187,308	561,924	$207,466,301	$146,293,211	34,200	$247,740,255	$247,612,545	$40,273,954	$101,319,334
Historical SPP Big Stone LMPs	0%	0	533,544	$45,673,869	($9,688,416)	34,200	$71,788,382	$71,639,387	$26,114,513	$81,327,803
	25%	187,308	346,236	$43,969,076	$4,875,626	34,200	$72,460,473	$72,354,048	$28,491,398	$67,478,423

Q. WHAT ASSUMPTIONS DID YOU MAKE IN THIS ANALYSIS?

A. The analysis assumes the value of avoiding intraday natural gas forecasting uncertainty. This includes intraday pricing deltas and timing challenges associated with procurement of natural gas, offering generation, and commitment/dispatch by the MISO market. Despite using historical data,

numerous assumptions were required, including timely gas nominations, intraday purchase pricing and liquidation pricing, and changing market conditions. Sensitivity analysis was completed based on varied natural gas timely nominations and energy market pricing. We also assumed LNG dispatch of the unit being capped at five days and the output of Astoria Station at 285 MW. Assuming 285 MW of output, a five-day supply of onsite fuel would allow for generation output of 34,200 MWh from the stored fuel resource. This theoretical event contains simplified assumptions for the purpose of providing a guideline for possible futures. It also allows for utilization and optimization of a relatively low-cost, stored fuel resource within a high priced, volatile market.

Q. WHAT DOES ADP TABLE 3-12 INDICATE?

A. As provided in the yellow highlighted column "Net Benefit: Average Gas Case", in the cases where February 2021 historical Astoria LMP data was utilized, the net benefit of dual fuel capability ranged from $4.7 million to $23.7 million, depending on the amount of timely gas nominations. Similar to the analysis included in our initial IRP filing, the net benefit nearly doubles under a "worst" natural gas scenario where natural gas is either purchased at the high trading mark of the day or liquidated at the low trading mark of the day. Under the additional scenarios considering the possibility of increased LMP prices above what was historically experienced during Winter Storm Uri, the net benefit ranged from $14.1 million - $40.3 million.

Q. HAVE YOU UNDERTAKEN AN EFFORT TO DETERMINE THE PROPENSITY FOR FUTURE WINTER STORM URI EVENTS?

A. Yes. [IRP] Figure 3-11 above can be used as a guideline to determine the propensity for future Winter Storm Uri-type events, but it cannot be concluded that the propensity for such events will not grow in the future. In fact, there are reasons to conclude the propensity will in fact grow.

Q. WHAT ARE THE REASONS INDICATING THE PROPENSITY OF THESE EVENTS MAY INCREASE IN THE FUTURE?

A. First, as shown in [IRP] Figure 3-11, natural gas prices rose significantly three separate times, for different durations, over approximately a 12-year span, or roughly once every four years. Second, the North American Electric Reliability Corporation's (NERC) 2022-2023 Winter Reliability Assessment (Winter Assessment), issued November 2022, highlighted the increased risk of extreme

weather events.[2] Third, our experience with Winter Storm Elliot, which I discuss below, came only 22 months after Winter Storm Uri, suggesting these events may occur with increased frequency.

Q. HAVE YOU ASSESSED POTENTIAL NET BENEFITS OF ONSITE FUEL STORAGE AT ASTORIA STATION CONSIDERING THE PROPENSITY OF FUTURE WINTER-STORM URI EVENTS?

A. Yes. We analyzed the net benefits in ADP Table 3-12 with likelihood of events of similar magnitude occurring with a frequency of once every four years into the future. We calculated the net present value financial benefit of onsite fuel inventory by including the net benefits delta from ADP Table 3-12 into a table with an event occurring once every four years and discounting future events back to present day dollars. Using ADP Table 3-12 and a four-year propensity, the net present value of the financial benefits for many of the scenarios offsets a significant portion of the cost of the project while also increasing reliability and reducing rate volatility.

Q. HAVE RECENT EVENTS INFORMED YOUR VIEW ABOUT THE NEED FOR ONSITE FUEL STORAGE AT ASTORIA STATION?

A. Yes. Winter Storm Elliot recently had a significant impact on Astoria Station, including a forced outage, which lends support for onsite fuel storage.

Q. PLEASE DESCRIBE WINTER STORM ELLIOT.

A. Winter Storm Elliot was a significant extreme weather event that commenced December 21, 2022 and ended December 26, 2022. Winter Storm Elliot was deemed a bomb cyclone, bringing extreme cold temperatures to the eastern two-thirds of the Lower 48, with blizzard conditions occurring in several states.

Q. HOW DID WINTER STORM ELLIOT IMPACT ASTORIA STATION?

A. During Winter Storm Elliot Otter Tail experienced: (1) a forced outage at Astoria due to lack of fuel on Northern Border Pipeline, (2) natural gas pricing of $150/MMBtu, and (3) MISO committing Astoria for reliability purposes under a unit offer utilizing approximately $120/MMBtu natural gas costs even though locational marginal pricing (LMP) at Astoria was relatively low at the time. MISO

[2] Available at: https://www.nerc.com/pa/RAPA/ra/Reliability Assessments DL/NERC_WRA_2022.pdf.

provided Otter Tail make whole payments for this requested commitment which covered the unit's offer cost.

Q, PLEASE FURTHER DESCRIBE THESE EVENTS.

A. On December 23, 2022, the Northern Border Pipeline declared an operational flow order (OFO) limiting withdrawals from the pipeline to scheduled nominations.[3] Despite the MISO LMP being relatively low, and the Astoria unit being priced utilizing extremely high natural gas, MISO continued to call for the unit during December 23 and December 24. During this time, Astoria was able to utilize natural gas from Otter Tail's Park and Loan balance (PAL),[4] which Otter Tail ultimately exhausted. After exceeding Astoria's PAL balance, and still facing a declared OFO at a time when additional gas nominations were not possible, Otter Tail was forced to place Astoria on outage due to lack of fuel. When the gas markets opened on the morning of December 24, Otter Tail was unable to procure gas at Astoria *for any price* because of increased demand and production facility freeze offs. These conditions persisted for over two days. And not until December 26 did fuel become available. At that time, we purchased 3,500 MMBtu at $50/MMBtu to return us to within our PAL balance. As a result of these pipeline and gas market disruptions, Astoria was on forced outage and fully curtailed from operations from early morning December 24 into mid-morning December 26. Because of this occurrence, we expect to see a decrease in the unit's accreditation under the new Resource Adequacy accreditation methodology per Schedule 53 of MISO's Seasonal Accreditation Construct.

Q. DID OTTER TAIL SUFFER MARKET PRICE CONSEQUENCES DUE TO WINTER STORM ELLIOT?

A. Fortunately, strong regional wind generation greatly contributed to keeping Otter Tail LMP pricing relatively low. During these events, we avoided very serious market price consequences at Astoria Station in large part because strong regional wind generation helped keep Otter Tail's LMPs relatively low over these dates. Of course, we cannot count on low LMPs occurring during future pipeline/gas market disruptions. In this instance, the gas markets and LMP

[3] Northern Border Pipeline issued the OFO in order to protect system integrity. Extreme cold and blizzard conditions resulted in natural gas production and processing underperforming throughout the Bakken region (specifically the Roosevelt, Rawson, Southeast Little Missouri, and Stateline receipt points).
[4] Park and Loan (PAL) is the Northern Border Pipeline balancing service. Park and Loan is procured on an annual basis and entitles a customer to either park excess gas in the pipeline to be consumed later or to borrow gas from the pipeline to be replaced later, within a set, predetermined bandwidth.

markets diverged, which is not a common occurrence. For some of Astoria's operating hours, we were able to utilize our very limited PAL balance—and this is only something we have for the purpose of balancing withdrawals. It is not a balance we can count on for prolonged risk mitigation (of more than a few hours), and, as noted, that balance was ultimately fully depleted. Otter Tail customers could have seen very different results if regional LMP pricing would have followed natural gas pricing. Five days of onsite fuel inventory, however, would have allowed Astoria to operate continuously throughout this most recent event. Astoria would have been able to remain online as a capacity resource for MISO instead of being forced into an outage for over two days for lack of fuel.

Q. WHAT CONCLUSIONS DO YOU DRAW FROM THIS EXPERIENCE?

A. Winter Storm Elliot illustrates the reliability risks that are posed by an operational strategy that relies solely on pipeline-delivered fuel at this important generating station. These circumstances and the likelihood of similar circumstances in the future demonstrate the necessity and prudence of adding onsite fuel storage.

IV. CONCLUSION

Q. PLEASE SUMMARIZE THE KEY POINT OF YOUR TESTIMONY.

A. The addition of onsite fuel inventory at Astoria Station maintains and enhances system resiliency, the importance of which has been demonstrated by events such as the recent Winter Storm Uri and Winter Storm Elliot. Specifically, the Project substantially increases the level of resilient generation provided by Otter Tail's generation portfolio during all seasons and mitigates natural gas market volatility impacts to customers. It allows Otter Tail to preserve an important onsite fuel inventory and dispatchable-market-hedge attribute once provided by our retired Hoot Lake generation unit that we are currently without.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes, it does.

STATE OF NORTH DAKOTA
BEFORE THE
PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Prudence –
Astoria Gas Application

Case No. PU-23-

VERIFICATION

STATE OF NORTH DAKOTA)
) ss.
COUNTY OF OTTER TAIL)

RYAN D RETZLAFF, being first duly sworn on oath, deposes and says that he is the Manager of Power Services for Applicant Otter Tail Power Company; that the testimony and schedules submitted in the above-captioned matter under his name were prepared under his direction; and that he knows and verifies the contents thereof, and that the same is true and correct to the best of his knowledge and belief.

Dated this 8 day of February, 2023

Ryan D Retzlaff

Subscribed and sworn to before
me on this 8th day of February, 2023.

Notary Public
My Commission expires 1/31/2026

Valerie J Moxness
NOTARY PUBLIC
MINNESOTA
My Commission Expires Jan 31, 2026