

STATE OF NORTH DAKOTA
BEFORE THE
PUBLIC SERVICE COMMISSION



**In the Matter of Otter Tail Power
Company Advance Prudence
Application – Astoria Station
Onsite Fuel Inventory System**

**Case No. PU-23-

APPLICATION**

I. INTRODUCTION

Pursuant to N.D.C.C. § 49-05-16, Otter Tail Power Company (Otter Tail or the Company) respectfully submits this Application for an advance determination of prudence (ADP) for the Company’s proposed development, ownership, and operation of an onsite fuel inventory system at Astoria Station (the Project).

Astoria Station is a 250 MW natural gas-fired, frame-style, simple cycle combustion turbine generation facility near Astoria, South Dakota that was placed into service in early 2021.¹ Astoria Station was constructed to replace the capacity and dispatchable attributes of Otter Tail’s Hoot Lake coal-fired generating plant, retired in 2021.² However, while Astoria Station currently functions well to replace the capacity lost at Hoot Lake, its dependency on just-in-time delivered fuel limits its ability to serve as a dispatchable hedge against energy market disruptions. The now-retired Hoot Lake plant had a substantial onsite source of fuel (i.e., the coal stockpile, upon which it could operate for approximately 30 days), and this attribute was lost upon Hoot Lake’s retirement.

In this Application we propose adding an onsite fuel inventory system at Astoria Station utilizing liquefied natural gas (LNG) to provide a dispatchable-market-hedge attribute that was lost when Hoot Lake was retired. The current risk of not having onsite storage at Astoria Station is that we are dependent on just-in-time delivery of fuel from the gas pipeline. This dependency exposes our customers to uncontrollable and unpredictable market disruptions and their effects on reliability and price. Recent economy-wide supply chain events have demonstrated that reasonable operators of facilities for which high reliability is required must ensure access to inventories of crucial

¹ Otter Tail Power Company’s Application for Advanced Determination of Prudence for Astoria Natural Gas Project, Case No. PU-17-140.

² Astoria Station combined with the Merricourt Wind Energy Center comprised Otter Tail’s two-part plan to reliably meet our customers’ electric needs, replace expiring capacity purchase agreements, and to respond to the 2021 retirement of the 1950s-era 140 MW Powder River Basin (PRB) coal-fired Hoot Lake Plant near Fergus Falls, Minnesota.

inputs. More specific to the energy industry, recent events driven by 2021 Winter Storm Uri affecting the Southwest Power Pool (SPP) and Electric Reliability Council of Texas (ERCOT) illustrate that market disruptions can have catastrophic reliability and economic consequences.³ Otter Tail is not immune to such events, as recently demonstrated during Winter Storm Elliot, noted herein. The project will mitigate fuel supply and fuel price risks, and it will provide reliability and rate stability for Otter Tail customers.

Otter Tail's Integrated Resource Plan⁴ (IRP), pending before the Commission, identified dual fuel (using fuel oil) at Astoria Station by 2026 as a key part of a resilient generation portfolio that would enable Otter Tail to protect our customers from severe market disruptions. We noted that dual fuel capability at Astoria Station was a cost-effective option that would "allow Otter Tail to use natural gas supplied by the current pipeline as the main source of fuel and use stored fuel oil during rare instances of pipeline unavailability or volatile natural gas markets."

On October 14, 2022, we supplemented our initial IRP filing noting our intent to update our IRP modeling to account for the Midcontinent Independent System Operator's (MISO) recent adoption of a seasonal resource adequacy construct, as well as assess changes in MISO Planning Resource Action pricing and capacity projections, and the enactment of the Inflation Reduction Act.⁵ In that letter we noted our intent to seek an ADP for dual fuel at Astoria Station:

[O]ur revised modeling will not alter our efforts to add dual fuel capability at Astoria Station. Our preferred plan anticipates 2026 commercial operation of dual fuel at Astoria Station, and we are currently engaged in development activities with that target date in mind. We believe it is appropriate to address dual fuel at Astoria Station without delay to strengthen the resilience and availability of the unit during extreme conditions. To this end we plan to file a request for an advance determination of prudence (ADP) with the Commission. Our development work has allowed us to refine the plan for dual fuel at Astoria Station. We will outline those refinements in our ADP filing.

³ Renewable generation was at times not available, natural gas availability was at times limited, and electricity market prices and natural gas prices were at times extremely high. What Winter Storm Uri highlighted more so than any time before is natural gas volatility for availability and intra-day price risk; reliability and financial risks that onsite fuel inventory capabilities at Astoria would protect against.

⁴ *In the Matter of Otter Tail Power Company's 2022-2036 Resource Plan*, Case No. PU-21-380.

⁵ The changes to MISO's tariff allow it to move forward with seasonal capacity auctions with each season having its own requirement based on seasonal coincident peak loads and a seasonal reserve margin. These changes will be implemented in the 2023/2024 planning year. Of particular consequence is MISO's adoption of a winter season Planning Reserve Margin (PRM) of 25.50 which differs significantly from the PRM percentage forecast in the modeling for our initial IRP filing. Another significant development since the initial IRP filing was the passage of the Inflation Reduction Act (IRA), which President Biden signed into law on August 16, 2022. The IRA provides approximately \$369 billion toward wind, solar, clean energy storage, and clean energy manufacturing projects.

As described in this Application and supporting testimony we have identified LNG (rather than fuel oil) as the most cost-effective secondary fuel source for Astoria Station. Therefore, in this Application we refer to dual fuel alternatively as onsite LNG storage. This Application builds on and draws from our IRP filing concerning dual fuel. In support of this Application, the Company provides the following Direct Testimony:

- Policy - Mr. Bradley E. Tollerson;
- Project Description – Mr. Kirk A. Phinney;
- Project Need & Justification – Mr. Nathan R. Jensen;
- Project Need & Justification– Mr. Ryan D. Retzlaff.

This Application and supporting testimony demonstrate that Otter Tail’s proposed development, ownership, and operation of Astoria Station onsite fuel inventory system (a/k/a dual fuel) is a prudent resource addition. Onsite fuel inventory will mitigate fuel supply and fuel price risks, and it will provide reliability and rate stability for Otter Tail’s North Dakota customers. For these reasons, the Company respectfully requests that the Commission grant an ADP for the Astoria onsite fuel project.

II. DESCRIPTION OF APPLICANT

Applicant’s full name and post office address are as follows:

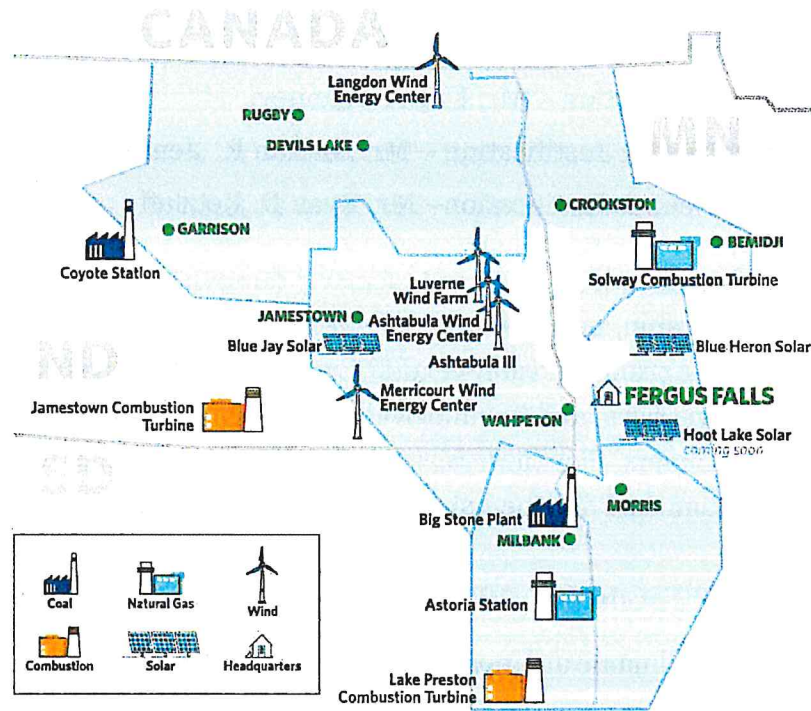
Otter Tail Power Company
215 South Cascade Street
P.O. Box 496
Fergus Falls, MN 56538-0496

Otter Tail is a Minnesota corporation duly authorized to do business in the State of North Dakota as a foreign corporation, and it is doing business in North Dakota as a public utility subject to the jurisdiction of, and regulation by, the Commission under N.D.C.C. Title 49, as amended. Otter Tail’s certificate of incorporation and amendments to the certificate have previously been filed with the Commission in Case No. PU-09-677. The certificate and amendments are hereby incorporated by reference, as though fully set forth herein. A current certificate of good standing is attached as Appendix 1.

Otter Tail’s service area covers approximately 70,000 square miles in North Dakota, South Dakota, and Minnesota. The Company has approximately 59,000 North Dakota customers spread across 224 communities in the eastern half of the state but does not cover Fargo or Grand Forks. Over sixty percent of Otter Tail’s communities, system

wide, have populations of fewer than 200 people. Figure 1 provides an overview of Otter Tail’s service area, generating facilities, and customer service centers.

Figure 1: Overview of Otter Tail Power Service Area, Generation Facilities and Customer Service Centers



III. COMMUNICATION AND SERVICE

The Company respectfully requests that the following persons be placed on the Commission’s official service list for all communications in this case:

Nathan Jensen
Manager, Resource Planning
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496
njensen@otpc.com

Cary Stephenson
Associate General Counsel
Otter Tail Power Company
215 S. Cascade Street
Fergus Falls, MN 56538-0496
cstephenson@otpc.com

We request that all communications regarding this proceeding, including data request, also be directed to:

Regulatory Filing Coordinator
Otter Tail Power Company
215 South Cascade Street
P.O. Box 496
Fergus Falls, MN 56538-0496
regulatory_filing_coordinators@otpc.com

IV. STANDARD OF REVIEW FOR ADVANCE DETERMINATION OF PRUDENCE

North Dakota Century Code section § 49-05-16(1)(d) authorizes the Commission to issue an ADP if it “determines that the resource addition is prudent.” This standard is similar to the “honestly and prudently invested” standard that the Commission uses for ratemaking.⁶ The general prudence standard calls for determining whether the utility action was reasonable at the time it was taken under all relevant circumstances.⁷ Under Section 49-05-16(1), the Commission may issue an order approving the prudence of a proposed project if four conditions are met:

1. The public utility files with its application a projection of costs to the date of the anticipated commercial operation of the resource addition;
2. The public utility files with its application a fee ... of one hundred seventy-five thousand dollars....
3. The commission provides notice and holds a hearing, if appropriate, in accordance with [N.D.C.C.] section 49-02-02; and
4. The commission determines that the resource addition is prudent. For facilities located or to be located in this state the commission, in determining whether the resource addition is prudent, shall consider the benefits of having the resource addition located in this state.

A “resource addition” means the “construction, modification, purchase, or lease of an energy conversion facility, renewable energy facility, demand response system, transmission facility, or a contract to acquire energy, capacity, or demand response for the purpose of providing electric service.”⁸ This Application seeks approval for onsite

⁶ See N.D.C.C. § 49-06-02.

⁷ See Charles F. Philips, Jr., *The Regulation of Public Utilities – Theory and Practice* at 292 (Public Utility Reports 1988); see also David J. Muchow & William A. Mogel, *Energy Law and Transactions* at § 4.02[3][b] (2009).

⁸ N.D.C.C. § 49-05-16.

LNG fuel storage at Astoria Station, which under the ADP statute is a modification of an energy conversion facility (Astoria Station).

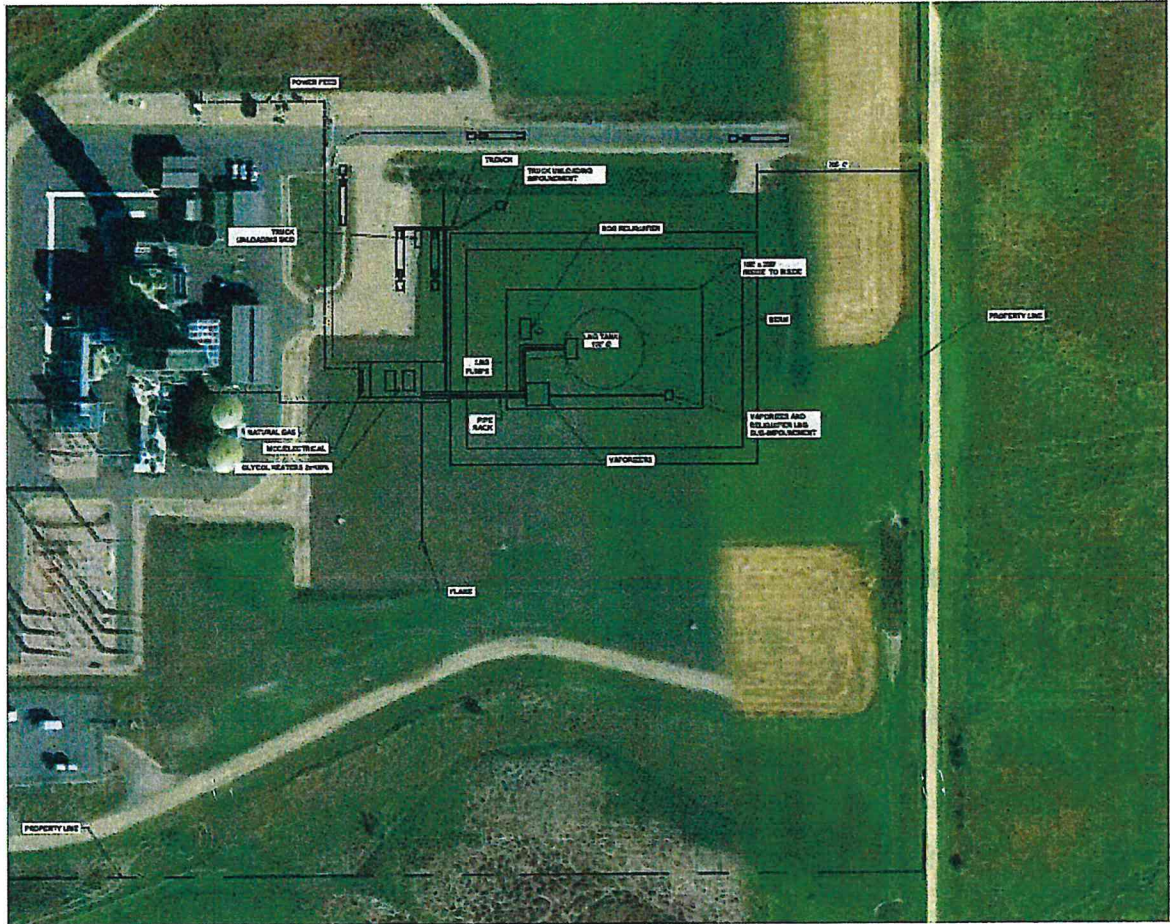
V. PROJECT DESCRIPTION, DEVELOPMENT, MANAGEMENT & COST

A. Project Description

Otter Tail proposes adding an onsite fuel inventory system at Astoria Station utilizing liquefied natural gas (LNG). The Project will provide Astoria Station a LNG storage tank and the required pumps and vaporizers to convert the liquid to a gas. The vaporized gas will be delivered to the turbine via the same onsite route as pipeline natural gas.

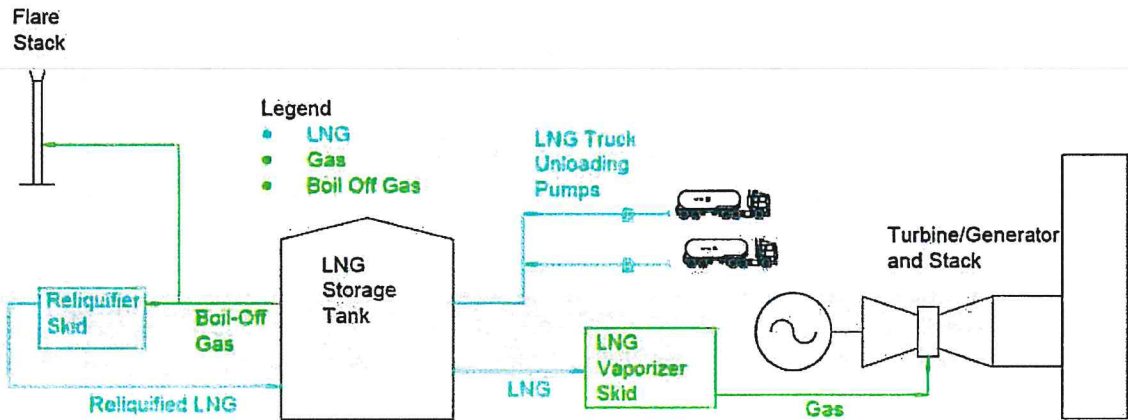
Key components for onsite LNG fuel storage include (1) a LNG truck unloading facility, (2) a 5-million-gallon LNG storage tank, and (3) a forwarding pump and vaporizer to convert the LNG to conditions suitable for the existing combustion turbine. Other systems associated with the Project are secondary containments in the event of a LNG release, fire protection systems, LNG boil off gas reliquifier, and all required electrical systems. The new equipment and systems will be installed on the property Otter Tail currently owns adjacent to Astoria Station. Figure 1 is the current proposed layout of the Project.

FIGURE 1: ASTORIA STATION SITE LAYOUT



Similar to all peak-shaving natural gas facilities, Astoria Station will utilize a LNG storage tank and the required pumps and vaporizers to convert the liquid to a gas. The vaporized gas will be delivered to the turbine via the same onsite route as pipeline natural gas. Since vaporized LNG is like pipeline natural gas, combustion turbine modifications will not be required, and combustion turbine operation will remain the same. One difference between Astoria's LNG project and other large peak-shaving natural gas facilities is that Otter Tail does not intend to install equipment to liquify pipeline natural gas onsite. Otter Tail evaluated onsite liquefaction and could not justify the added cost. This is mainly due to the frequency at which Otter Tail assumes LNG will be used. LNG will be trucked to site and will be procured under a long-term agreement that will be competitively bid. Figure 2 provides an overview LNG storage and use process.

FIGURE 2: LNG PROCESS DIAGRAM



B. Project Development

As noted above Otter Tail introduced a dual fuel project for Astoria Station in our initial IRP filing. At the time of that filing we focused on fuel oil as a secondary fuel type to be stored onsite at Astoria Station. Since then, we have completed an evaluation of fuel type. To determine the most cost-effective dual fuel source for Astoria Station, conceptual designs and cost estimates were developed for a fuel oil project and a LNG project. Otter Tail retained Sargent & Lundy to develop the fuel oil design and cost estimate and to complete the economic analysis between fuel oil and LNG. For LNG, Otter Tail retained HDR, Inc., to develop the design and cost estimate. HDR, Inc., has experience in estimating and supporting recent LNG projects. After the conceptual designs and cost estimates were completed a net present value comparison was used to determine which fuel source would have the lowest cost over a 30-year life.

The conceptual design criteria included five days of onsite fuel storage based on Astoria Station’s maximum winter capacity of 286 megawatts (MWs). Another base assumption was that the fuel stored at Astoria Station would be completely consumed once every four years. Otter Tail evaluated several options to achieve the design criteria and determined LNG as the most economical fuel type. Compared to fuel oil, LNG has lower initial capital cost, lower O&M costs, and lower fuel cost. In addition to lower overall costs, LNG does not have the emissions, capacity, or operational drawbacks or limitations that have been identified with fuel oil as a secondary fuel source

C. Project Management and Schedule

The Project will be developed and managed by Otter Tail, which has significant experience in managing large utility projects, including Astoria Station and the Big Stone Plant Air Quality Control System. Otter Tail has obtained a third-party engineer to perform the front-end engineering and design necessary to obtain all necessary permits and regulatory approvals. In conjunction with supporting permitting and regulatory approvals, the same engineer will also develop an Engineering, Procurement, and Construction (EPC) contractor bid package. Ultimately the EPC contractor will have responsibility for schedule and cost as it relates to the detailed design, procurement administration, erection, and commissioning of all project components.

Another activity that will occur in parallel with obtaining the EPC contractor will be securing a LNG supply agreement. As part of the conceptual design development, we evaluated producing LNG onsite versus having LNG delivered to site via truck. We determined that truck deliveries were more economical. The source for Astoria Station’s LNG is expected to be existing natural gas peak-shaving facilities that have onsite liquefaction. Otter Tail will issue a LNG supply agreement bid package to LNG distributors. Those distributors work with existing gas peak-shaving facilities to obtain LNG for customers and are also responsible for the delivery of LNG. The following is planned schedule to complete the project:

Receive EPC proposals	July 2023
Receive LNG supply proposals	August 2023
Obtain permits and regulatory approvals	September 2023
Begin construction	March 2024
In-Service	December 2026

D. Project Cost

The current cost estimate to complete the Project as described above is **[PROTECTED DATA BEGINS... ..PROTECTED DATA ENDS]**. A further breakdown of the project cost is:

TABLE 1: Project Cost Estimates

[PROTECTED DATA BEGINS...

...PROTECTED DATA ENDS]

These initial cost estimates are based on the best information now available and are provided in advance of the commencement of the bidding and procurement process for the Project. Given this stage of development the Company’s initial cost estimate includes a reasonable contingency.

The Company’s analyses indicate that onsite fuel inventory using LNG being put in service in 2026 is the most prudent course of action. Should the Company’s cost estimates materially change, Otter Tail submits that the Project will remain a prudent resource addition. The Commission retains oversight of the prudence of the project pursuant to N.D.C.C. § 49-05-16(5). Consistent with N.D.C.C. § 49-05-16(3), Otter Tail will provide Project updates throughout the Project’s development as may be directed by the Commission.

VI. NEED FOR AND JUSTIFICATION OF THE ONSITE FUEL INVENTORY SYSTEM AT ASTORIA STATION

Onsite LNG storage at Astoria Station will protect our customers from extreme events and market volatility. Specifically, adding LNG storage capability at Astoria Station significantly enhances the amount of resilient generation in Otter Tail’s generation portfolio. Resilient generation provided by onsite LNG storage reduces the amount of market energy exposure faced by our customers and mitigates natural gas price volatility. The net benefits to be derived from onsite LNG fuel inventory at Astoria Station are substantial when considering the past and likely future frequency of extreme, market-

changing events. For these reasons, the addition of onsite LNG inventory at Astoria Station is prudent.

A. Dual Fuel at Astoria Station Enhances Generation Resiliency.

Otter Tail introduced plans to add dual fuel capability at Astoria Station in the Company's pending IRP filing. In Section 3.8 of that filing we identified the following characteristics of resilient generation:

“Historically, resource plans have been focused on energy and capacity metrics to assess a utility’s ability to produce electricity cost-effectively and reliably for its customers. With changes in the marketplace, however, concepts of resilience have grown in significance. These concepts were highlighted during events such as the 2014 Polar Vortex and the 2021 Winter Storm Uri, where renewable generation was at times not available, natural gas availability was at times limited, and electricity market prices and natural gas prices were at times extremely high. While Otter Tail had limited exposure during these events, some other utilities experienced very concerning service interruptions and high fuel and electricity bills.

While resiliency is not a defined term as applied to generation resources, in the context of cold or hot weather conditions (mentioned above) we identify three characteristics of a resilient generation resource:

1. Dispatchability – A generation resource is dispatchable if it can reasonably be expected to generate when called upon.
2. Reliable Fuel Supply – A generation resource has a more reliable fuel supply when fuel is available onsite, when onsite fuel storage is possible or there is more than one reasonable means for fuel delivery.
3. Energy Price Protection – A generation resource has more energy price protection if the availability and cost of fuel for generation can be managed during volatile market conditions.

Table 3-8 below provides a high-level summary of what resiliency factors Otter Tail’s current and potential future generation resources possess. The resources are also listed in order of most resilient to least resilient.”

[IRP] Table 3-8: Generation Resources and Resiliency Factors

Generation Resource	Dispatchable	Reliable Fuel Supply	Energy Price Protection	Ranking Factors
1. Coal Generation	Yes	Yes	Yes	Fuel storage capability and low volatility in fuel price
2. Dual Fuel Simple Cycle	Yes	Yes	Yes	Fuel oil storage capabilities, multiple fuel sources, fuel oil storage protects from volatility in natural gas market
3. Fuel Oil Simple Cycle	Yes	Yes	Yes	Fuel oil storage capability protects from volatility in natural gas market
4. Natural Gas Simple Cycle	Yes	No	No	Without dual fuel capabilities, no storage capability, dependence on single natural gas supply pipeline, no protection from volatile natural gas markets and relatively close correlation in gas and electricity markets
5. Solar	No	No	No	Ranked higher than wind due to generation occurring during peak loads, and while not dispatchable, no significant correlation to energy and natural gas markets

6. Wind	No	No	No	No fuel storage and relatively close inverse correlation between wind generation operating and energy and gas market prices
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To provide an updated picture of the resiliency characteristics of generation resources, we provide the following ADP Table 3.8, which is the same as [IRP] Table 3-8, except we have added battery storage as one of the considered generation resources.

ADP Table 3-8: Generation Resources and Resiliency Factors

Generation Resource	Dispatchable	Reliable Fuel Supply	Energy Price Protection	Ranking Factors
1. Coal Generation	Yes	Yes	Yes	Fuel storage capability and low volatility in fuel price
2. Dual Fuel Simple Cycle	Yes	Yes	Yes	Fuel oil storage capabilities, multiple fuel sources, fuel oil storage protects from volatility in natural gas market
3. Fuel Oil Simple Cycle	Yes	Yes	Yes	Fuel oil storage capability protects from volatility in natural gas market
4. Natural Gas Simple Cycle	Yes	No	No	Without dual fuel capabilities, no storage capability, dependence on single natural gas supply pipeline, no protection from volatile natural gas markets and relatively close correlation in gas and electricity markets

5. Battery Storage*	Yes	No	No	The fuel supply cannot be considered reliable only covering 17% of one day. Limited fuel supply also diminishes the ability to protect customers in volatile events.
6. Solar	No	No	No	Ranked higher than wind due to generation occurring during peak loads, and while not dispatchable, no significant correlation to energy and natural gas markets
7. Wind	No	No	No	No fuel storage and relatively close inverse correlation between wind generation operating and energy and gas market prices

*Batteries are not technically generation; they are stored energy.

In Section 3.8 “Resilience” of our initial IRP filing we explained how dual fuel (now onsite LNG storage) can promote resilient generation:

“In addition to considering individual resource resiliency, Otter Tail also considers the resiliency of its entire generation portfolio. This includes the diversity of its portfolio and the portfolio’s ability to withstand significant unforeseen events. One question at the heart of resiliency is the extent to which wind and solar generation may be relied upon during a significant event. As shown in Table 3-8 above, from an individual generation resource level, wind and solar are not dispatchable and have other features considered less resilient than dispatchable resources. Therefore, the analysis of market exposure detailed below conservatively assumes no contribution from wind and solar resources. From an overall generation portfolio perspective,

however, it is reasonable to expect solar and wind resources to provide some generation in many of the hours of high loads. In terms of our expectations for actual operation, some portion, if not all, of the “market exposure” identified below is expected to be covered by Otter Tail’s variable resources. The addition of new resources and the removal of other resources requires Otter Tail to look at what opportunities it is taking advantage of and whether it is creating potential resiliency problems for the portfolio.

While our portfolio has performed exceptionally well, even during significant events, maintaining and enhancing the overall resiliency of the portfolio is an important consideration. One cost effective option to maintain and enhance resiliency is adding dual fuel capability at Astoria Station, which would allow Otter Tail to use natural gas supplied by the current pipeline as the main source of fuel and use stored fuel oil during rare instances of pipeline unavailability or volatile natural gas markets. Otter Tail currently operates its Solway combustion turbine in similar fashion...

...Given the three criteria listed above for assessing resiliency, Table 3-9 compares Otter Tail’s total current resilient generation resources to what the Preferred Plan resilient generation would be in 2030, assuming dual fuel capability is added at Astoria. Controllable load is also included in the list of resilient resources because the net result of a reliable load control system and a resilient generator is similar in terms of reducing market exposure during peak load situations. Two separate values have been given for summer and winter generation capabilities since Otter Tail’s combustion turbines and load control resource have varying output capabilities depending on the season.”

[IRP] Table 3-9: Resilient Generation

	Current Winter	Current Summer	Preferred Plan Winter	Preferred Plan Summer
Big Stone	256	256	256	256
Coyote	149	149	0	0
Astoria	0	0	285	245
Solway	46	43	46	43
Oil Peakers	74	69	74	69
Controllable Load	115	20	115	20
Total (MW)	640	537	776	633

Otter Tail provides the following ADP Table 3-9 “Resilient Generation” which states the current level of resilient generation in our generation portfolio assuming onsite LNG storage capability is added at Astoria. Specifically, ADP Table 3-9 replaces the columns based on 2030 resilient generation in IRP Table 3-9 with *current* resilient generation assuming onsite LNG inventory at Astoria Station.

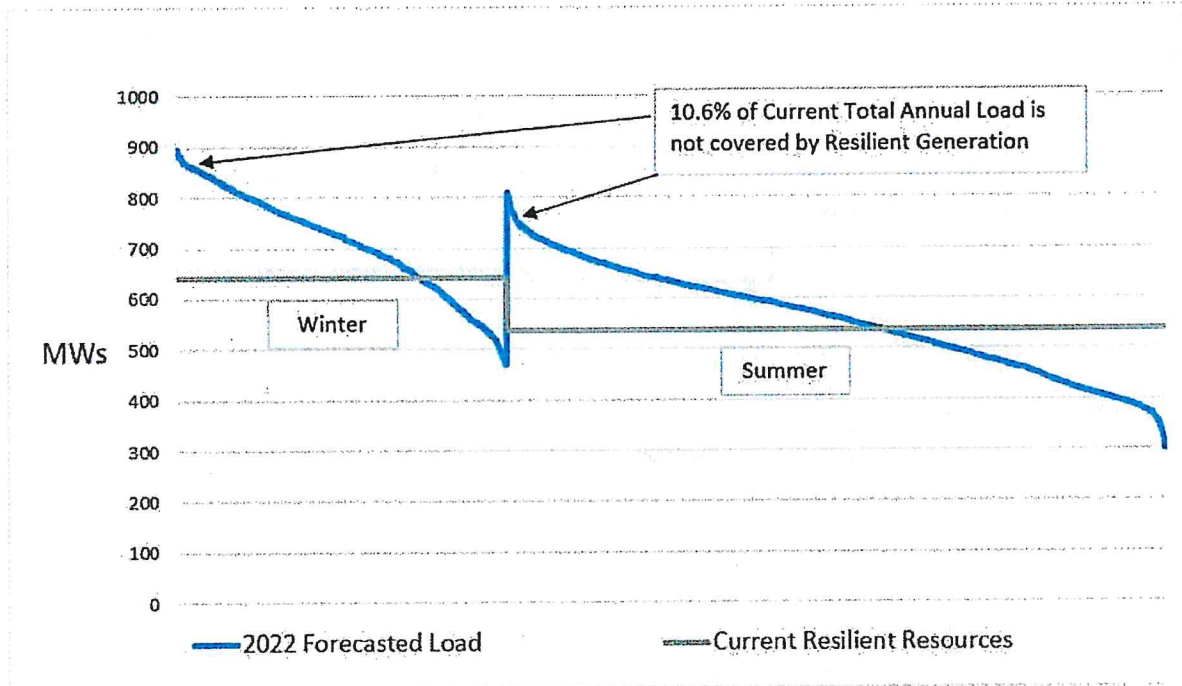
**ADP Table 3-9: 2022 Resilient Generation
(With Astoria Onsite LNG Storage)**

Resilient Resource	Current Winter	Current Summer	Current + Astoria Onsite Storage Winter	Current + Astoria Onsite Storage Summer
Big Stone	256	256	256	256
Coyote	149	149	149	149
Astoria	0	0	285	245
Solway	46	42	46	42
Oil Peakers	59	59	59	59
Controllable Load ⁹	120	115	210	115
Total (MW)	720	621	1,005	866

In our initial IRP filing we provided the following Figure 3.9, which compared Otter Tail’s 2022 forecasted hourly load to existing resilient generation capabilities:

⁹ Otter Tail current customer base includes those that allow for a considerable amount of control for which the load control is registered as a load modifying resource in MISO. Otter Tail’s load forecasts in this filing include the net of customer load and the load modifying resources.

[IRP] Figure 3-9: 2022 Forecasted Load Relationship with Resilient Generation

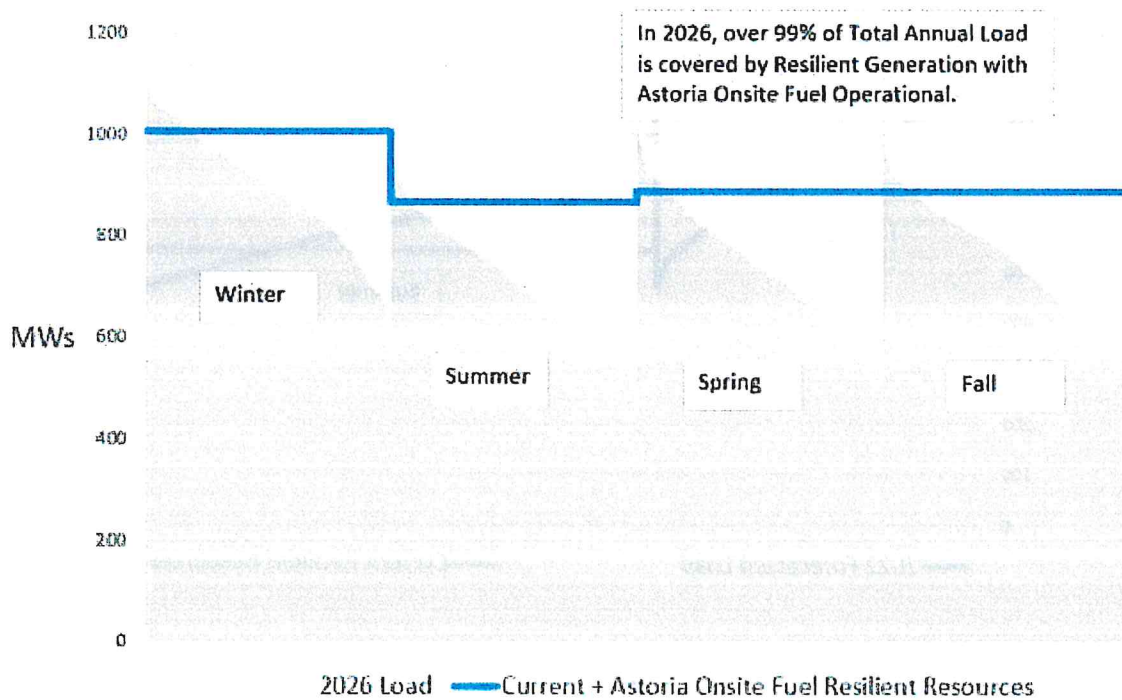


We explained Figure 3-9 as follows:

“The blue line in Figure 3-9 depicts OTP’s winter and summer load duration curves. A load duration curve illustrates the total amount of load in each hour of the season arranged in order of magnitude. From it, we can consider the maximum amount of load we need to be prepared to serve over the course of a year. The grey line in Figure 3-9 is drawn to show the level of our resilient generation resources. The purpose of this figure is to show the relationship between resilient generation capabilities and forecasted hourly load and potential market exposure if variable resources were not generating at the time load exceeded the resilient generation capabilities. As shown in the figure, Otter Tail projects that 10.6 percent of its overall load will be exposed to market energy prices assuming no variable resource generation in 2022.”

ADP Application Figure 3-10 below similarly compares Otter Tail’s 2026 forecasted hourly load with the resilient generation from current resources plus Astoria onsite LNG storage. As illustrated by ADP Application Figure 3-10, onsite LNG storage (a/k/a dual fuel) at Astoria Station reduces the amount of load not backed by resilient generation from 10.6 percent to zero percent in the winter and almost zero percent in the summer.

ADP Figure 3-10: 2026 Forecasted Load Relationship with Resilient Generation (Current plus Astoria Onsite LNG Storage)



Assuming for analysis that Otter Tail did not add dual fuel at Astoria Station, then ADP Application Figure 3-10 does not fully capture the total market risk, and the total market risk in 2026 would be similar to 2022 in Figure 3-9 above. As we explained in our initial IRP filing:

“The reason for this is because 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. Relying on natural gas units to serve load during volatile market situations will not provide adequate price protection for customers unless those units have the ability and fuel on hand to switch to an alternate fuel source when natural gas prices are elevated. There is also the potential in extreme situations that natural gas might not be available, in which case the unit would be forced offline and unable to generate when it is needed most. This makes the addition of dual fuel capability at Astoria a particularly attractive resiliency enhancement.

...To reduce the risk associated with natural gas generation, Otter Tail currently uses forward energy purchases to hedge against the potential for high natural gas prices in the winter months. Recently

the forward energy purchase price points have been competitive due to the low market prices seen in the last handful of years. This is an adequate solution for the time being but adding dual fuel capability at Astoria will mitigate the need for forward energy hedge which Otter Tail finds desirable to reduce exposure to the forward energy purchase market.”

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 initial 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. In summary, forecasted market pricing has increased significantly since our September 2021, and that increase has brought even greater emphasis to the market exposures that we described in our initial IRP filing.

B. Onsite LNG Storage at Astoria Station Mitigates Natural Gas Price Volatility and Provides Significant Net Benefits.

In Section 3.10 of our initial IRP filing “Adding Dual Fuel Capabilities at Astoria Station” we noted the connection between extreme weather events (such as Winter Storm Uri) and natural gas price volatility and intra-day price risk:

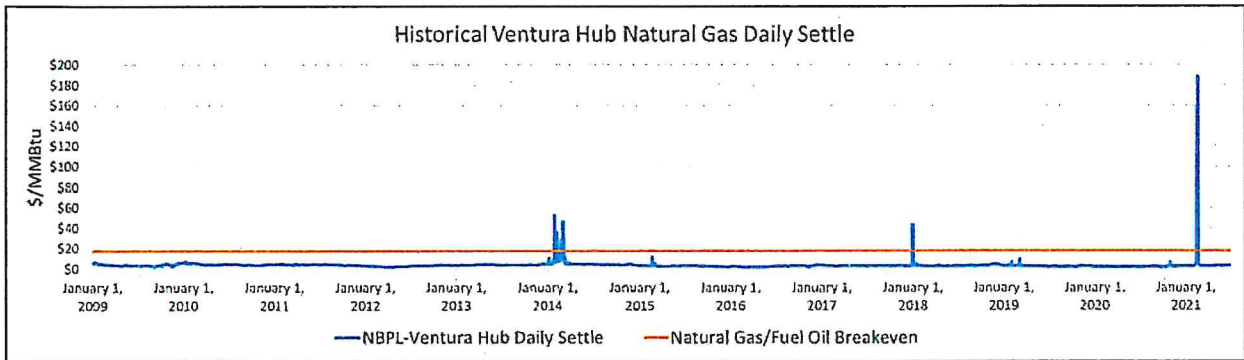
“Astoria Station was designed, permitted, and constructed with natural gas as the sole source of fuel. Prior to selecting a combustion turbine, Otter Tail confirmed that any one of the potential combustion turbines selected could be converted to dual fuel. To be clear, MISO does not currently require dual fuel capabilities for capacity accreditation. Prior to MISO, it is our understanding that MAPP (the Midwest Area Power Pool) required fuel oil backup for natural gas fired units which is why we have fuel oil backup at our Solway Power plant. The natural gas transmission lines are very reliable. In fact, even during Winter Storm Uri in February 2021, natural gas would have been available for Astoria Station if it would

have needed to operate. What Winter Storm Uri highlighted more so than any time before is natural gas volatility and intra-day price risk; risk that dual fuel capabilities at a peaker would protect against. The volatility seen during Winter Storm Uri demonstrates that installation of dual fuel capability at Astoria is justified and have inherent reliability benefits, as discussed below.

Natural Gas Price Volatility

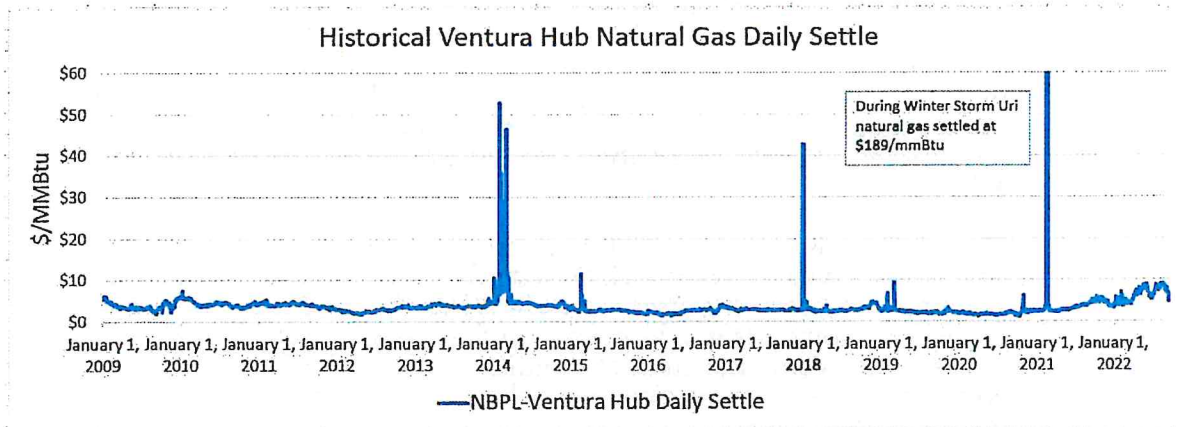
The natural gas transmission lines, where the Otter Tail natural gas peakers are located, are very reliable. The extraordinary pricing variability during the 2021 Winter Storm Uri event generated our internal review of the intra-day pricing variability exposure of a natural gas generator without a secondary 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. Figure 3-11 below depicts the gas market prices since January 2009.

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



Otter Tail provides ADP Application Figure 3-11 below depicting the 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 2021 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



Since our initial IRP filing, world events have caused volatility in the gas markets. This is due to a variety of events including the world’s response to the war in Ukraine, and as detailed above, it has caused gas prices to more than double, on average, in the near term compared to those forecasted in our initial IRP filing.

To analyze the economic benefits of onsite LNG storage at Astoria Station when considering the intra-day pricing risk one must focus on three primary factors: (1) protection against intraday natural gas pricing deltas,¹⁰ (2) energy hedge value,¹¹ and (3) the changing MISO capacity construct.¹² In Section 3.10 of our initial IRP filing we provided an analysis of the value of having dual fuel (now onsite LNG storage) at Astoria Station incorporating these factors:

¹⁰ 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. Dual fuel capability mitigates if not eliminates this risk by providing a known and stable fuel supply during extreme natural gas pricing events.

¹¹ Without the ability to call on Astoria Station for dual fuel capability (and therefore run the facility at a pre-determined energy price), Otter Tail has utilized energy purchases at the Otter Tail load zone to hedge against high priced, natural gas-driven markets during the winter months of December, January, and February. This winter energy hedge purchase could likely be significantly reduced or eliminated with installation of dual fuel. While not directly related to intraday pricing risk, this value can be considered in the analysis.

¹² At the time of initial IRP filing MISO was considering but had not adopted changes to its capacity construct. 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 moved to adopt 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.

“Using Winter Storm Uri as an example, Otter Tail has been able to back cast the value of having dual fuel available at Astoria Station.¹³ The data below provides insight on the potential, historical, financial implications. The following 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.

The analysis is based on historical energy and natural gas pricing data during Winter Storm Uri. Despite the historical data, numerous assumptions were required, complicating the analysis, 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.

[IRP] Table 3-12: February 2021 LMP Pricing Scenario

LMP Pricing Scenario	Timely Gas Purchase: % of Daily Capacity	Timely MMBtu Purchase (MMBTu)	Intraday Purchase (MMBTu)	Gas Only		Dual Fuel Integration			Net Benefit Delta	
				Net Benefit: Average Gas Case	Net Benefit: Worst Gas Case	Fuel Oil 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	43,696	(\$545,053)	(\$2,388,478)	20,825	\$2,736,879	\$2,736,879	\$3,281,932	\$5,125,357
	10%	72,098	(28,402)	(\$2,158,476)	(\$5,394,416)	20,825	\$2,801,247	\$2,710,305	\$4,959,723	\$8,104,721
	15%	108,148	(64,452)	(\$3,016,393)	(\$7,449,380)	20,825	\$2,833,431	\$2,697,018	\$5,849,825	\$10,146,398
	25%	180,246	(136,550)	(\$4,834,641)	(\$12,663,298)	20,825	\$2,897,799	\$2,670,444	\$7,732,440	\$15,333,742
	50%	360,492	(316,796)	(\$9,391,184)	(\$25,720,761)	20,825	\$3,047,796	\$2,581,341	\$12,438,980	\$28,302,102
Historical Astoria LMPs X2	0%	0	281,293	(\$3,059,285)	(\$16,700,630)	35,525	\$8,991,457	\$8,868,562	\$12,050,742	\$25,569,192
	25%	180,246	101,047	(\$6,509,090)	(\$18,603,269)	35,525	\$9,326,478	\$9,244,548	\$15,835,568	\$27,847,817
MISO LMP Price Cap \$3,500/MWh	0%	0	720,984	\$173,912,028	\$95,423,088	64,680	\$216,278,628	\$216,114,768	\$42,366,600	\$120,691,680
	25%	180,246	540,738	\$172,612,885	\$113,746,180	64,680	\$216,613,650	\$216,490,755	\$44,000,764	\$102,744,574
Historical SPP Big Stone LMPs	0%	0	494,311	\$35,155,620	(\$13,818,038)	38,710	\$66,852,204	\$66,708,827	\$31,696,585	\$80,526,865
	25%	180,246	314,065	\$33,105,452	(\$4,972,881)	38,710	\$67,187,226	\$67,084,813	\$34,081,774	\$72,057,694

The possible benefits of having dual fuel at Astoria Station varied significantly based on the given sensitivity. In the cases where February 2021 historical Astoria LMP data was utilized, the net benefit of dual fuel capability ranged from \$3.2 million to \$21.8 million, depending on the amount of timely gas nominations. 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.

Additional scenarios considered the possibility of increased LMP prices above and beyond what was historically experienced during Winter Storm Uri. Under these scenarios, the net benefit ranged from \$12.1 million - \$44.0 million. While some of these scenarios have a very remote possibility of occurrence, it is prudent to mitigate these risks and increase our fleet resiliency by adding dual fuel capability at Astoria Station.”

¹³ During Winter Storm Uri Otter Tail had not yet retired Hoot Lake and Astoria Station was still in the testing phase. As such, these costs were not incurred by Otter Tail or its customers.

Otter Tail’s analysis in developing the onsite LNG storage project identified that the delivery of additional fuel is uncertain. For this reason, we updated [IRP] Table 3-12 with following ADP Table 3-12 which caps the dispatch of the unit at five-days.¹⁴ It also updates the output of Astoria Station from 245 MW to 285 MW and allows for unit commitment in the real-time energy market.

Assuming 285 MW of output, a five-day supply of onsite fuel would allow for generation output of 34,200 MWh from the stored dual 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.

ADP Table 3-12: February 2021 LMP Pricing Scenario

LMP Pricing Scenario	Timely Gas Purchase: % of Daily Capacity	Timely MMBtu Purchase (MMBTU)	Intraday Purchase (MMBTU)	Gas Only		LNG Dual Fuel Integration (5 Day Invty)			Net Benefit Delta	
				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
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

In ADP Table 3-12 the benefits of having dual fuel at Astoria Station varied significantly based on the given sensitivity. 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 IRP analysis, 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.

Astoria Station’s location on the Northern Border Pipeline is advantageous. It is located between the Canadian and North Dakota supplier injection points and

¹⁴ 5 days x 24 hours x 285 MWs = 34,200 MWh. The 285 MW is the winter capacity as reflected in ADP Table 3-9 above.

the higher load centers to the southeast. It is important to note that natural gas was always available for Astoria Station during Winter Storm Uri in February 2021. However, while the deliverability of gas was stable, the price for the delivered gas was high. Even if one believes gas deliveries would remain stable in a future event (which cannot be guaranteed, of course), onsite fuel storage capability still mitigates the risk of intraday pricing volatility and overall energy pricing risks that were experienced by some other utilities during the February 2021 event.

[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, including the late December 2022 event. In any event, in [IRP] Figure 3-11, natural gas prices rose significantly three separate times, for different durations, over a 12-year span, or roughly once every four years.

The North American Electric Reliability Corporation's (NERC) 2022-2023 Winter Reliability Assessment (Winter Assessment),¹⁵ issued November 2022, highlighted the increased risk of extreme weather events. NERC's concern in the Winter Assessment is that MISO's winter reserve margin dropped from 48 percent last year to 43 percent this year – a drop of 5 percentage points. However, NERC's Winter Assessment also shows that the required "normal" reserve margin is about 18 percent. So, the issue is the trend of declining reserve margins rather than the immediate impact. In addition, NERC may be concerned that extreme weather events are likely to be more common than in the past.

Given this history and recent events, for the sake of creating price stability and reducing unknowns for our customers, 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.¹⁶ 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.

¹⁵ Available at: [https://www.nerc.com/pa/RAPA/ra/Reliability Assessments DL/NERC_WRA_2022.pdf](https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2022.pdf).

¹⁶ Astoria Station was commissioned in 2021 with a 35-year life to 2056. Astoria Station dual fuel will be commissioned in 2026.

Recent events further illustrate the risks of relying solely on just-in-time fuel deliveries from the gas pipeline. Winter Storm Elliot commenced December 21 and ended December 26, 2022, with the most significant threats to reliability occurring from December 23 through December 24, 2022.¹⁷ As more fully described below, Winter Storm Elliott caused or contributed to: (1) a forced outage at Astoria due to lack of fuel available on Northern Borders Pipeline (2) natural gas supply at \$150/MMBTu, and (3) MISO committing Astoria for reliability purposes under a unit offer utilizing approximately \$120/MMBTu natural gas costs even though LMP at Astoria was relatively low the morning of December 23, 2022. These unusual circumstances and the possibility for similar situations in the future bear out the prudence of having onsite fuel storage.

Extreme operating conditions for Astoria commenced on December 23 when the Northern Borders Pipeline serving Astoria declared an operational flow order (OFO) limiting the withdrawals from the pipeline to scheduled nominations. Despite 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)¹⁸. Otter Tail eventually exhausted and slightly exceeded its available PAL balance during this time.

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. Later once the gas markets opened 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. As a result, Astoria was on forced outage due to lack of fuel from early morning December 25 into mid-morning December 26. With no fuel onsite to replace the pipeline gas, Astoria's offers were obviously dropped to zero megawatts. Because of this, Otter Tail can expect to see a decrease in their accreditation as a result of the new Resource Adequacy hour methodology per Schedule 53 in MISOs Seasonal Accreditation Construct. At the point on December

¹⁷ Winter Storm Elliot Winter 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. See <https://www.wunderground.com/article/storms/winter/news/2022-12-23-winter-storm-elliott-bomb-cyclone-midwest-northeast-winds-snow>. The North American Electric Reliability Corporation's (NERC) 2022-2023 Winter Reliability Assessment issued in November 2022 (available at [https://www.nerc.com/pa/RAPA/ra/Reliability Assessments DL/NERC_WRA_2022.pdf](https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_WRA_2022.pdf)) highlights the increased risk of extreme weather events and seemingly foreshadowed Winter Storm Elliot.

¹⁸ 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.

26 that fuel became available we purchased 3,500 MMBtu at \$150/MMBtu to return us to within our PAL balance.

Fortunately, strong regional wind generation appears to have kept Otter Tail LMP pricing relatively low. The gas markets and LMP markets diverged. For most of Astoria's operating hours we were able to utilize relatively cheap gas procured in advance of Winter Storm Elliot. Otter Tail customers could have seen very different results if regional LMP pricing would have followed natural pricing. Five days of onsite fuel 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 lack of fuel. We also would have been able to utilize relatively cheap stored LNG to generate into at high gas market, providing financial benefits to Otter Tail's customers.

VII. CONCLUSION

For the reasons set forth above, Otter Tail Power respectfully requests the Commission grant an ADP for the Company's proposed Astoria Station onsite fuel inventory system.

DATED: February 8th, 2023

Respectfully submitted,

OTTER TAIL POWER COMPANY

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Case No. PU-23-

Appendix 1

Certificate of Good Standings

State of North Dakota

SECRETARY OF STATE



Certificate of Good Standing of OTTER TAIL POWER COMPANY

SOS Control ID#: 0000016296

Certificate #: 022900722-1

The undersigned, as Secretary of State of the state of North Dakota, hereby certifies that, according to the records of this office,

OTTER TAIL POWER COMPANY

a Corporation - Business - Foreign was formed under the laws of MINNESOTA and filed with this office effective February 24, 1914. This entity has, as of the date set forth below, complied with all applicable North Dakota laws.

ACCORDINGLY, the undersigned, as such Secretary of State, and by virtue of the authority vested in him by law, hereby issues this Certificate of Good Standing.

DATE: January 19, 2023

A handwritten signature in black ink that reads "Michael Howe". The signature is written in a cursive style with a long horizontal stroke at the end.

Michael Howe
Secretary of State