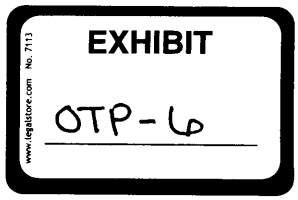

STATE OF NORTH DAKOTA
BEFORE THE
PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Prudence – Astoria Gas
Application

Case No. PU-17-

DIRECT TESTIMONY

OF

WILLIAM SWANSON

ON BEHALF OF

OTTER TAIL POWER COMPANY

Project Development Testimony

PUBLIC DOCUMENT – NOT PUBLIC DATA HAS BEEN EXCISED

April 10, 2017

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I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is William Swanson. I am Manager of Supply Engineering for Otter Tail Power Company (Otter Tail or the Company).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have a Bachelor of Science degree in Mechanical Engineering from North Dakota State University. I am a registered professional engineer in the state of South Dakota. I have worked in the Energy Supply area of Otter Tail Power Company for 22 years, holding various positions including Plant Engineer, Engineering Supervisor, and Site Manager (Big Stone II Project). I currently serve as Manager of Supply Engineering.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to support the Company's application for an Advance Determination of Prudence (ADP) for the Astoria Station. In particular, I describe:

- The Project and associated facilities;
- Our planned approach to development, engineering, procurement, and construction of the Project;
- The key risks the Company has identified in its analysis of the Project and how we intend to address them; and
- Our efforts to minimize Project-related sales/use and property taxes for the benefit of our customers.

II. DESCRIPTION OF PROJECT

Q. PLEASE DESCRIBE ASTORIA STATION.

A. Otter Tail proposes to develop, own and operate an approximately 250 MW natural gas-fired, frame-style, simple cycle combustion turbine near Astoria, South Dakota. The Project includes all associated facilities, including a short segment of natural gas pipeline necessary to interconnect to the Northern Border Pipeline, and a generation-tie line necessary to interconnect the Project to a switching station to be constructed by the co-

owners of the Big Stone South-Brookings County 345 kV electric transmission line. The Project will be designed with quick-start capability to serve a load-following function and provide for peak capacity needs.

Q. HAS THE COMPANY DETERMINED THE FINAL PROJECT DETAILS?

A. No. The Company has decided on natural gas as a fuel source and a simple cycle combustion turbine as the basic energy conversion technology. Otter Tail has also determined that it will utilize a frame-style turbine in the approximately 250 MW range, equipped with quick-start capability. The final size of the simple cycle turbine and the specific features to be included will be determined through Otter Tail's sourcing efforts, initiated closer to the time of construction. The Company will seek to purchase the lowest evaluated cost combustion turbine then available on the market, consistent with the size of the Company's capacity needs.

Q. WHAT DO YOU MEAN THAT THE COMBUSTION TURBINE WILL BE IN THE APPROXIMATELY 250 MW RANGE?

A. Otter Tail's capacity needs are currently forecast to be approximately 273 MW in 2021, as discussed in Mr. Draxten's testimony. That amount of capacity need indicates that a simple cycle turbine should be sized at approximately 250 MW. Therefore, Otter Tail intends to source a combustion turbine in that size range. However, because different combustion turbine manufacturers have different sized machines in that range, the exact size of the simple-cycle generator will not be known until we select and procure the turbine.

Q. WHEN DOES THE COMPANY PLAN TO COMPLETE THE PROJECT?

A. The Project is expected to be placed in service no later than May 2021, in order to meet the Company's anticipated capacity need at that time.

Q. WHERE WILL THE PROJECT BE LOCATED?

A. As noted, the Project will be located near Astoria in Deuel County, South Dakota. The Company purchased property near the intersection of the Northern Border Pipeline and

the Big Stone South-Brookings County 345 kilovolt transmission line, where the Project is to be developed and constructed. Because of the site's proximity to both natural gas and electric transmission, the site is advantageous for development of natural gas-fired generation. The Company is currently working to finalize the precise location of the generation equipment and associated facilities.

Q. PLEASE DESCRIBE ANY OTHER BALANCE OF PLANT FACILITIES NECESSARY FOR THE PROJECT.

A. The Project will also include an approximately 10-inch diameter segment of natural gas pipeline less than 1000 feet in length to the Northern Border Pipeline in order to access the natural gas needed for the combustion turbine. In addition, the Project will require that a 345 kV generation tie line be built to a switching station to be constructed by the co-owners of the Big Stone South-Brookings County 345 kV electric transmission line at a point designated by MISO in its interconnection process. The costs associated with the natural gas pipeline segment and generation-tie line are included in our cost estimates for the Project.

Q. WHAT IS A SIMPLE CYCLE COMBUSTION TURBINE?

A. A combustion turbine is essentially a type of internal combustion engine. It has an upstream rotating compressor coupled to a downstream turbine, and a combustion chamber in between. In a simple cycle combustion turbine, air is introduced into the front of the unit and is compressed using rows of rotating blades. The compressed air is then sent to a combustion chamber where it is mixed with fuel and ignited. The hot combustion gases are then expanded through rotating turbine blades, delivering mechanical energy that rotates the generator to produce electricity.

Modern simple cycle combustion turbines are generally capable of starting quickly in order to serve peak capacity needs and follow load as necessary. The generator will be air-cooled in order to avoid incurring cost for additional equipment. The unit will be fueled by natural gas only, so that additional equipment for fuel oil or other liquid fuels is unnecessary.

Q. DESCRIBE THE DIFFERENCE BETWEEN SIMPLE CYCLE AND COMBINED CYCLE GENERATION.

A. A simple cycle combustion turbine generator can be a stand-alone facility like the Project, or it can be part of a larger and more complex system at a combined cycle plant. A combined cycle plant captures a simple cycle generator's exhaust energy in a heat recovery steam generator (or HRSG) which, in turn, produces steam to operate a second steam turbine cycle. Combining the steam cycle with the gas cycle improves overall plant efficiency, but requires considerably more capital to build. A simple cycle combustion turbine is the core building block of a combined cycle plant and, therefore, a simple cycle site could be converted to combined cycle at a later date. We are prudently developing Astoria Station with the flexibility to add combined cycle generation if circumstances later warrant it.

Q. WHAT TYPES OF COMBUSTION TURBINE TECHNOLOGIES COULD BE CONSIDERED FOR USE IN THE PROJECT?

A. Simple cycle combustion turbines can be broadly categorized into small aero-derivative and large frame technologies. Aero-derivative turbines are generally characterized by smaller size, quicker starting capability, and modular construction. They are essentially analogous to jet engines. Their electric generation output is less than that of frame turbines. Otter Tail currently owns and operates an approximately 50 MW aero-derivative combustion turbine at its Solway, MN site.

Frame machines, by contrast, are characterized by lower pressure ratios and tend to be physically large. Frame machines can have output capability in excess of 300 MW. On a per kW basis, frame-style combustion turbines are less costly due to economies of scale. Historically, frame turbines required longer starting times than aero-derivative units, but recent frame technology has reduced the start time to less than ten minutes for the purpose of efficiently following load. In addition, recent technical gains by frame manufacturers have improved the efficiency in current frame turbine models.

Q. WHAT TYPE OF SIMPLE CYCLE COMBUSTION TURBINE IS PROPOSED FOR ASTORIA STATION?

A. We are proposing to install a frame machine, which makes it easier to accommodate the 250 MW need that we have identified. This technology is superior to alternative combustion turbine technologies, as it allows Otter Tail to realize economies of scale.

Q. WHAT CRITERIA WERE USED TO EVALUATE THE ASTORIA, SOUTH DAKOTA SITE?

A. The primary considerations for siting a combustion turbine are proximity to reliable and robust natural gas and electric transmission infrastructure. One of the largest drivers of the overall cost for developing simple cycle generation is the need to construct pipeline segments for natural gas access and electric transmission lines to interconnect to the electric transmission grid. Minimizing these costs enables a least-cost project, because turbine and installation costs are generally the same for any site. Other considerations include site suitability for construction, capital costs, availability of water, permitting, local conditions and tax incentives.

Q. HOW DID THE COMPANY UNDERTAKE ITS SITE EVALUATION?

A. The Company reviewed locations within its service area where major natural gas pipelines intersected with significant electric transmission infrastructure. The Company originally assessed several sites throughout North Dakota, South Dakota, and Minnesota. It then narrowed its consideration to three North Dakota sites (near Wishek, Ellendale, and Merricourt), one South Dakota site, and one Minnesota site. The Company reviewed historical and projected locational marginal pricing (LMPs) at each site, site suitability for construction, capital costs (including anticipated interconnection costs under MISO's generator interconnection process), available tax incentives, and required permits. The Company also reviewed the availability of water resources necessary for the Project.

Q. WHAT WERE THE RESULTS OF THE SITE EVALUATION?

A. The Astoria site was identified as the preferred site due to its proximity to the intersection of the Northern Border Pipeline and the CapX2020 Big Stone South-Brookings County

345 kV transmission line. Otter Tail's assessment is that the Astoria site requires the least amount of supporting infrastructure investment, which reduces capital investment and ensures that the project will be least-cost. Moreover, it would impose minimal disruption to landowners, as opposed to a project requiring a long natural gas pipeline segment or electric transmission line to be constructed. Finally, the Astoria site is sufficiently large to allow for plant expansion in the future.

The North Dakota sites considered would have required significant natural gas pipeline segments from the Northern Border Pipeline. Long pipeline segments would impact a far greater number of landowners and would add significant cost to the Project. By contrast, no such significant pipeline segment is required at the South Dakota site. As Mr. Tollerson testified, Otter Tail explored whether there were ways to more economically extend a pipeline segment for a North Dakota site.

The Company also considered its existing Solway, Minnesota site. As a brownfield site, Solway had several advantages. However, unlike the Astoria site, Solway does not have sufficient electric transmission infrastructure to support an additional simple cycle generator and likely would have required additional electric transmission routing and investment. In addition, there would have been more landowner impact.

Further, the Solway site had disadvantages from a reliability perspective in two respects. First, the Solway site already has natural gas electric generation served by the Great Lakes Gas Transmission pipeline. Adding additional generation at that site would increase reliance on natural gas supply from that single pipeline. The Company believes it is prudent to diversify its reliance on natural gas supply to mitigate exposure to fuel supply disruption. Astoria Station will accomplish this by being served by the Northern Border Pipeline. Second, adding natural gas generation in a different part of the Company's service territory provides geographic diversity for our generation resources. Geographic diversity provides benefits by mitigating storm and other site-specific risks.

Q. WHAT IS THE ESTIMATED COST FOR ASTORIA STATION?

A. The estimated cost of the Project is $165 million. This estimated cost includes engineering, procurement, and construction of the generation plant, the natural gas pipeline segment, interconnection facilities, and reasonable contingencies. While the estimate includes escalation, it does not include AFUDC.

Q. PLEASE PROVIDE A HIGH-LEVEL BREAKDOWN OF SIMPLE CYCLE COMBUSTION TURBINE, INTERCONNECTION, AND NATURAL GAS PIPELINE PORTIONS OF THE PROJECT.

A. A high-level breakdown follows:

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...NOT PUBLIC DATA ENDS]

Reasonable contingencies consistent with early-stage generation development are included in the categories above. Escalation is estimated by using an escalation factor based on the timing of when actual expenditures are expected to occur.

Q. HAS OTTER TAIL FINALIZED THESE COST ESTIMATES?

A. No. The cost estimates are preliminary and are based on Otter Tail's market knowledge and preliminary engineering studies. I believe the estimates are reasonable at this stage of development. I discuss drivers for these costs, related risks, and Otter Tail's approach to managing these risks later in my testimony.

Q. IS IT REASONABLE FOR THE COMMISSION TO GRANT AN ADP BASED ON PRELIMINARY ESTIMATES?

A. Yes. In the Application and supporting testimony, the Company has provided a detailed and reasoned justification for moving forward with a simple-cycle combustion turbine. Further, Otter Tail has concluded that ownership, rather than a capacity purchase agreement, is the most appropriate structure for the simple cycle plant, because it would extend the availability of the capacity to meet customer needs materially beyond industry-standard capacity purchase agreement terms and will allow for future expansion of the plant should circumstances warrant. Given these considerations, the biggest cost driver is site selection inasmuch as this drives the two largest variables of simple cycle generation development: electric transmission and natural gas infrastructure. Otter Tail's selection of the Astoria Site mitigates these variables. Consequently, Astoria Station is the least-cost simple cycle generation available to Otter Tail.

III. REASONABLE MITIGATION OF RISKS

Q. WHAT IS THE PURPOSE FOR THIS SECTION OF YOUR TESTIMONY?

A. In this section of my testimony, I provide the Company's assessment of the risks associated with Astoria Station and the Company's efforts to prudently manage those risks. Specifically, this section covers:

a. A description of the MISO Generator Interconnection Process and the Company's efforts to develop the Project despite challenges in estimating interconnection costs under current circumstances;

b. A description of the Company's approach to the development, engineering, procurement and construction of the Project and the potential issues we foresee in that process; and

c. A discussion of how the Company addresses the development and construction risks identified with the Project.

A. **Approach to Interconnection Cost Risk**

Q. DID OTTER TAIL ANALYZE INTERCONNECTION ISSUES AT THE SITES IT CONSIDERED?

A. Yes. Otter Tail conducted its own internal transmission analyses to determine how much power could be injected into the MISO grid at the likely interconnection points for each of the sites under consideration. The Company has compared this Project and its estimated interconnection costs with other potential sites. Locating the project on the Astoria site is projected to have lower interconnection costs compared to other locations on the grid. The Astoria site can absorb greater power injection into the transmission system compared to the other sites.

Q. PLEASE EXPLAIN THE GENERATOR INTERCONNECTION PROCESS THAT MUST BE FOLLOWED FOR THE PROJECT.

A. The MISO generator interconnection process groups generators for study based on when their interconnection requests were filed. The Project is part of the February 2016 Definitive Planning Phase (DPP) study group. MISO will perform an analysis to determine the feasibility, impacts, and interconnection cost estimates for the Project and its study group. Upon completion of the analysis, a Generation Interconnection Agreement (GIA) for the Project will be negotiated and signed, allowing the Project to interconnect to the transmission system.

The sheer volume of generation projects currently seeking to interconnect in MISO has led to greater uncertainty in interconnection costs than in the past. Previous MISO study groups have typically included approximately 1,500 MW of new generation in a single study. Current study groups include approximately 6,000 MW of new generation in a single study. The large amount of new generation being included in each study group study has created significant cost uncertainty for all potential projects moving through the MISO generator interconnection process.

Q. WHAT IS THE NATURE OF THE COST RISK OF THE MISO GENERATOR INTERCONNECTION PROCESS?

A. Because of the study timelines plus the amount of generation currently in the interconnection queue, it is not possible to know at this time the precise interconnection costs that could be imposed by MISO for this interconnection request. The MISO queue is currently very congested with many potential generation projects with queue positions and rights to be studied for interconnection under the MISO Tariff. If all of the projects in the queue move forward to completion it would result in the need for numerous significant interconnection upgrades to accommodate them. However, the reality is that many of the projects in the interconnection queue may not have offtakers or other outlets for the power from their projects. If, as a consequence of that circumstance, many of these projects drop out of the queue, it will substantially change the required interconnection upgrades, which will affect the costs that may be allocated to the remaining projects.

Q. WHEN DOES THE COMPANY EXPECT GREATER CLARITY ON INTERCONNECTION COSTS FROM THE MISO GENERATOR INTERCONNECTION PROCESS?

A. The Company is expecting MISO's first estimate of interconnection costs for the February 2016 study group in May or June of 2017, with a GIA being signed in 2018. In the meantime, the Company will continue to perform additional analyses to estimate costs, as models and assumptions are refreshed throughout the MISO generator interconnection process.

Q. HOW ELSE IS THE COMPANY ADDRESSING INTERCONNECTION COST RISK?

A. The selection of the generation resource itself was another way of addressing this risk. Astoria Station is expected to operate on-peak at times when there is less wind generation on the system. Further, quick-start natural gas simple cycle generation can mitigate interconnection cost risk because of the flexibility of this generation resource and its ability to coordinate with variable energy resources, such as wind energy.

The Company anticipates significant wind energy development within Otter Tail's footprint. This impacts the overall generation supply picture in our region of MISO. As a result, a simple cycle combustion turbine primarily designed for peaking can be efficiently called on to operate when wind generation is reduced. This is an important premise for our overall resource planning analysis. The Company believes that regional interconnection costs will primarily be allocated to the new wind generation projects rather than to dispatchable, natural gas-fired combustion turbines, whose primary function is as backup generation during times when the wind is not available or peak loads demand increased generation.

B. Approach to Development and Construction Risks

Q. PLEASE EXPLAIN THE ANTICIPATED PROJECT DELIVERY METHODOLOGY.

A. Otter Tail has had a history of successful large project execution. The Company will select an experienced consulting engineering firm to provide necessary technical support for Otter Tail's detailed design of Astoria Station. We intend to competitively bid the turbine and associated equipment, with the assistance of the engineering firm. The Company will contract directly with the turbine manufacturer to ensure contractual recourse. Otter Tail anticipates performance guarantees and warranties will be provided by the turbine manufacturer. Any other balance of plant equipment of significant value, such as the generator step-up transformer, will also be directly procured by the Company. Installation contractors will competitively bid for turbine and balance-of-plant assembly, construction of foundations, piping, electrical, mechanical, painting, insulation, etc. The installation contractors may also supply smaller balance of plant equipment specified by the Company and its consulting engineer. Otter Tail may have separate contracts for a number of other plant site components, such as prefabricated buildings.

Northern Border Pipeline will manage and construct the facilities that will allow for interconnection to the existing natural gas pipeline. The co-owners of the Big Stone South-Brookings County 345 kV electric transmission line will manage and construct the facilities that will allow for interconnection to the existing 345 kV electric transmission line.

Q. WHY DOES THE COMPANY INTEND TO TAKE THIS APPROACH?

A. Selecting an experienced engineering firm to support our efforts will supplement the Company's own expertise with the necessary technical advice to engineer, procure, and construct the Project on time and on budget.

Since a significant portion of the Project cost stems directly from the combustion turbine contract, it is logical to contract directly with the manufacturer, eliminating the markup of an intermediate supplier (i.e., a turn-key project vendor). If the combustion turbine performance guarantees and warranties were placed with an intermediate supplier instead of the manufacturer, overall Project cost would increase as the intermediate supplier would build in additional cost for taking on risk. Our plan to contract directly with the combustion turbine manufacturer will increase value, while addressing cost and schedule risk.

Q. PLEASE EXPLAIN HOW THE COMPANY'S APPROACH WILL ADDRESS CONSTRUCTION COST OVERRUN RISK.

A. The Company's approach makes the engineering firms, manufacturers, and installation contractors responsible for their own specific areas of expertise, under the direct control and supervision of the Company, which is ultimately responsible for project schedule and cost. Detailed design and planning between the consulting engineering firm and the Company will help to ensure least-cost procurement and installation.

C. <u>Approach to Schedule Risk</u>

Q. WHAT IS THE ANTICIPATED SCHEDULE FOR COMMERCIAL OPERATION OF ASTORIA STATION?

A. The anticipated commercial operation date for the Project is no later than May 2021.

Q. PLEASE EXPLAIN HOW THE COMPANY INTENDS TO AVOID PROJECT DELAY RISK.

A. The Company is pursuing Project permitting and regulatory approvals prior to significant procurements. Schedule information from combustion turbine manufacturers has been

obtained to ensure timely delivery of the Project. Equipment supply and installation contracts will likely include delay liquidated damages.

Q. WHAT SITE-RELATED PERMITS AND REGULATORY APPROVALS ARE REQUIRED?

A. There will be a number of Project permits required from federal, state, and local agencies. The primary South Dakota permits required to construct the plant are an Energy Conversion Facility Permit from the South Dakota Public Utilities Commission, and air emissions and water appropriations permits from the South Dakota Department of Environment and Natural Resources.

D. Fuel Risks

Q. PLEASE EXPLAIN HOW FUEL SUPPLY WILL BE ARRANGED FOR ASTORIA STATION?

A. The natural gas fuel supply for the Project is expected to be procured in the same manner as fuel is procured for our existing Solway simple cycle combustion turbine. While the Project will not obtain firm deliverability, it is expected that natural gas will be purchased on the daily spot market and will be frequently delivered on firm transport by gas marketers, consistent with the Company's current practice for its other simple cycle generator.

E. Tax Risks

Q. PLEASE DESCRIBE THE COMPANY'S EFFORTS TO MINIMIZE SALES/USE AND PROPERTY TAXES RELATED TO ASTORIA STATION.

A. The Company applied for sales/use tax relief for the Project under South Dakota's Reinvestment Payment Program. Applications approved under the program allow project owners to receive a reinvestment payment that does not exceed the sales/use tax paid on project costs. The Company's application was approved by the South Dakota Board of Economic Development on February 14, 2017. This results in a nearly $5 million benefit to our customers.

In addition, the Company will pursue a statutory discretionary formula for property taxation purposes. The formula includes, for the five years following construction, all or any portion of the Project's assessed valuation for tax purposes. Under the formulaic model adopted, we believe the Project will be assessed on a graduated scale of 20% assessed value in year one, 40% in year two, 60% in year three, 80% in year four, and 100% in year five (at which time the property value will have decreased due to depreciation). This will yield property tax savings of approximately $3 million to the benefit of our customers.

IV. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

STATE OF NORTH DAKOTA

PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Prudence – Astoria Gas
Application

Case No. PU-17-___

VERIFICATION

STATE OF MINNESOTA)
) ss.
COUNTY OF OTTER TAIL)

William Swanson, being first duly sworn on oath, deposes and says that he is the Manager of Supply Engineering 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 10th day of April, 2017

William Swanson

Subscribed and sworn to before
me on this 10 day of April, 2017.

Notary Public
My Commission expires 1-31-22

KIMBERLY ANN WARD
NOTARY PUBLIC
MINNESOTA
My Commission Expires Jan. 31, 2022