215 South Cascade Street
PO Box 496
Fergus Falls, Minnesota 56538-0496
218 739-8200
www.otpco.com (web site)

OTTER TAIL POWER COMPANY

February 15, 2021

Steve Kahl
Director of Administration/Executive Secretary
North Dakota Public Service Commission
600 East Boulevard, Dept. 408
Bismarck, ND 58505

RE: Otter Tail Power Company's Application for Advance Determination of Prudence - AMI Project
Case No. PU-21-
Initial Filing

Dear Mr. Kahl:

Otter Tail Power Company respectfully submits the enclosed Application for Advance Determination of Prudence.

An original and seven copies of the Company's Application are also provided, along with the following:

- Direct testimony of Company witnesses JoAnn M. Thomspon, Al Koeckeritz, Bryce C. Haugen, and Kirby Kugler.
- Verifications for the testimony.

Also enclosed is a check in the amount of $175,000.00 for the filing fee. Please feel free to contact me at (218) 739-8956 if you have any questions.

Sincerely,

/s/ CARY STEPHENSON
Cary Stephenson
Associate General Counsel

cjh
Enclosures

STATE OF NORTH DAKOTA
BEFORE THE PUBLIC SERVICE COMMISSION

Otter Tail Power Company Advance Determination of Prudence – AMI Project	Case No. PU-21-
	APPLICATION FOR ADVANCE DETERMINATION OF PRUDENCE

I. Introduction

Pursuant to North Dakota Century Code (N.D.C.C.) § 49-05-16 and North Dakota Administrative Code (N.D.A.C.) § 69-20-02-04, Otter Tail Power Company (Otter Tail or the Company), submits this Application for an Advance Determination of Prudence (ADP) to the North Dakota Public Service Commission (the Commission) for the Company's proposed investments in Advanced Metering Infrastructure (AMI) that will improve reliability, enhance customer control, and save money on meter reading logistics (the AMI Project or Project). Given the size and scope of the AMI Project and its material impact on Otter Tail's operations, Otter Tail is requesting this ADP to engage the Commission on the significant and beneficial effects the AMI Project will have on the Company's operations, systems, and customers, and to obtain its approval prior to making this investment.

Currently, about 99 percent of Otter Tail's approximately 77,000 customer meters in North Dakota must be manually read by Otter Tail employees or a contracted meter-reading service provider.[1] This means that Otter Tail employees and contractors need to physically access all customer premises monthly to read virtually all meters – a significant expense given Otter Tail's rural, 37,000 square-mile service territory in North Dakota. This manual meter reading can also be an inconvenience for customers and can cause safety and privacy concerns.

By automating meter-reading activity, Otter Tail can significantly reduce operations and maintenance (O&M) expenses and redeploy its workforce to higher value activities. The AMI Project is expected to generate net system-wide revenue requirements savings of approximately $43 million over the 20-year life of the Project. These savings will begin upon full implementation of the Project and will be realized by eliminating the need to physically deploy personnel to read meters and by automating service connections and disconnections.[2] Improved efficiency of existing processes through software enhancements in the AMI Project could further increase these projected savings. While the Company's annual revenue requirement is expected to increase during the initial phase of the AMI Project when the new infrastructure is deployed, the O&M savings generated by the Project will more than offset the costs over time.

[1] The Company has a small number of AMI meters that are used for interruption monitoring purposes, and a small number of automatic meter reading (AMR) meters in use for some larger customers and substations.

[2] Otter Tail intends to manage the impact to its workforce of this automation through attrition and reassignment of personnel.

In addition to cost savings, the AMI Project will provide reliability and safety improvements, as well as opportunities for customers to obtain more information about their electricity usage. Reliability improvements will be obtained through Otter Tail achieving near real-time system awareness, allowing the Company to predict and plan for loading-related outages and to more quickly respond to weather-related and other outages. Safety will be enhanced by reducing the frequency of sending personnel into the field. From the customer perspective, improved outage communications and access to near real-time usage information online will support improved customer engagement and satisfaction.

Importantly, the AMI Project is a key component in maintaining and expanding Otter Tail's industry-recognized Demand Response programs. These programs are core Company service offerings utilized by over one-third of Otter Tail customers. This strong customer participation – making Otter Tail's Demand Response portfolio one of the largest in the country by customer adoption – allows Otter Tail to control between 10-15 percent of total winter peak load, reducing overall system capacity needs and lowering costs materially for customers. However, much of the Company's existing Demand Response infrastructure is either approaching end of life or already functionally obsolete, threatening the Company's ability to continue to offer Demand Response options in the future.

The two-way communications network installed as part of the AMI Project will be utilized to support the continued long-term functionality of the Company's Demand Response programs and to enable their improvement and expansion. Further, because

Otter Tail receives capacity accreditation for the amount of interruptible load on its system, the future expansion and modernization of the Company's Demand Response System is expected to generate additional benefits by potentially delaying the need for new resources that would otherwise be necessary but for Otter Tail's ability to control load through Demand Response programs.

To achieve the significant O&M savings and other benefits of the Project, Otter Tail will deploy the following infrastructure: (1) replacement of manually-read meters with automated meters capable of two-way communication; (2) installation of a Field Area Network and local collectors to receive and transmit meter data; and (3) deployment of a head-end hardware and software system where the data will be stored and made available to other Otter Tail systems. This is all industry standard equipment.

AMI metering technology has matured sufficiently and the time is right to move forward with implementation of this Project. Currently available AMI metering systems are capable of providing Otter Tail and its customers with significantly more information and control than previous iterations of the technology. The new metering systems are also designed to adapt to other applications that may be developed to meet emerging and evolving operational needs and customer interests. Ultimately, the AMI Project will provide a platform to support automation of the Company's distribution system and thereby lower costs, and will enable the continuation and expansion of Otter Tail's Demand Response programs. For these reasons, the Company respectfully requests that the Commission grant an ADP for the AMI Project.

In support of this Application, the Company provides the following Direct Testimony:

- Policy – Ms. JoAnn M. Thompson;
- Project Description and Need – Mr. Al Koeckeritz;
- Demand Response – Mr. Kirby Kugler; and
- Economic Analysis – Mr. Bryce C. Haugen.

This Application and supporting testimony demonstrate that Otter Tail's proposed investment in the AMI Project is a prudent resource addition.

II. Compliance Matters

A. Description of Applicant

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

Otter Tail Power Company
215 South Cascade Street
Post Office 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

B. **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 docket:

Cary Stephenson
Associate General Counsel
Otter Tail Power Company
215 South Cascade Street
Post Office Box 496
Fergus Falls, MN 56538-0496

Bryce C. Haugen
Supervisor Regulatory Analysis, Regulatory Administration
Otter Tail Power Company
215 South Cascade Street
Post Office Box 496
Fergus Falls, MN 56538-0496

C. **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.[3] The general prudence standard calls for determining whether the utility action was reasonable at the time it was taken under all relevant circumstances.[4] Under Section 49-05-16(1), the Commission may issue an order approving the prudence of a proposed project if four conditions are met:

a. The public utility files with its application a projection of costs to the date of the anticipated commercial operation of the resource addition;

b. The public utility files with its application a fee in the amount of one hundred seventy-five thousand dollars . . . .;

c. The commission provides notice and holds a hearing, if appropriate, in accordance with section 49-02-02; and

[3] *See* N.D.C.C. § 49-06-02.
[4] *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).

d. 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.

For resource additions located in North Dakota, there is a rebuttable presumption that the resource addition is prudent.[5]

D. Authority for Relief Requested

North Dakota Century Code section 49-05-16 allows for a public utility to seek an ADP from the Commission for a resource addition at the utility's discretion. A "resource addition means construction, *modification*, purchase, or lease of. . .[a] *demand response system*," among other things.[6] As discussed in this Application, the Company's AMI Project is a necessary modification of its demand response system, in that the enhanced communication capability provided through the AMI Project is necessary to continue Otter Tail's existing Demand Response programs as well as to enable expansion of such programs and rate offerings in the future. Thus this Application complies with the requirements of N.D.C.C. § 49-05-16 and N.D.A.C. § 69-20-02-04. Furthermore, under N.D.C.C. § 49-05-16(7), a rebuttable presumption exists that AMI Project investments made in North Dakota are prudent.

III. Project Description

The AMI Project will involve the deployment of the following infrastructure: (1) approximately 170,000 AMI meters, of which nearly 80,000 will be located in North

[5] N.D.C.C. § 49-05-16(7).
[6] N.D.C.C. § 49-05-16 (Emphasis added).

Dakota; (2) a Field Area Network, local data collectors, and other communications infrastructure that will collect and transmit meter data back to Otter Tail and, over time, be used to support Otter Tail's Demand Response System; and (3) a head-end system and Meter Data Management System (MDM) where data will be routed and stored, as needed, to facilitate automated meter reading, demand response, and automated distribution control in the Company's provision of electric service.

A. Background on AMI and the AMI Project

The term Advanced Metering Infrastructure (AMI) encompasses the technology and systems that enable two-way communication between the customer's meter and the utility's billing, distribution, dispatch, and control systems. AMI meters contain a communication device to enable two-way communication, providing timely and detailed energy usage and outage data to the utility and the customer. The capabilities of AMI meters today are superior to prior AMI systems, as well as older automated and manual-read meter models. Figure 2 presents a visual representation of the infrastructure and systems to be installed in the AMI Project.

Figure 2: Diagram of AMI Infrastructure

The left side of the Figure shows the new AMI meters that will be installed at every service location in North Dakota. To create the communications pathway to receive data from the new meters, the Company will deploy the Field Area Network and place collectors in local areas to receive meter data in near real-time (shown in Figure 2 as the "Gateway"). This data will then be transmitted to a head-end system, which will collect and transmit the data to be stored in the MDM (shown in Figure 2 as the "MDMS"). The MDM, which also serves as the long-term data storage and management system, will import and process meter data through a validation, estimation and editing procedure and then will make it available to certain other Otter Tail systems, such as the customer information system (CIS, shown in Figure 2), a future outage management system, geographic information systems (GIS), and other systems still being considered as part of the Company's business process review. The MDM will also receive power quality alerts, outage notifications, and other alarms from the AMI meters, among other data. The AMI Project will allow the Company to expand upon its initial investment through the implementation of an advanced distribution management system (ADMS) that has an outage management system (OMS), providing the Company with additional capabilities to reduce the length of outages, better inform customers during outages, and, over time, reduce the number of outages. Last, Figure 2 shows that manual meter reading and the associated driving time will be virtually eliminated once AMI meters are installed.

B. AMI Project Implementation Schedule

Phase 1 of the Otter Tail AMI Project is currently underway and entails issuing requests for proposals (RFPs) and evaluating bids, contract negotiations with suppliers, implementation and deployment planning, and internal staffing of the Project. Otter Tail has already received RFP responses and expects to select bids and finalize contracts with vendors in the third quarter of 2021. Phase 2 of the AMI Project is scheduled to run from the fourth quarter of 2021 through fourth quarter 2022 and consists of business process development, system integrations, and initial deployment for proof of concept. Phase 3 of the AMI Project is currently scheduled for late 2022 through the third quarter of 2024, and will entail full deployment of AMI meters and the supporting infrastructure, integration into the existing system, and change management and department staffing processes.

IV. Need for and Justification of the Resource Addition

Approximately 99 percent of Otter Tail's customer meters in North Dakota are outdated electromagnetic and digital models that require manual reading on a monthly basis. The average age of the Company's meters is 29 years old. According to the most recent Energy Information Administration (EIA) data from 2017, Otter Tail is the only electric company or cooperative that still has manual-read meters widely deployed in

North Dakota; all other North Dakota electric service providers have shifted to automated meter reading (AMR) or AMI models.[7]

AMR meters provide one-way communication from the meter to the utility, either via a handheld meter reading device or through a cellular communications network. Otter Tail did not invest in AMR when that technology was introduced in the 1990s because the business case for doing so was not yet strong enough to justify the investment. However, in recent years, customers' expectations have changed and the technology and economic advantages of AMI have improved considerably. Rather than expecting to see Otter Tail meter reading personnel in their community, customers are now more likely to expect greater insight into their electric service and usage data than Otter Tail can provide with current metering infrastructure. Additionally, the AMI Project investments will provide business synergies and enhance compatibility given the timing of required upgrades to the Company's Demand Response infrastructure. Thus rather than continuing to invest in outdated metering technology, the Company is planning to "leap" over AMR technology to AMI, which is now the industry standard.[8]

[7] U.S. Energy Information Administration, Form EIA-861M, Advanced Metering Data (2017), *available at* https://www.eia.gov/electricity/data/eia861m/#ammeter. The EIA data notes that Otter Tail had 76,459 manual-read/non-smart meters deployed in North Dakota in 2017, while all other utilities and coops, combined, had a total of 61.

[8] According to the Edison Foundation, electric companies had installed more than 88 million smart meters by the end of 2018, covering nearly 70% of U.S. households. By the end of 2020, an estimated 107 million smart meters were expected to be deployed nationwide. *Electric Company Smart Meter Deployments: Foundation for a Smart Grid (2019 Update),* Edison Foundation Institute for Electric Innovation (Dec. 2019), *available at*: https://www.edisonfoundation.net/-/media/Files/IEI/publications/IEI_Smart-Meter-Report_2019_FINAL.ashx.

A. Benefits of AMI

The Company's investment in the AMI Project will generate significant short-run and long-term O&M savings by eliminating almost all manual meter reading and the associated costs by fully automating the meter reading process. Additionally, the two-way communication capability of AMI meters and the associated communications network will improve reliability and safety, and enhance customer satisfaction by providing customers with more data and control over energy usage and bills.

1. Efficiency Gains and Cost Savings

The proposed AMI Project will deploy meters that will enable automated meter reading along with multiple other capabilities including remote disconnects and reconnects. This new system will virtually eliminate the Otter Tail's need to manually read meters and connect/disconnect service thus, eliminating the costs of manually-reading meters and substantially reducing the labor required for many other metering related activities. Reducing manual meter reading and associated travel and transactional costs through the AMI Project will provide significant efficiency gains that will lower Otter Tail's overall revenue requirement.

More specifically, the Company estimates average savings from reduced O&M expenses of approximately $6.9 million per year. These O&M savings are expected to begin in 2024 once the AMI Project is fully deployed and will increase thereafter as the Company avoids future O&M costs associated with manually reading meters. An economic analysis of the costs and savings of the AMI Project is provided in the Direct

Testimony of Company Witness Mr. Bryce C. Haugen and summarized in Section V of this Application.

Aside from the O&M savings associated with manual meter reading, additional efficiencies will accrue from improvements to unbilled revenue calculations, improving customer service response times, reducing manual processes in data entry, and other business efficiencies. However, Otter Tail has not quantified these savings in this Application.

2. **Reliability and Safety**

Advanced Metering Infrastructure enhances reliability by providing the utility with improved system awareness and system planning insight, as well as the ability to automate the distribution system at the substation and feeder-circuit level. Deployment of the AMI Project communications infrastructure will allow Otter Tail to implement further technologies that are able to identify and respond to outages more quickly, thereby improving overall reliability. Additionally, the near real-time data provided by the AMI system will allow the Company to predict and plan for potential loading-related outages, and will enable the reduction in response times for weather-related or other outages that occur on the system. In particular, the ADMS and OMS that are currently under consideration will allow Otter Tail to identify outages more rapidly and deploy crews more efficiently to reduce the length of outages and number of outages over time. The AMI system will also allow for transformer loading optimization, which will enhance the Company's transmission analysis capabilities and ultimately allow Otter Tail to operate

the distribution grid more reliably by identifying loading issues before they create an outage.

Other devices, when added to the Company's distribution system, can also benefit from deployment of the AMI communications network, including fault indicators, regulator controls, and switch controls, with the ability to use AMI voltage data to optimize voltage and reduce customers' overall energy consumption. Finally, the AMI system will improve reliability and safety by providing better and more reliable alarms for tampering and overheating of Company equipment.

In addition to these distribution system benefits, the AMI Project will also contribute to the continued provision of safe electric service by greatly reducing the need to send Company personnel into the field and onto customer property to read meters.

3. **Customer Experience**

In addition to reliability benefits, the Company's rollout of AMI is intended to enhance customer satisfaction by enabling improved outage communications as well as web-based customer engagement through near real-time usage information and access to other data. New AMI meters are capable of making data available directly to customers, allowing Otter Tail to meet customer expectations to have information available on customer devices.

Further, the collection of near real-time usage data will enable the Company to roll out expanded time of use (TOU) rate offerings, providing customers more options for taking electric service and saving on their electric bill. Such TOU rates and other future potential Company initiatives could also include broadening of Demand Response

programs, as discussed below and in the testimony of Company witness Mr. Kirby Kugler. By enabling the Company to provide customers with advanced analytics and data on their electricity usage, the AMI Project could result in more flexibility in billing and rate options for Otter Tail customers, helping them to save money based on their usage.

B. Demand Response Benefits of AMI

The AMI Project is a critical first step in refreshing and enhancing Otter Tail's Demand Response programs, which are very successful from a customer adoption perspective but are currently supported by hardware and software that is either at or nearing end of life and overall obsolescence. As a result, the communications enhancements provided by the AMI Project will provide the foundation for improvement and expansion of the Company's Demand Response offerings in the future.

1. Otter Tail's Existing Demand Response Program

In general, the Company's Demand Response programs shift or reduce load when called upon by activating load management switches located at customer homes or businesses, or on appliances such as air conditioners. The ability to reduce load in this way allows the Company to realize economic efficiencies for customers by offering them a lower rate in return for the ability to reduce their load during certain times. Ability to reduce load also provides reliability benefits for the grid by providing an additional tool to address high-demand situations. Customers also are able to reduce their bills by taking advantage of TOU rates, which match customer electric use with the pricing of electricity at particular times of day, thereby encouraging customers to shift electric use to times when it is cheaper to provide.

Through strong customer engagement, Otter Tail has built a robust demand response portfolio over many decades. Otter Tail customers have invested heavily in heating, water heating, and cooling technologies that provide the Company with substantial demand response capabilities. The Company offers ten rates that incorporate Demand Response, providing flexibility and savings for residential, commercial, and industrial customers.

Otter Tail's Demand Response program also provides the Company with system-operation flexibility through the ability to reduce the cost of serving load in organized electricity markets. During periods of higher prices, the Company can choose to either buy the energy at market cost or interrupt customers. This generates both capacity and energy benefits for the Company and customers. Otter Tail receives capacity credit from the Midcontinent Independent System Operator, Inc. (MISO) for the amount of interruptible load on the Company's system, fulfilling a portion of the Company's annual capacity requirement set by MISO under Module E of the MISO Open Access Transmission, Energy, and Operating Reserve Markets Tariff. Thus, expanding Otter Tail's Demand Response capability will allow the Company to reduce overall system energy and capacity costs for customers.

2. New Communications Infrastructure is Needed to Support Demand Response Programs

The Company's Demand Response program currently uses a radio communications network, IT infrastructure, and Load Management System (LMS) switches to enable load control through a software platform configured with time of use

and other parameters that are defined by rates, MISO market pricing, and the desire for customer comfort. However, the existing radio communication system that is at the heart of Otter Tail's Demand Response programs is aging and only provides for one-way communication with LMS switches at customer locations. A more advanced network with two-way communications would give Otter Tail greater control over Demand Response, ensuring all signals are received so the system is receiving the full benefits of the Demand Response program, and would provide better insights into the impact of those programs. The AMI meters and communications infrastructure that will be installed in the AMI Project provide this capability.

In addition to the aging radio network, much of the hardware and software used to support the existing Demand Response System is antiquated and/or obsolete. Most of the software that supports the Demand Response System was procured in 2003 and is currently operating with limited support from the vendor. As a result, the Demand Response programs are essentially limited to existing functionality, limiting Otter Tail's ability to maintain its current offerings, let alone to grow and enhance its Demand Response programs.

As discussed further in the testimony of Mr. Kugler, several specific hardware components of the Demand Response System are no longer available for sale, which means replacement units cannot be purchased, and/or are no longer supported by their manufacturers. For example, the Company uses discontinued Palm Pilot devices to program and control LMS switches. Palm Pilot devices have not been supported by the manufacturer since 2011, and of the 16 Palm Pilots that Otter Tail originally purchased,

only 6 remain operational. If the Company does not upgrade and replace these and other aging hardware and software components of the Demand Response System, there is a risk that the system will degrade to the point at which it is no longer usable. This means that new investments in Demand Response technologies are necessary. The AMI Project, if approved and implemented, will provide a new communications network which will provide the foundation around which the Company's Demand Response programs can be retained and enhanced.

For example, Otter Tail will be able to more finely tune its load control programs, better respond to price fluctuations, and more accurately identify its MISO capacity accreditation and avoid future capacity costs to customers. If the existing Demand Response System is allowed to further degrade, the amount of capacity credit received from MISO will likely decrease over time. Rebuilding and enhancing the communications backbone of the Demand Response System through the AMI Project will increase opportunities for Demand Response, resulting in additional capacity credit. This will potentially reduce the cost risk to the Company, and customers, of having to procure additional capacity in the market or through new acquisitions.

As a result, moving to the next generation of AMI infrastructure is an important and necessary modification to the Company's Demand Response infrastructure and will enable its continued success in the future.

V. Economic Analysis

A. Project Costs

The Company expects the capital cost of the AMI Project to be approximately $50-60 million on a company-wide basis. Otter Tail staff worked with outside consultants who have prior experience with AMI implementation to develop this cost estimate based on industry standards and known pricing of AMI infrastructure, and the Company has validated these estimates using the initial information received in the responses to its RFP. Table 1 provides a breakdown of the estimated capital costs of the AMI Project.

Table 1: Estimated Capital Costs of AMI Project (in millions)

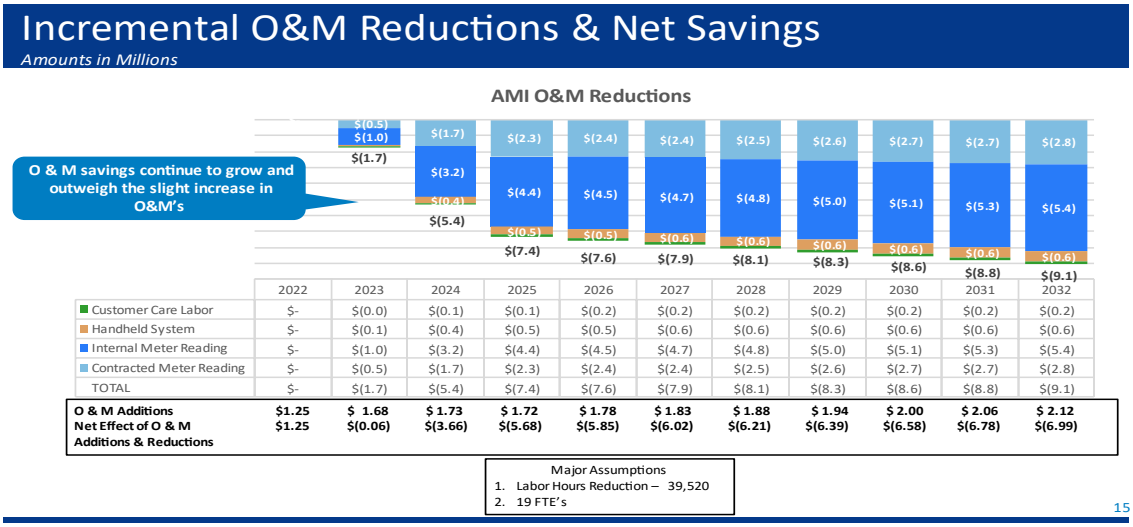
Amounts in Millions	Low	High
Initial Gross Capital Costs		
Internal Labor	$ 4.4	$ 6.4
Legal and Consulting	$ 1.9	$ 2.3
Meters	$ 18.0	$ 25.0
Installation	$ 11.6	$ 11.6
Field Area Network	$ 5.1	$ 5.1
Headend	$ 1.4	$ 1.4
Other - AMI vendor fees	$ 3.5	$ 5.3
Meter Data Management	$ 1.4	$ 2.6
Integrations	$ 1.5	$ 7.0
Project Total	**$ 48.8**	**$ 66.7**

As explained in the Direct Testimony of Mr. Haugen, consistent with past practice for meter-related expenses, the Company plans to allocate system wide costs of the AMI Project to the North Dakota jurisdiction pursuant to allocations approved by the Commission in the Settlement Agreement resolving the Company's last general rate case.

B. Economic Benefits of the AMI Project

By eliminating virtually all manual meter reading through the installation of AMI meters, the Company expects O&M expenses to be reduced on average by approximately $6.9 million per year over the 20-year life of the AMI meters. These O&M savings are expected to begin in 2024 once the AMI Project is fully deployed and will increase thereafter as the Company avoids future O&M costs associated with manually reading meters. Table 2 below provides the expected incremental O&M expense reductions and net savings for 2023 through 2032.

Table 2: AMI Project O&M Net Savings (in millions), 2022-2032



The O&M savings depicted in Table 2 are netted with the additional, albeit far smaller, O&M costs associated with the new AMI meters and related infrastructure. Other potential savings generated by the AMI Project, such as business process savings associated with reducing manual processes in data entry and possible additional capacity accreditation from MISO due to an expansion of the Demand Response program, are not included in the Company's savings calculation.

The O&M savings described above translate to total revenue requirement savings of approximately $43 million over the 20-year life of the meters. This results in approximately $19 million in revenue requirements savings for Otter Tail's North Dakota customers. Table 3 below shows the annual revenue requirement impacts of the AMI Project.

Table 3: AMI Project Estimate of Annual Revenue Requirements (in millions)

Line	A	B	C	D	E	F	G	H	I
1	**AMI Project (OTP Total)**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
2	Return on Rate Base	$ 0.86	$ 2.25	$ 3.31	$ 3.50	$ 3.10	$ 2.72	$ 2.45	$ 2.30
3	Net Expenses	$ 1.48	$ 4.89	$ 2.67	$ 1.62	$ 1.35	$ 1.09	$ (2.92)	$ (3.14)
4	**Annual Revenue Requirement**	$ 2.34	$ 7.14	$ 5.98	$ 5.12	$ 4.45	$ 3.80	$ (0.47)	$ (0.85)
5	**AMI Project (OTP Total)**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**
6	Return on Rate Base	$ 2.14	$ 1.99	$ 1.84	$ 1.69	$ 1.54	$ 1.39	$ 1.24	$ 1.09
7	Net Expenses	$ (3.37)	$ (3.61)	$ (3.84)	$ (4.09)	$ (4.34)	$ (4.60)	$ (4.86)	$ (5.14)
8	**Annual Revenue Requirement**	$ (1.23)	$ (1.61)	$ (2.00)	$ (2.40)	$ (2.80)	$ (3.20)	$ (3.62)	$ (4.05)
9	**AMI Project (OTP Total)**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
10	Return on Rate Base	$ 0.94	$ 0.80	$ 0.65	$ 0.50	$ 0.35	$ 0.21	$ 0.09	$ 0.02
11	Net Expenses	$ (5.42)	$ (5.71)	$ (6.01)	$ (6.32)	$ (6.63)	$ (6.95)	$ (7.68)	$ (8.88)
12	**Annual Revenue Requirement**	$ (4.47)	$ (4.92)	$ (5.36)	$ (5.82)	$ (6.28)	$ (6.75)	$ (7.59)	$ (8.86)

Line	AMI Project (OTP Total)	2022-2045 (OTP Total)	2022-2045 (OTP ND)*
13			
14	Return on Rate Base	$ 36.98	$ 16.52
15	Net Expenses	$ (80.42)	$ (35.93)
16	**Annual Revenue Requirement**	$ (43.44)	$ (19.41)

*Based on OTP's C6 jurisdictional allocation of 44.67973 percent as approved in Case No. PU-17-398

Further information regarding the Company's economic analysis and the jurisdictional allocation factor are provided in the Direct Testimony of Mr. Haugen.

VI. Prudence of the AMI Project

The Company's proposed AMI Project is prudent because it will bring the Company's metering and communications infrastructure up to industry standard, improving reliability and supporting Demand Response, all while generating cost savings for customers.

The AMI Project is needed to replace Otter Tail's aging fleet of manually read meters with industry-standard AMI meters that will enable two-way communication with the utility and provide customers with additional data and opportunities for conservation and savings. The Company prudently decided not to deploy one-way AMR meters, but the AMI market is now mature, and current AMI systems have much broader capability than AMR systems and even AMI systems from a handful of years ago.

The communications infrastructure that the Company will deploy to enable the collection of new smart meter data and two-way communication with customer locations will support the continuation and expansion of Otter Tail's successful Demand Response program. Thus in addition to generating considerable economic savings by eliminating manual meter reading, the AMI Project's deployment of a modern communications network will allow the Company to build on its Demand Response program and the associated rate options for all customers and rate classes.

Otter Tail currently estimates that the AMI Project will generate approximately $19.41 million in total North Dakota revenue requirement savings over the 20-year life of the AMI meters. In addition to being direly needed, the AMI Project will allow the Company to significantly upgrade its metering, distribution, and communication infrastructure to support its Demand Response program. Therefore, the AMI Project is prudent, reasonable, and in the customers' best interest.

VII. Conclusion

For the reasons set forth above, Otter Tail Power respectfully requests the Commission grant an ADP for the Company's proposed AMI Project.

Dated: February 15, 2021

Otter Tail Power Company

Respectfully submitted,

_/s/ CARY STEPHENSON
Cary Stephenson
Associate General Counsel
Otter Tail Power Company

APPENDIX 1:
Otter Tail North Dakota Certificate of Good Standing (2021)

State of North Dakota
SECRETARY OF STATE

Certificate of Good Standing
of
OTTER TAIL POWER COMPANY

SOS Control ID#: 0000016296

Certificate #: 019457938

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 11, 2021

Alvin A. Jaeger
Secretary of State

Before the North Dakota Public Service Commission
State of North Dakota

In the Matter of the Application of Otter Tail Power Company
For Advance Determination of Prudence
AMI PROJECT

Case No. PU-21-

POLICY

Direct Testimony and Schedules of

JOANN M. THOMPSON

February 15, 2021

TABLE OF CONTENTS

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is JoAnn M. Thompson. I am the Vice President of Asset Management for Otter Tail Power Company (Otter Tail or the Company).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have worked for Otter Tail since 1997, initially as a Research Specialist. I joined the System Operations Department in 1999 as Electrical Engineer and transitioned to Tariff Engineer in 2000. In 2006, I became Policy and Compliance Advisor and in 2009 advanced to Manager, Federal Regulatory Compliance and Policy. I have been in my current position as Vice President of Asset Management since June 2014. I have a Bachelor of Science degree in electrical and electronics engineering from North Dakota State University.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. In my current role I am accountable for the company's electrical transmission and distribution (T&D) lines, engineering infrastructure design, substations, planning, protection, maintenance, power quality and reliability, system operations, land rights and permitting, T&D project management, materials and materials warehousing and deployment, and Federal Energy Regulatory Commission (FERC)/Regional Transmission Organization (RTO) policy. I am also responsible for management of Advanced Concepts, energy measurement and control, Construction Services, including computer-aided design (CAD) and geographic information systems (GIS), as well as Facilities and Construction/Building Services.

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

A. The purpose of my testimony is to provide support for Otter Tail's application for an Advance Determination of Prudence (ADP) for the Company's proposed Advanced Metering Infrastructure (AMI) Project. The AMI Project entails (1) replacement of all existing customer meters with AMI meters; (2) installation of new communications

infrastructure, including a Field Area Network and local collectors, to receive and transmit meter data; and (3) development of a head-end hardware and software system where the data will be stored and made available to other Otter Tail systems.

Q. HOW IS YOUR TESTIMONY STRUCTURED?

A. In my testimony, I address the following topics:

- Regulatory Matters;
- Overview of the AMI Project;
- Prudence of the AMI Project; and
- Presentation of the other witnesses testifying on behalf of the Company.

II. REGULATORY MATTERS

Q. PLEASE PROVIDE A BRIEF OVERVIEW OF OTTER TAIL POWER COMPANY.

A. Otter Tail is an investor-owned utility serving approximately 132,000 customers across North Dakota, South Dakota, and Minnesota. The Company serves approximately 59,000 North Dakota customers spread across 224 communities in the eastern half of the state but does not have service territory in and around Fargo or Grand Forks. Otter Tail's service area is vast and rural – the Company covers approximately 70,000 square miles of service territory, and over sixty percent of Otter Tail's communities, system wide, have populations of fewer than 200 people.

Q. WHY IS THE COMPANY SEEKING AN ADP FOR THE AMI PROJECT?

A. The AMI Project represents a significant investment by Otter Tail in updating its metering and distribution communications infrastructure. The savings that the Company will realize indicate that the expenditures are prudent. However, given the size and scope of the AMI Project and its material impact on Otter Tail's operations, the ADP process gives the

Company an opportunity to seek Commission support prior to making the investment. Consequently, Otter Tail is seeking an ADP for the AMI Project.

Q. WHAT ARE THE COMPANY'S REQUIREMENTS WITH RESPECT TO FILING THIS ADP?

A. North Dakota Century Code (N.D.C.C.) section 49-05-16 allows a public utility to seek an ADP from the Commission at the utility's discretion for a "resource addition." Under the statute, a "resource addition" includes construction, modification, purchase, or lease of a demand response system, among other potential resources that could be added. For "resource additions" located in North Dakota, N.D.C.C. § 49-05-16(7) provides a rebuttable presumption of prudence.

Q. IS THE AMI PROJECT A MODIFICATION OF A DEMAND RESPONSE SYSTEM?

A. Yes, I believe it is. As I discuss later in my testimony, the AMI Project is a key component in maintaining and expanding Otter Tail's existing Demand Response programs. In particular, the new communications infrastructure and two-way communications capability provided by the AMI Project will allow the Company to continue to offer robust Demand Response programs for customers, and to expand these offerings in the future.

III. OVERVIEW OF THE AMI PROJECT

A. PROJECT BACKGROUND AND DESCRIPTION

Q. WHAT IS ADVANCED METERING INFRASTRUCTURE?

A. The term Advanced Metering Infrastructure (AMI) encompasses the metering and communications technology and systems that enable two-way communication capabilities between the customer's meter and the utility's billing, distribution, dispatch, and control systems.

Q. PLEASE DESCRIBE THE COMPANY'S AMI PROJECT.

A. Otter Tail's AMI Project consists of the installation of AMI meters with two-way communication capability at every service location in Otter Tail's three-state service

territory, including North Dakota. To create a communications pathway to receive data from the new meters, the Company will also install a Field Area Network and place collectors in local areas to receive meter data in near real-time. Last, the AMI Project includes a head-end system and Meter Data Management System (MDM), where data will be routed and stored, as needed, to facilitate automated meter reading, demand response, and automated distribution control in the Company's provision of electric service. Otter Tail witness Mr. Al Koeckeritz describes the functionality of the AMI Project in more depth in his testimony.

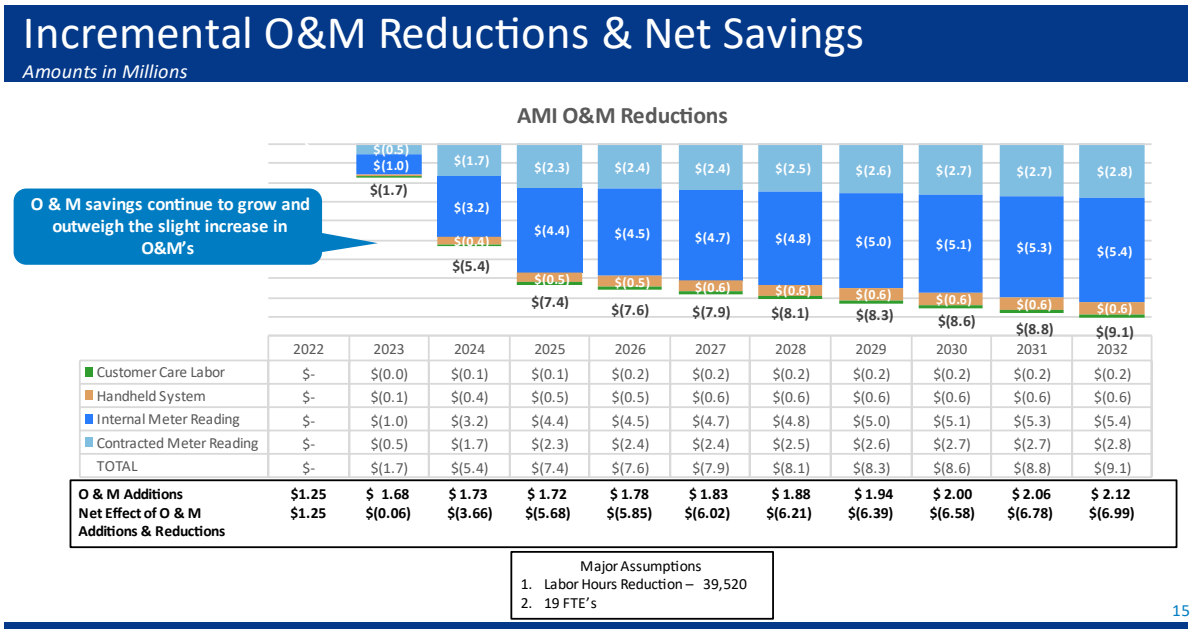
Q. HOW WILL THE AMI METERS TO BE INSTALLED IN THE AMI PROJECT DIFFER FROM OTTER TAIL'S EXISTING METERS?

A. Approximately 99 percent of the Company's existing meters are outdated electromechanical and digital meters that are manually read by Otter Tail employees or contracted meter-reading service providers. By contrast, the AMI meters the Company plans to install allow for two-way communication with customer premises to support core utility functions of meter reading and service connect/disconnect, as well as enabling the continuation and expansion of the Company's successful Demand Response program. Mr. Koeckeritz provides more details on the specifications of the AMI meters to be installed in his direct testimony.

Q. WHAT ARE THE ADVANTAGES OF SHIFTING TO AMI METERS?

A. The primary advantage of installing AMI meters is the reduction in operations and maintenance (O&M) costs associated with virtually eliminating manual meter reading. Given the Company's large, rural service territory, the O&M costs associated with manual meter reading and manual connect/disconnect of service are substantial. Even after accounting for the additional expenses of operating and maintaining the AMI Project, Otter Tail will realize significant reductions in O&M expenses through the Project. Figure 1 below shows the net O&M savings expected over the first decade of the AMI Project.

Figure 1: AMI Project Net O&M Savings (in millions), 2022-2032

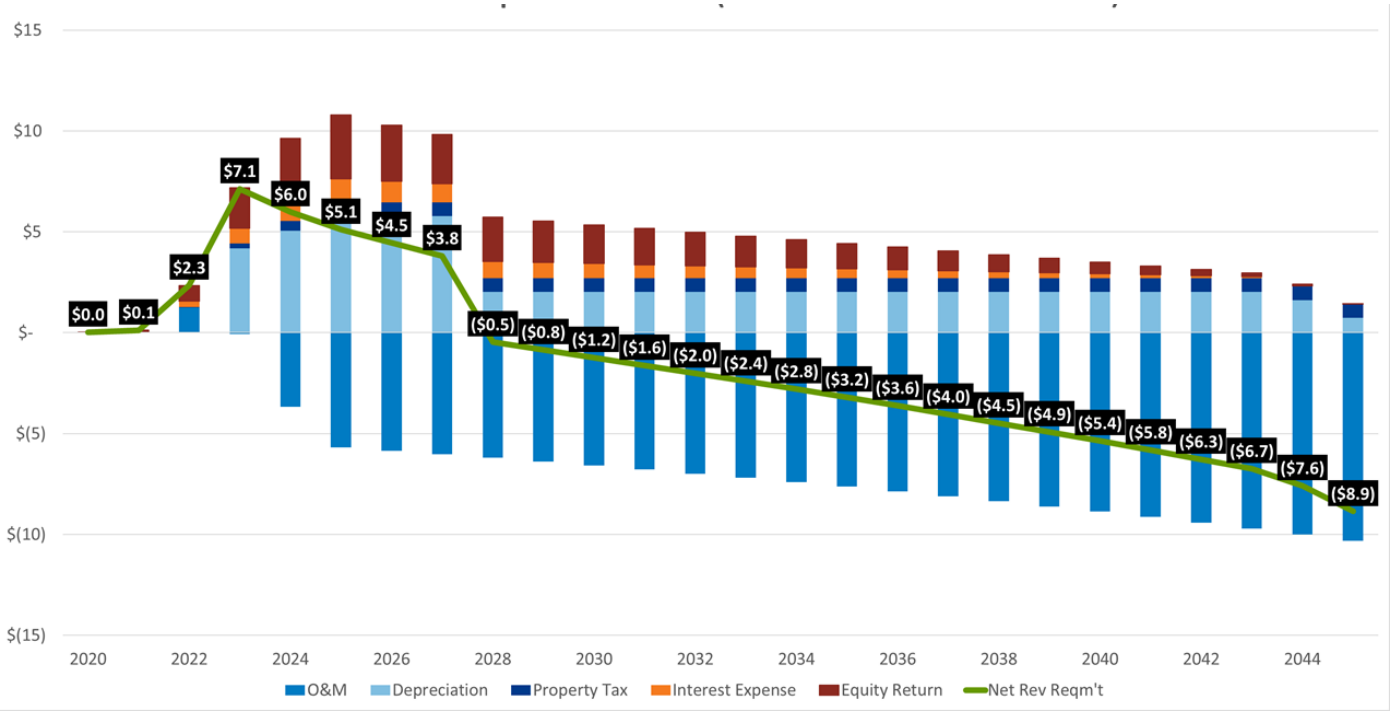


	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Customer Care Labor	$-	$(0.0)	$(0.1)	$(0.1)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)
Handheld System	$-	$(0.1)	$(0.4)	$(0.5)	$(0.5)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.6)
Internal Meter Reading	$-	$(1.0)	$(3.2)	$(4.4)	$(4.5)	$(4.7)	$(4.8)	$(5.0)	$(5.1)	$(5.3)	$(5.4)
Contracted Meter Reading	$-	$(0.5)	$(1.7)	$(2.3)	$(2.4)	$(2.4)	$(2.5)	$(2.6)	$(2.7)	$(2.7)	$(2.8)
TOTAL	$-	$(1.7)	$(5.4)	$(7.4)	$(7.6)	$(7.9)	$(8.1)	$(8.3)	$(8.6)	$(8.8)	$(9.1)
O & M Additions	**$1.25**	**$ 1.68**	**$ 1.73**	**$ 1.72**	**$ 1.78**	**$ 1.83**	**$ 1.88**	**$ 1.94**	**$ 2.00**	**$ 2.06**	**$ 2.12**
Net Effect of O & M Additions & Reductions	**$1.25**	**$(0.06)**	**$(3.66)**	**$(5.68)**	**$(5.85)**	**$(6.02)**	**$(6.21)**	**$(6.39)**	**$(6.58)**	**$(6.78)**	**$(6.99)**

Q. WHAT IS THE EXPECTED REVENUE REQUIREMENT IMPACT OF THE AMI PROJECT?

A. The AMI Project will increase the Company's revenue requirement in the near term due to the significant investments being made in AMI infrastructure. However, beginning in 2028 and for every year thereafter, the AMI Project is projected to reduce the Company's overall revenue requirement, saving money for Otter Tail and its customers. As shown in Figure 2 below, the Company expects revenue requirement savings to begin in 2028, increasing steadily to $8.9 million in annual savings in 2045. As described further in the direct testimony of Company witness Mr. Bryce Haugen, these annual revenue requirement savings add up to approximately $43 million over the 20-year life of the AMI meters. This translates to approximately $19 million in revenue requirement savings for Otter Tail's North Dakota customers over the depreciable life of the AMI Project.

Figure 5: AMI Project Revenue Requirement Costs/Savings 2020-2045



Q. ARE THERE OTHER ADVANTAGES OF SHIFTING TO AMI METERS?

A. Yes. In addition to cost savings, reducing the need for Otter Tail staff to physically visit customer premises for meter reading and other services, such as connections, reconnections, and disconnections will improve safety for Otter Tail employees by reducing driving time and their need to enter onto customers' premises.

Q. ARE AMI METERS INDUSTRY STANDARD?

A. Yes. A recent study by the Edison Foundation[1] found that electric companies had installed more than 88 million AMI meters by the end of 2018, covering nearly 70 percent of U.S. households. The study projected that by the end of 2020, approximately 107 million AMI meters would be deployed nationwide.

[1] Electric Company Smart Meter Deployments: Foundation for a Smart Grid (2019 Update), The Edison Foundation Institute for Electric Innovation (December 2019).

Q. WHAT PURPOSE WILL THE AMI COMMUNICATIONS NETWORK, HEAD-END SYSTEM, AND MDM SERVE?

A. The AMI communications network will allow the Company to collect hourly meter data and, critically, will support the continuation and future expansion of the Company's Demand Response program, as further described in the direct testimony of Company witness Mr. Kirby Kugler. The head-end system and MDM will serve as a repository of meter data and will assist with billing, power quality alerts, outage notifications, and other reliability efforts. The MDM in particular will serve as Otter Tail's long-term data storage and management system, importing and processing meter data through a validation, estimation and editing procedure and then sending it to the billing system.

Q. WILL OTTER TAIL BE ABLE TO LEVERAGE THE AMI PROJECT INTO THE FUTURE?

A. Yes. Otter Tail generally waits until technologies have matured before making investments. This allows the Company to keep rates well below the national average and below other North Dakota investor owned utilities. Otter Tail is making its investment in the AMI Project at this time because the technology has matured and become industry standard. Similarly, other tools and technologies have sufficiently matured to the extent that Otter Tail is exploring other investments that can cost effectively improve the Company's operations and support a more reliable system as part of the Company's Innovation 2030 (I2030) Initiative. Through I2030, Otter Tail would expect to leverage the AMI Project infrastructure through a portfolio of projects to upgrade the Company's communications and technology assets to enhance the customer experience while continuing to provide low cost, safe and reliable service. As part of the Company's I2030 plans, the Company is currently studying the cost-effectiveness of investing in technologies to enhance the Company's ability to manage the distribution system so that it may address reliability issues more rapidly and reduce the number of outages, improve information available to customers during outages, and, over time, reduce the number of outages. Other I2030 projects that are currently being considered include: (1) additional implementation of Demand Response System components, including load management switches; (2) fiber

optic telecommunications additions; (3) Geographic Information System (GIS) enhancements; and (4) creation of a Work Asset Management System (WAMS). The AMI Project will be a key component that Otter Tail can build on in the future – if it is cost-effective to do so. I note that Otter Tail is not seeking an ADP for any of these other I2030 projects at this time.

B. NEED FOR AND BENEFITS OF THE AMI PROJECT

Q. WHY IS THE AMI PROJECT NEEDED AT THIS TIME?

A. As I noted earlier, the Company's existing customer meters in North Dakota are outdated and require manual reading on a monthly basis. Rather than continuing to invest in this outdated technology, the Company will upgrade all meters to industry standard models. The prudence of this investment is evidenced by the considerable O&M savings that will be passed along to customers. However, in addition to these savings, integrating AMI meters will improve overall reliability and safety and enhance the customer experience. Additionally, the communications capabilities provided by the new AMI infrastructure will enable the continuation and expansion of the Company's robust and highly successful Demand Response program, which is limited by the existing radio-based network and supporting hardware and software that it is dependent upon – most of which is now outdated and/or obsolete.

Q. HOW DOES AMI IMPROVE RELIABILITY?

A. In general, the two-way communication capability of AMI improves reliability by providing the utility with improved system awareness and system planning insight, and it will allow Otter Tail to automate the distribution system once AMI meters and the supporting network are installed. The infrastructure to be deployed in the AMI Project is a key enabler for future reliability efforts as well, including various projects currently under consideration as part of the Company's overall I2030 plans. Company witness Mr. Koeckeritz discusses other reliability enhancements that come with deployment of AMI.

Q. HOW DOES THE AMI PROJECT ENHANCE SAFETY?

A. The AMI Project will enhance the safety of customers and Otter Tail personnel by significantly reducing the need to send Company personnel into the field, onto customer property, and – in some cases – into customer homes and businesses to read meters. Additionally, the AMI system will improve safety by providing better and more reliable alarms for tampering and overheating of Company equipment.

Q. HOW WILL THE AMI PROJECT ENHANCE THE CUSTOMER EXPERIENCE?

A. The Company's rollout of AMI will provide the information necessary to improve customer interaction by enabling improved outage communications to customers as well as web-based customer engagement through near real-time usage information and access to other data. The collection of real-time usage data will also enable the Company to offer expanded time of use (TOU) rates and other new Demand Response rates. By enabling the Company to provide customers with advanced analytics and data on their electricity usage, the AMI Project could result in more flexibility in billing/rate options for Otter Tail customers, allow customers to better integrate customer-owned generation, and provide customers the ability to conserve electricity and save money based on tailoring of near real-time usage.

Q. HOW WILL THE AMI PROJECT SUPPORT THE COMPANY'S DEMAND RESPONSE PROGRAM?

A. The AMI Project is a critical first step in refreshing and enhancing Otter Tail's Demand Response program, which is very successful from a customer adoption perspective but is currently supported by hardware and software that is either at or nearing end of life and overall obsolescence. The communications enhancements provided by the AMI Project will provide the foundation for improvement and expansion of the Company's Demand Response offerings in the future.

Q. PLEASE PROVIDE MORE BACKGROUND ON THE COMPANY'S EXISTING DEMAND RESPONSE PROGRAM.

A. Otter Tail's Demand Response program is recognized as one of the most robust in the nation from a customer adoption perspective. Otter Tail has built its notable Demand Response portfolio over many decades through strong customer engagement – Otter Tail customers have invested heavily in heating, water heating, and cooling technologies, resulting in approximately one-third of Otter Tail's system-wide customers currently participating in Demand Response. The Company currently offers ten rates that incorporate Demand Response, providing flexibility and savings for residential, commercial, and industrial customers. Company witness Mr. Kugler describes the Company's Demand Response program in more detail in his direct testimony.

Q. DOES THE INFRASTRUCTURE THAT SUPPORTS THE COMPANY'S DEMAND RESPONSE PROGRAM NEED TO BE UPDATED?

A. Yes. As described further in Mr. Kugler's direct testimony, the radio communication system that serves Otter Tail's Demand Response system is aging and only provides one-way communication with customer locations. Additionally, much of the hardware and software used to support the existing Demand Response system is antiquated and/or obsolete. Most of the software that supports the Demand Response system was procured in 2003 and is currently operating with limited support from the vendor. As a result, the Demand Response system is essentially limited to existing functionality, limiting Otter Tail's ability to grow and enhance its Demand Response offerings. If the Demand Response system degrades to the point of not being usable, the Company could be forced to discontinue its existing Demand Response rates, depriving customers of the ability to receive the cost savings associated with Demand Response programs and stranding the investments they have made in controllable appliances. Additionally, if the Company's existing Demand Response system is allowed to further degrade, the amount of capacity credit Otter Tail receives from the Midcontinent Independent System Operator, Inc. (MISO) will likely decrease over time, potentially increasing costs for the Company and

customers by having to procure additional capacity in the market or through new acquisitions.

Q. HOW WILL THE AMI PROJECT SUPPORT CONTINUATION AND EXPANSION OF THE COMPANY'S DEMAND RESPONSE PROGRAM?

A. The deployment of AMI meters and communications infrastructure in the AMI Project will provide the two-way communication infrastructure that is needed to operate the Company's Demand Response system on an ongoing basis. As described in Mr. Kugler's testimony, the Company is currently unable to verify the success of current Demand Response actions due to the one-way nature of communications on the existing radio network. This limits the Company's Demand Response activities and forces the Company to undercount the amount of load control that it receives capacity accreditation for from MISO. With the AMI Project systems in place, Otter Tail will be able to continue to provide its current Demand Response programs and expand upon those offerings in the future. Not only will this replace obsolete infrastructure, it will allow the Company to better respond to real-time pricing and gain a more accurate picture of the breadth and depth of its Demand Response capability.

C. PROJECT IMPLEMENTATION AND COSTS

Q. WHAT IS THE COMPANY'S PROPOSED SCHEDULE FOR IMPLEMENTING THE AMI PROJECT?

A. Phase 1 of the Otter Tail AMI Project is currently underway. Otter Tail has received RFP responses and expects to select bids and finalize contracts with vendors in the third quarter of 2021. Phase 2 of the AMI Project is scheduled to run from the fourth quarter of 2021 through fourth quarter 2022 and entails business process development, system integrations, and initial deployment for proof of concept. Phase 3 of the AMI Project is currently scheduled for late 2022 through the third quarter of 2024 and will entail full deployment of AMI meters and the supporting infrastructure, integration into the existing system, as well as change management and department staffing processes. Company witness Mr.

Koeckeritz provides further details on the current status of AMI Project implementation in his direct testimony.

Q. WHAT ARE THE EXPECTED CAPITAL COSTS OF THE AMI PROJECT?

A. The Company expects the capital cost of the AMI Project to be approximately $50-$60 million on a total Company basis. The majority of these costs are the costs of procuring approximately 170,000 new AMI meters for all customer locations across North Dakota, South Dakota, and Minnesota. Company witness Mr. Koeckeritz provides details on the estimated costs and benefits of the AMI Project in his direct testimony, and Mr. Haugen discusses the allocation of costs to the North Dakota jurisdiction.

IV. PRUDENCE OF THE PROJECT

Q. IS THE AMI PROJECT PRUDENT?

A. Yes. The Company's existing meters are outdated and need to be replaced, and the infrastructure supporting the Demand Response program is also due for replacement. In response to this need, the Company proposes to invest in industry-standard technology to replace its antiquated infrastructure. Full deployment of AMI meters and the supporting communications infrastructure will enhance reliability and safety, allow the Company to provide customers with near real-time outage and usage data, and will generate significant additional efficiencies. Most importantly, however, the AMI Project is expected to generate considerable savings for customers due to significant reductions in O&M expenses. Customers will realize these savings through reductions in annual revenue requirements, which are expected to begin in 2028, increasing throughout the life of the AMI Project to nearly $8.9 million in 2045.

Q. DOES THE AMI PROJECT HAVE OTHER BENEFITS THAT DEMONSTRATE ITS PRUDENCE?

A. Yes. The communication network improvements and two-way communication capability provided by the AMI Project will enable the modernization of Otter Tail's Demand Response program, which is currently reliant on obsolete infrastructure. Access to near

real-time data could allow the Company to offer customers more options for reducing energy costs through new Demand Response or TOU offerings. Continuation and expansion of the Company's Demand Response program could also potentially reduce the cost risk to the Company, and customers, of having to procure additional capacity in the market or through new acquisitions.

Q. DOES THE COMPANY'S IMPLEMENTATION OF THE AMI PROJECT TO DATE DEMONSTRATE ITS PRUDENCE?

A. Yes. The Company prudently delayed investing in an AMR system and older versions of AMI systems which do not carry the same benefits as current models and would not have generated the same level of financial benefit to customers. In terms of Project implementation, the Company has competitively bid all aspects of the AMI Project to ensure maximum value to customers.

V. PRESENTATION OF WITNESSES

Q. WHO ARE THE WITNESSES FOR THE COMPANY IN THIS PROCEEDING?

A. In addition to my Policy Testimony, the Company sponsors the following witnesses in support of the Application:

- Mr. Al Koeckeritz provides further details on the Company's existing infrastructure, the need for the AMI Project, AMI Project investments, estimated costs and savings of the AMI Project, and status of AMI Project implementation;
- Mr. Kirby Kugler provides further details on the Company's Demand Response program and how the AMI Project is critical to the continuation of these efforts; and
- Mr. Bryce C. Haugen provides an economic analysis of the estimated costs and benefits of the AMI Project and how those costs and benefits will be allocated across Otter Tail jurisdictions.

VI. CONCLUSION

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. For the reasons stated above, Otter Tail's AMI Project is prudent, and the ADP should be approved by the Commission.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.

STATE OF NORTH DAKOTA
BEFORE THE PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Determination of Prudence –
AMI Project

Case No. PU-20-

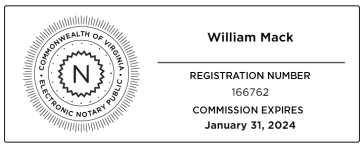
VERIFICATION

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

JoAnn M. Thompson, being first duly sworn on oath, deposes and says that she is the Vice President of Asset Management for Applicant Otter Tail Power Company, a Minnesota corporation, in the above-captioned matter, that the testimony submitted in the above-captioned matter under her name was prepared under her direction, that she knows the contents thereof, and that the same is true and correct to the best of her knowledge and belief.

JoAnn Marie Thompson
JoAnn M. Thompson

Subscribed and sworn to before me on this 13th day of February, 2021



Virginia
Augusta

William Mack
Notary Public

Notarized online using audio-video communication

My Commission expires: 01/31/2024

Before the North Dakota Public Service Commission
State of North Dakota

In the Matter of the Application of Otter Tail Power Company
For Advance Determination of Prudence
AMI PROJECT

Case No. PU-21-

PROJECT DESCRIPTION AND NEED TESTIMONY

Direct Testimony and Schedules of

AL KOECKERTIZ

February 15, 2021

TABLE OF CONTENTS

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Al Koeckeritz. I am the Manager of Advance Concepts, Metering, and Land Rights at Otter Tail Power Company (Otter Tail or the Company).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have worked for Otter Tail since 1988, initially as a substation engineer. In 1990, I moved to Rugby, ND as a Division Engineer. I joined the Operations Support Department in 2002 as a Manger and transitioned to a Manager in the Project Management Department in 2008. In this role, I managed multiple electric transmission projects, and served as Project Manager for Montana Dakota Utilities and Otter Tail Power Company for the 163-mile 345kV transmission line from Big Stone City, SD to Ellendale, ND. I have been in my current position as Manager of Advance Concepts, Metering, and Land Rights since 2019. I have a Masters' of Science degree for Agricultural Engineering from North Dakota State University.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. In my current role, I am responsible for developing an implementation strategy related to "Smart Grid" devices and systems such as Advanced Metering Infrastructure (AMI), Outage Management Systems, Load Management, and other Asset Management-specific systems. I also oversee the metering department to ensure new metering systems meet metering needs and advance the Company's overall goals. Additionally, I lead the Land Rights and Permitting Department's efforts to acquire and dispose of land-related rights and approvals.

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

A. The purpose of my testimony is to provide details on the Company's proposed AMI Project, including the need for the AMI Project and its current implementation status. My

testimony begins with a description of the Company's existing metering infrastructure and the need for replacement of this legacy infrastructure. I then describe the AMI Project in detail and the Company's implementation efforts to date.

II. EXISTING METERING INFRASTRUCTURE

Q. PLEASE DESCRIBE OTTER TAIL'S EXISTING METERING INFRASTRUCTURE.

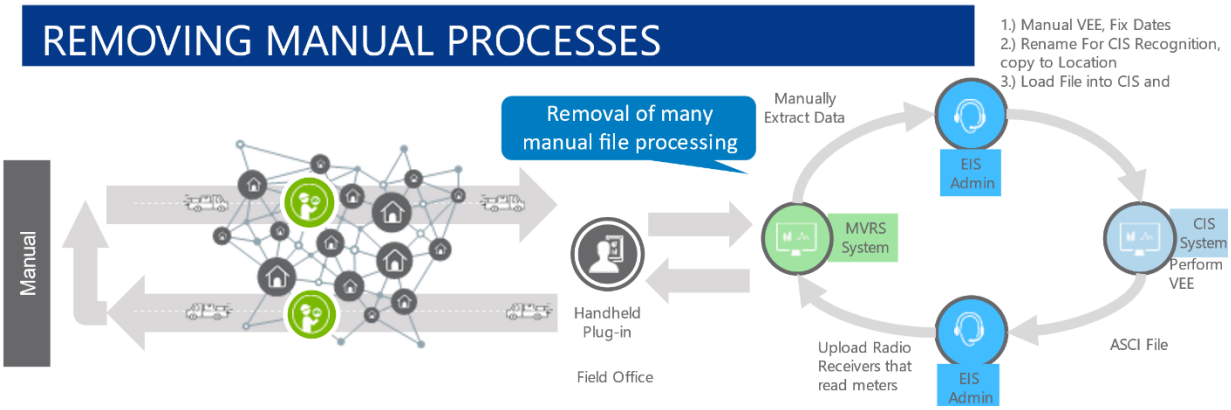
A. Otter Tail has 174,466 meters across its three-state service territory. Of that total, 76,936 are in North Dakota. The vast majority of meters, approximately ninety-nine percent, are manual-read meters, which do not have communications capabilities, and which Otter Tail must physically visit for meter reading. The remaining approximately one percent of meters utilize either automated meter reading (AMR) technology with one-way communication capabilities, or advanced meter infrastructure technology with two-way communication capabilities; I discuss these meters further, below. The existing meters are, on average, 29.22 years old.

Q. HOW DOES OTTER TAIL MANUALLY READ ITS METERS?

A. To manually read our meters, an Otter Tail employee or contractor must drive to the service location, locate the meter, and type the information from the meter into a handheld device, which then inputs the meter data into our different systems for various purposes. This requires us to maintain a significant workforce to perform this function, which is rather costly given the Company's largely rural 70,000 square-mile service territory, 37,000 square miles of which is in North Dakota.

Figure 1 below shows the steps in the process.

Figure 1: The Manual Meter Reading Process



Q. WHAT DOES FIGURE 1 DEMONSTRATE?

A. Our manual meter reading process starts with our Customer Information System (CIS) system (depicted on the right side of the figure) generating a file indicating which meters should be read. That file goes to an Energy Information Specialist (EIS) who revises the file and reviews and modifies the file if necessary. Then, the meter read file is pushed through our Multi-Vendor Reading System (MVRS) to the handheld devices Otter Tail and our meter reading contractor use to read meters. Next, our employee or contractor personnel drive to the manual-read meters, which is depicted on the far-left side of the figure. They key in the meter readings at individual locations. Following that, at the end of the day (or in some cases upon completing the meter reading cycle), the field personnel place the handheld device in its cradle and the file goes back to the MVRS system. There, the data is manually extracted and the manual Validation, Estimation, and Editing (VEE) process takes place to ensure the validity of the data. Finally, once the data is determined to be accurate, an employee renames the file and sends it over to our CIS system so a bill can be developed.

Q. DO OTTER TAIL EMPLOYEES AND CONTRACTORS NEED TO ENTER ONTO CUSTOMER PREMISES TO READ THE METER?

A. Yes. For residential meters, Otter Tail's standard practice is to place the meter on the side of the residence. Thus, the person reading the meter typically must walk across the property

to read the meter on the side of the house. However, some legacy meters, approximately ten percent, are located within a customer's building, meaning the Otter Tail employee or contractor must enter the building to read the meter, which can add time and complexity to the process.

Q. PLEASE DESCRIBE THE OTHER METERS OTTER TAIL HAS CURRENTLY DEPLOYED?

A. As I noted earlier, approximately one percent of Otter Tail's deployed meters have either one- or two-way communication capabilities. Specifically, the Company has approximately 150 Automatic Meter Reading (AMR) meters installed in North Dakota at some larger customers' premises and at certain substations. Otter Tail also has approximately 620 AMI meters deployed in North Dakota, which the Company uses for interruption monitoring purposes.

Otter Tail's AMR meters provide one-way communication from the meter over a communication path, which could be a handheld unit, a mobile unit, a Power Line Carrier, a cellular network, a radio frequency, or some other network. This generally eliminates the need for utility staff to physically visit a customer location to manually read the meter. AMR technology was originally introduced in the 1990s and is the most common type of automated meter deployed by other electric service providers in North Dakota today. Otter Tail uses its AMR meters to remotely read and bill certain large customers and to monitor energy flows at key substations.

Otter Tail's existing AMI meters are similar to the AMI meters that are part of the AMI Project, but have older technology. Otter Tail uses the two-way communication capability of these AMI meters to obtain near-real time system data in key locations. More specifically, the near-real time visibility that AMI meters provide allows the Company to capture a voltage profile in key locations and the meters send notifications regarding voltage condition to Otter Tail for further analysis or action. At most locations, Otter Tail also uses the AMI meters to collect customers' energy consumption data for billing

purposes. The current AMI meters each have a cellular communication card that provides the necessary communication channel.

Q. WHY DOES OTTER TAIL STILL MAINLY RELY ON MANUAL-READ METERS?

A. As I mentioned, AMR technology, the predominate automated meter reading technology in North Dakota, was first broadly deployed in the 1990s. Otter Tail did not invest in AMR technology on a broad scale at that time primarily because there was never a sufficiently strong business case for doing so. AMR meters only provide one-way communication to the utility and have limited benefits other than remote meter reading. While AMR meters would have allowed Otter Tail to reduce O&M costs associated with manual meter reading, the Company did not believe the reduced costs alone were a sufficient enough reason to make a change in light of the Company's historic view of the importance of having a visible employee presence in the communities that it serves.

Q. WHY IS OTTER TAIL UPDATING ITS METER TECHNOLOGY NOW?

A. Customer expectations and advances in technology are driving the need to update our meter technology at this time. Additionally, the operating savings make doing so prudent.

Over time, customers have changed their expectations. While they once expected to see Otter Tail employees or contractors out visiting customer premises, now customers are more likely to expect to be able to access detailed data on their computers or mobile devices. Customers used to find it acceptable to call when their electricity was disrupted and now customers expect utilities to know when a power disruption occurs, and customers expect utilities to notify them of the disruption along with an estimated restoration time. The Company now needs AMI meters to meet these expectations. Further, AMI technology is now sufficiently mature and offers several other advantages, particularly when paired with other infrastructure investments, which would not have been appropriate or, in some cases, possible previously given the state of technological development.

Consequently, a strong business case now exists to push our operating expenses down through the cost savings of automating the meter reading function, while leveraging the

technology to meet customer expectations and provide an important technological upgrade to the Otter Tail system that will provide benefits today, and support additional applications into the future.

Q. HOW WILL THE NEW AMI METERS DIFFER FROM AMR AND MANUAL-READ METERS?

A. AMI meters measure and record electricity usage hourly (or even more frequently in some cases) and contain a communication device to enable two-way communication between the utility and the metering device. The ability to measure meter data in short intervals, coupled with the two-way communications capability of AMI meters, provide the basis for their benefits. AMI meters have the ability to collect timely and detailed energy usage data, power quality data, facility loading data, and outage and restoration information. That is data that neither Otter Tail's existing manual read meters nor AMR meters can provide.

The data available from AMI Meters will enhance the efficient management of Otter Tail's billing, distribution, dispatch, and control systems. This allows Otter Tail to automate the meter reading process, which reduces costs, while also increasing overall system reliability and Company efficiency. Additionally, Otter Tail will be able to more quickly address customer inquiries using the two-way communication capability of AMI meters, which will allow the Company to retrieve data from specific meters. Prior to this, if a customer had a question or other issue, Otter Tail might have had to send personnel to their location to collect information – delaying a timely response. Additionally, and unlike traditional AMR meters, Otter Tail can remotely perform connects and disconnects of electricity service using AMI meters, further reducing the need to send personnel into the field. The Company will also be able to transmit data to the meters remotely to, in part, support Demand Response programs.

Q. ARE AMI METERS INDUSTRY STANDARD?

A. Yes. A recent study by the Edison Foundation1 found that electric companies had installed more than 88 million AMI meters by the end of 2018, covering nearly 70 percent of U.S. households. The study projected that by the end of 2020 approximately 107 million AMI meters would be deployed nationwide. Although AMR and AMI systems have been available for many years, state-of-the-art AMI meters introduced in recent years provide a step-change in capability over prior models.

Q. WHAT MAKES NEW AMI METERS BETTER THAN PRIOR MODELS?

A. Not only is AMI now industry standard, but the AMI market is now mature and offers additional functionality. To take one important example, Otter Tail plans to use AMI meters capable of providing usage alerts and detailed usage data to customers on a near real-time basis.

Q. DOES THE AMI PROJECT ALSO SUPPORT OTTER TAIL'S DEMAND RESPONSE PROGRAMS?

A. Yes.

Q. PLEASE DESCRIBE THE COMPANY'S EXISTING DEMAND RESPONSE PROGRAMS.

A. The Company's Demand Response programs use a communications network, load control switches, and a software platform to interface with customers to reduce load during peak events. This can involve either directly controlling load by switching off devices or providing incentives to customers to reduce load through time of use (TOU) rates. Demand Response allows Otter Tail to save costs by reducing demand during periods of high market prices. The Company's Demand Response programs are described in more detail in the Direct Testimony of Company witness Mr. Kirby Kugler.

[1] Electric Company Smart Meter Deployments: Foundation for a Smart Grid (2019 Update), The Edison Foundation Institute for Electric Innovation (December, 2019).

Q. HOW WILL THE AMI PROJECT ADDRESS THE COMPANY'S DEMAND RESPONSE INFRASTRUCTURE?

A. As I discuss below, the AMI Project entails replacement of all existing meters with AMI meters, which enable two-way communication with the utility and eliminate the need for many meter related tasks. As a part of the project, the Company will deploy a new network to communicate with the AMI meters. Once this new network is in place, it can also serve as the communication infrastructure for other utility uses including the Demand Response programs.

III. DESCRIPTION OF THE AMI PROJECT

Q. PLEASE PROVIDE AN OVERVIEW OF THE AMI PROJECT.

A. The Company's AMI Project will involve the procurement and deployment of the following infrastructure:

1. Approximately 170,000 AMI meters, of which nearly 80,000 will be located in North Dakota;
2. A Field Area Network consisting of local data collectors/routers which will collect and transmit meter data back to Otter Tail and, over time, will replace the existing radio-based system supporting Otter Tail's Demand Response programs; and,
3. A head-end system and Meter Data Management System (MDM) where data will be routed and stored, as needed, to facilitate automated meter reading, alarms and outage information processing, Demand Response, and automated distribution control in the Company's provision of electric service.

Q. HOW WILL THE COMPANY ROLL OUT AMI METERS?

A. As part of the AMI Project, Otter Tail will install AMI meters at nearly every service location. The Company has not yet selected the specific meters that will be used as the procurement process is still underway, but any AMI meters (and associated infrastructure) that are deployed will have, at a minimum, the following characteristics:

1. Wi-Fi capabilities;
2. Net metering capabilities;
3. Edge computing capabilities (*i.e.,* the ability to interact with third-party software);
4. Multiple alarms including: voltage alarms, meter status alarms, high temperature alarms, tamper alarms, reverse power flow alarms;
5. Power Quality monitoring and event reporting;
6. Outage and restoration notifications;
7. A twenty-year expected life for devices;
8. Support for full two-way communication for all devices, including remote connect/disconnect and interval metering data which will support improvements to determine the amount of load controlled as well as the use of the meter as a Demand Response System control device;
9. Capabilities for remotely upgrading the firmware with software downloaded securely over the network without any need for an on-site presence;
10. UL2735 (an electrical/fire safety standard) certification for all endpoints;
11. Ability to support an Internet Protocol version 6 (IPv6) field area network by the Project start date; and,
12. Network performance that satisfies system acceptance tests and service level agreement (SLA) requirements over the 20-year life of the proposed AMI solution.

Q. PLEASE DESCRIBE THE FIELD AREA NETWORK IN MORE DETAIL.

A. The Field Area Network is a communications network that will collect and transmit meter data from customer locations to the Company's head-end system. Otter Tail will purchase the Field Area Network from the same vendor that provides the AMI meters to ensure the systems are fully compatible and integrated. The Field Area Network is a critical part of the AMI Project because it enables the Company to collect the meter data recorded and transmitted by the new AMI meters.

The Field Area Network will include collectors/routers and network extenders placed in local areas, an unlicensed radio network, meters, and, potentially, the use of streetlight controllers and network bridges for distribution automation. Some of the final deployment decisions will occur once the Company finishes the vendor selection process and completes its technical workshops and network design.

Q. PLEASE DESCRIBE THE HEAD-END SYSTEM AND MDM IN MORE DETAIL.

A. The head-end system is a hardware and software program that serves as the bridge point between the metering infrastructure and the Company's internal systems that will store and use meter data. The head-end system will be provided by the same vendor as the AMI meters and the Field Area Network, and will collect and pass metering data to the MDM and other systems. The head-end system is expected to also be the gateway to the Field Area Network for other utility functions such as automated distribution control and Demand Response.

The MDM will be the Company's hardware and software platform to serve as a repository for all meter data recorded by the AMI meters and collected and transmitted by the Field Area Network. Once collected in the MDM, Otter Tail will use this meter data to support core utility functions such as calculating billing determinants and reliability, and will provide data to our customer web portal and other systems. The final business processes and data flows will be determined once the Company selects the AMI and MDM vendors. At that time, Otter Tail will go through a business process review and establish the new processes.

Q. ARE THERE OTHER OPPORTUNITIES TO LEVERAGE THE AMI PROJECT?

A. Yes. Otter Tail is developing the AMI Project to help ensure that it has the two-way communications and distribution system visibility in place to leverage this this investment into the future. For example, the AMI Project could be used to support a more advanced outage management system to help the Company identify and respond to distribution system outages more quickly, thereby increasing reliability.

IV. CAPITAL INVESTMENTS AND EXPECTED COST SAVINGS

Q. WHAT IS THE EXPECTED CAPITAL COST OF THE AMI PROJECT?

A. The Company expects the capital cost of the AMI Project to be approximately $50-60 million on a company-wide basis. As explained in the Direct Testimony of Company witness Mr. Bryce C. Haugen, consistent with past practice for meter-related expenses, the Company plans to allocate system wide costs of the AMI Project to the North Dakota jurisdiction pursuant to the allocation approved by the Commission in the Settlement Agreement resolving the Company's last general rate case.

Q. HOW DID OTTER TAIL DETERMINE THE AMI PROJECT COST ESTIMATE?

A. Otter Tail staff worked with outside consultants who have prior experience with AMI implementation to develop this cost estimate based on industry standards and known pricing of AMI infrastructure. Otter Tail has also validated these estimates using the initial information it received in responses to its RFPs.

Q. PLEASE FURTHER ELABORATE ON THE COSTS OF THE AMI PROJECT.

A. Table 1 below provides a breakdown of the estimated capital costs for the AMI Project.

Table 1: Estimated Capital Costs for the AMI Project

Amounts in Millions	Low	High
Initial Gross Capital Costs		
Internal Labor	$ 4.4	$ 6.4
Legal and Consulting	$ 1.9	$ 2.3
Meters	$ 18.0	$ 25.0
Installation	$ 11.6	$ 11.6
Field Area Network	$ 5.1	$ 5.1
Headend	$ 1.4	$ 1.4
Other - AMI vendor fees	$ 3.5	$ 5.3
Meter Data Management	$ 1.4	$ 2.6
Integrations	$ 1.5	$ 7.0
Project Total	**$ 48.8**	**$ 66.7**

Q. WHAT DEGREE OF CERTAINTY DOES OTTER TAIL HAVE WITH RESPECT TO ITS COST ESTIMATES?

A. As I noted above, Otter Tail developed its cost estimates using information from industry consultants and the estimates have been in line with the responses to RFPs received to date. While the Company can never be completely certain regarding the costs of a future project, Otter Tail is confident that it is using reasonable estimates. As the process proceeds, the Company should have greater certainty regarding project costs. I discuss the status of implementing the AMI Project later in my testimony.

Q. HOW DOES THE AMI PROJECT REDUCE COSTS?

A. The AMI Project will provide significant O&M savings associated with reducing meter reading and associated meter activity costs. Otter Tail estimates savings of approximately $6.9 million per year, on average from 2022 when deployment begins through 2045.

Q. HOW DID OTTER TAIL DEVELOP ITS ESTIMATE OF O&M SAVINGS?

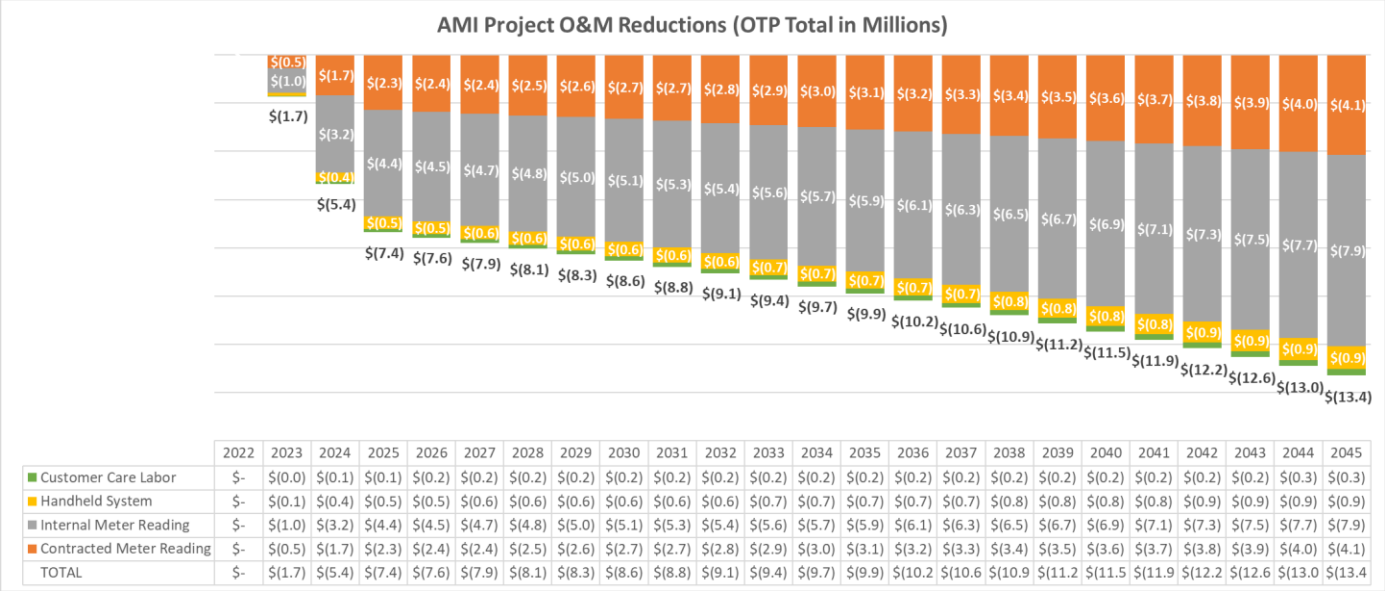
A. Otter Tail's savings estimate is based on estimated capital costs of the AMI Project compared with the reduction in O&M costs associated with the various efficiencies that I described above. The new AMI meters (and related infrastructure) will have their own O&M costs. However, those O&M costs have been netted against the reduction in O&M costs associated with the project. I would note that our calculation of overall savings is only based on the capital and O&M costs and savings of the AMI Project. There are other customer benefits associated with the AMI Project that are not included in our savings estimate.

Q. PLEASE DESCRIBE THE REDUCTION IN METER RELATED COSTS BY ELIMINATING MANUAL METER READING.

A. Otter Tail currently incurs O&M costs for manual meter reading in four categories: (1) internal meter reading – the cost of Otter Tail employees performing meter reading functions; (2) contract meter reading – the costs of contracted personnel who perform meter

reading functions; (3) the cost of operating and maintaining the handheld meter reading systems; and (4) the costs of the Company's Customer Care function in supporting meter reading. The O&M savings for the AMI Project comes from eliminating these costs. The estimate cost savings by eliminating these functions is $1.7 million in 2023 and rises to over $13 million in 2045, due to inflation. Figure 2 below shows the expected reduction in O&M expenses caused by implementation of the AMI Project through 2045.

Figure 2: Reductions in O&M Expenses from AMI Project (2022-2045)

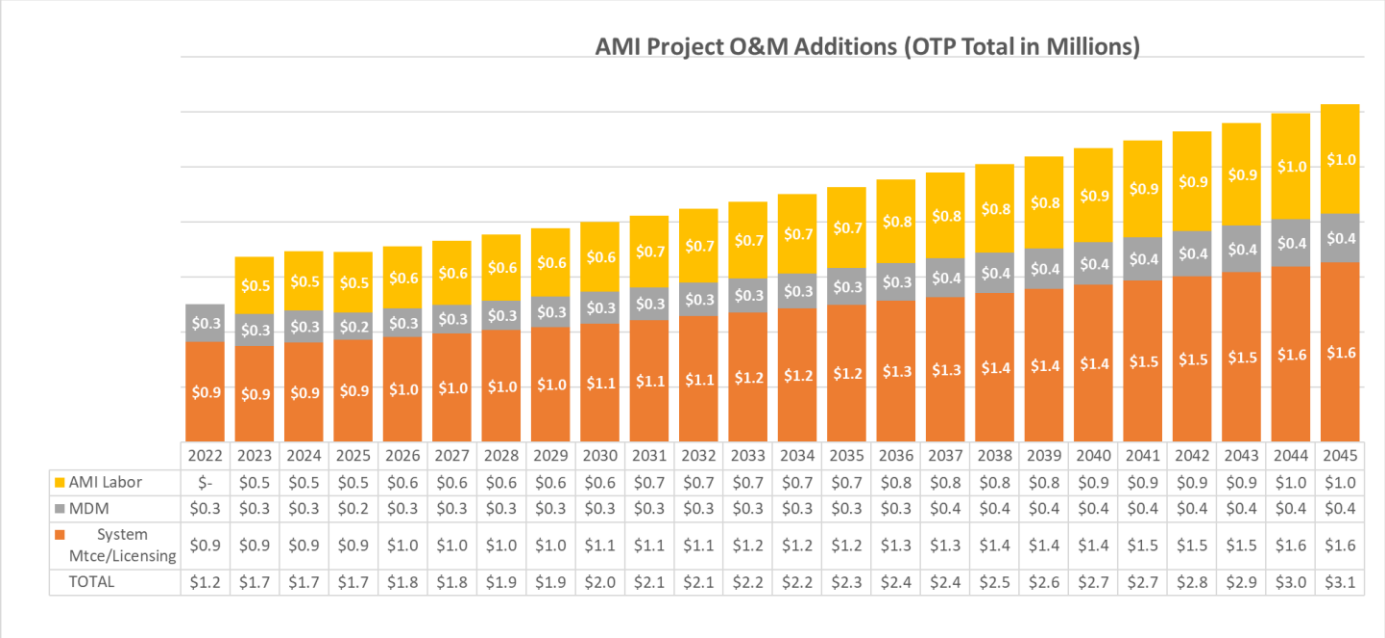


	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Customer Care Labor	$-	$(0.0)	$(0.1)	$(0.1)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.3)	$(0.3)
Handheld System	$-	$(0.1)	$(0.4)	$(0.5)	$(0.5)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.7)	$(0.7)	$(0.7)	$(0.7)	$(0.7)	$(0.8)	$(0.8)	$(0.8)	$(0.8)	$(0.9)	$(0.9)	$(0.9)	$(0.9)
Internal Meter Reading	$-	$(1.0)	$(3.2)	$(4.4)	$(4.5)	$(4.7)	$(4.8)	$(5.0)	$(5.1)	$(5.3)	$(5.4)	$(5.6)	$(5.7)	$(5.9)	$(6.1)	$(6.3)	$(6.5)	$(6.7)	$(6.9)	$(7.1)	$(7.3)	$(7.5)	$(7.7)	$(7.9)
Contracted Meter Reading	$-	$(0.5)	$(1.7)	$(2.3)	$(2.4)	$(2.4)	$(2.5)	$(2.6)	$(2.7)	$(2.7)	$(2.8)	$(2.9)	$(3.0)	$(3.1)	$(3.2)	$(3.3)	$(3.4)	$(3.5)	$(3.6)	$(3.7)	$(3.8)	$(3.9)	$(4.0)	$(4.1)
TOTAL	$-	$(1.7)	$(5.4)	$(7.4)	$(7.6)	$(7.9)	$(8.1)	$(8.3)	$(8.6)	$(8.8)	$(9.1)	$(9.4)	$(9.7)	$(9.9)	$(10.2)	$(10.6)	$(10.9)	$(11.2)	$(11.5)	$(11.9)	$(12.2)	$(12.6)	$(13.0)	$(13.4)

Q. WILL THERE BE NEW O&M EXPENSES ASSOCIATED WITH IMPLEMENTATION OF THE AMI PROJECT?

A. Yes. As with any new capital project, the Company will incur costs to operate and maintain the new facilities. For the AMI Project, the Company will incur new costs in three main categories: (1) general labor for overseeing and operating the AMI Project; (2) costs for meter data management; and (3) general maintenance and licensing of the technology and software. Figure 3 below shows the O&M additions expected for the AMI Project through 2045.

Figure 3: AMI Project O&M Additions (in millions), 2022-2045

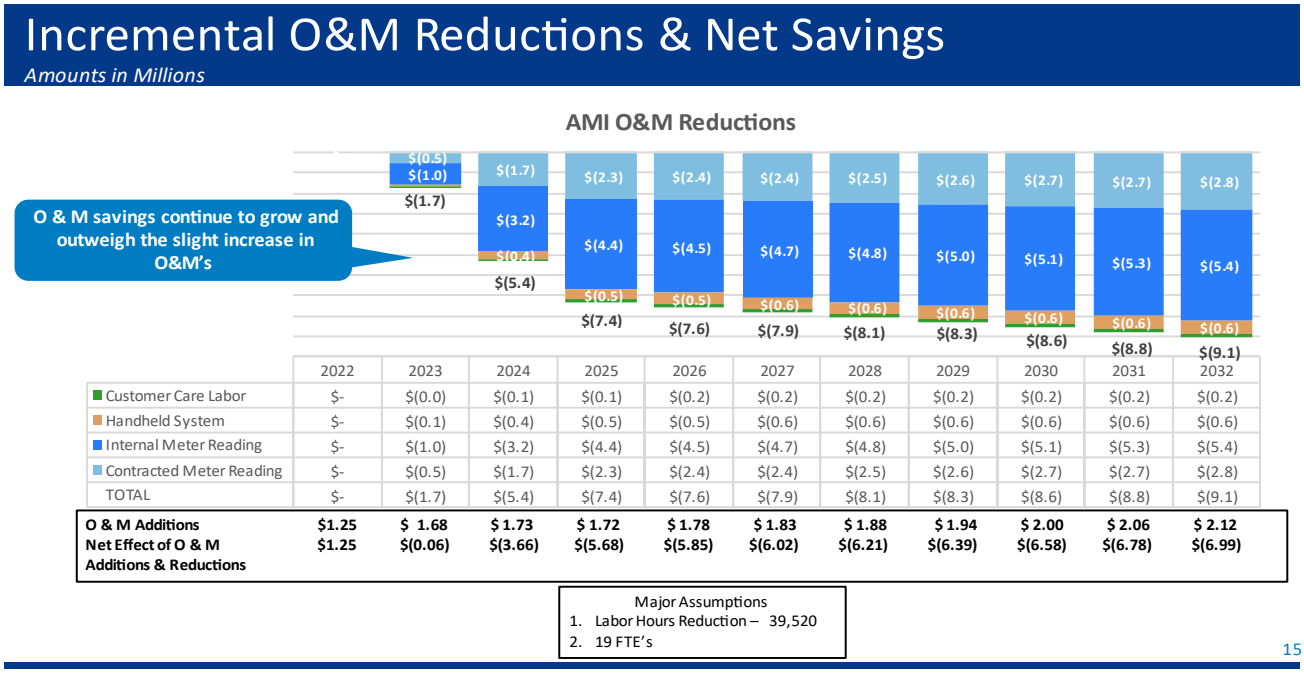


	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
AMI Labor	$-	$0.5	$0.5	$0.5	$0.6	$0.6	$0.6	$0.6	$0.6	$0.7	$0.7	$0.7	$0.7	$0.7	$0.8	$0.8	$0.8	$0.8	$0.9	$0.9	$0.9	$0.9	$1.0	$1.0
MDM	$0.3	$0.3	$0.3	$0.2	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.3	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4	$0.4
System Mtce/Licensing	$0.9	$0.9	$0.9	$0.9	$1.0	$1.0	$1.0	$1.0	$1.1	$1.1	$1.1	$1.2	$1.2	$1.2	$1.3	$1.3	$1.4	$1.4	$1.4	$1.5	$1.5	$1.5	$1.6	$1.6
TOTAL	$1.2	$1.7	$1.7	$1.7	$1.8	$1.8	$1.9	$1.9	$2.0	$2.1	$2.1	$2.2	$2.2	$2.3	$2.4	$2.4	$2.5	$2.6	$2.7	$2.7	$2.8	$2.9	$3.0	$3.1

Q. WILL THE REDUCTION IN O&M EXPENSES OUTWEIGH ANY ADDITIONAL O&M EXPENSES ASSOCIATED WITH IMPLEMENTATION OF THE AMI PROJECT?

A. Yes. The Company estimates overall O&M savings from eliminating the manual meter reading expenses notwithstanding the new expenses for operating and maintain the AMI Project. The Company estimates that modest O&M savings will accrue in the first year of the project and grow significantly over time. Figure 4 below shows the net O&M savings expected over the first decade of the AMI Project. As shown, the new AMI meters and associated infrastructure will have their own O&M costs, but these new O&M expenses are far outweighed by the reduction in O&M expenses associated with eliminating manual meter reading.

Figure 4: AMI Project Net O&M Savings (in millions), 2022-2032



	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Customer Care Labor	$-	$(0.0)	$(0.1)	$(0.1)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)	$(0.2)
Handheld System	$-	$(0.1)	$(0.4)	$(0.5)	$(0.5)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.6)	$(0.6)
Internal Meter Reading	$-	$(1.0)	$(3.2)	$(4.4)	$(4.5)	$(4.7)	$(4.8)	$(5.0)	$(5.1)	$(5.3)	$(5.4)
Contracted Meter Reading	$-	$(0.5)	$(1.7)	$(2.3)	$(2.4)	$(2.4)	$(2.5)	$(2.6)	$(2.7)	$(2.7)	$(2.8)
TOTAL	$-	$(1.7)	$(5.4)	$(7.4)	$(7.6)	$(7.9)	$(8.1)	$(8.3)	$(8.6)	$(8.8)	$(9.1)
O & M Additions	**$1.25**	**$ 1.68**	**$ 1.73**	**$ 1.72**	**$ 1.78**	**$ 1.83**	**$ 1.88**	**$ 1.94**	**$ 2.00**	**$ 2.06**	**$ 2.12**
Net Effect of O & M Additions & Reductions	**$1.25**	**$(0.06)**	**$(3.66)**	**$(5.68)**	**$(5.85)**	**$(6.02)**	**$(6.21)**	**$(6.39)**	**$(6.58)**	**$(6.78)**	**$(6.99)**

Q. WILL CUSTOMERS OBTAIN THESE SAVINGS IN RATES?

A. Over time, yes. Otter Tail anticipates that overall savings of the AMI Project on a revenue requirement basis, which includes the capital portion of the AMI Project, to begin in 2028 and increase significantly over time. As with any capital project, the realization of overall savings in rates is different than the actual expense outcomes the Company is projecting. Company Witness Mr. Haugen discusses the revenue requirement impact of the AMI Project in his testimony.

Q. ARE THERE OTHER EFFICIENCIES GAINED BY SHIFTING TO AMI?

A. Aside from the O&M savings associated with eliminating manual meter reading, additional efficiencies will accrue from improvements to unbilled revenue calculations, improved customer service response times, and the ability to safely and remotely connect and disconnect service. In general, the automated nature of data flow in the AMI system will reduce manual processes in data entry and produce business efficiencies within Otter Tail.

However, the business process improvement savings associated with these efficiencies are not included in our savings estimate.

V. ADDITIONAL BENEFITS OF AMI

Q. WHAT BENEFITS DOES AMI PROVIDE TO CUSTOMERS AND THE UTILITY?

A. In addition to the material O&M savings Otter Tail will achieve by implementing the AMI Project, the two-way communication capability enabled by AMI will provide many other benefits and potential benefits, including improvements to reliability and safety, net metering capabilities, improved loading analysis, better data for maintenance programs, and distribution automation opportunities. Through the Company web-portal, customers will have access to detailed data and improved ability to manage their energy use and control their bills. The AMI Project will also enable the continuation and expansion of the Company's Demand Response programs.

Otter Tail has researched other utilities' experience with AMI and a common theme expressed by peer companies has been the immediate benefit those utilities have seen in their ability to troubleshoot customer concerns. The system will enable Otter Tail's customer service personnel to review current, almost real-time customer usage data while talking directly with the customer. The system will also provide our team the ability to know if a customer has a power interruption and help a customer troubleshoot their power concerns.

Q. HOW DOES AMI IMPROVE RELIABILITY AND SAFETY?

A. Advanced Metering Infrastructure enhances reliability by giving the utility improved system awareness and planning insight. The AMI system will provide the network communication system that could allow Otter Tail to eventually automate the distribution system at the substation and circuit level using smart devices. Additionally, the near real-time data from the AMI system will allow the Company to predict and plan for potential loading-related outages and will enable a reduction in response times for outages that do occur on the system.

The AMI Project will enhance safety for the Company and customers. Reducing visits to customer premises will lower the Company's exposure to items such as slips trips, falls and dog bites while improving customer privacy. The AMI Project will also provide better and more reliable alarms in the event of tampering or overheating of Company equipment.

Q. ARE THERE OTHER RELIABILITY BENEFITS ASSOCIATED WITH THE AMI PROJECT?

A. Yes. The AMI system will allow for transformer loading optimization as well as system operations load calculations. This will enhance the Company's transmission analysis capabilities in that the Company could potentially use distribution substation metering to provide one-minute periodicity data to our network applications. Over time, the Company will use the granularity of the outage data from the AMI system to prioritize maintenance spending on the electric distribution and transmission system. The high sampling rates of the latest meter offering will also give Otter Tail power quality data that it can use beyond just loading to determine if transformers or other equipment are beginning to fail.

VI. STATUS OF AMI PROJECT IMPLEMENTATION

Q. WHAT IS THE COMPANY'S PROPOSED TIMELINE FOR IMPLEMENTING THE AMI PROJECT?

A. The Company is planning to roll out the AMI Project in phases. Phase 1 is currently underway and entails issuing RFPs, evaluating bids, contract negotiations with suppliers, implementation and deployment planning, proof of concept, and internal project staffing. The Company will competitively bid all aspects of the Project in open processes. Phase 2 of the AMI Project is scheduled to run from the fourth quarter of 2021 through the fourth quarter 2022 and entails business process development system integrations and initial deployment for proof of concept. Phase 3, which will run from late 2022 to the third quarter of 2024, is when full deployment occurs, including of the AMI meters, the Field Area Network, and the MDM. To summarize, the current estimated timeline is as follows:

- Phase 1: Selection of preferred vendor and finalize contracts is ongoing and will continue through Q3 2021;
- Phase 2: Business process development, system integration and initial deployment from Q4 2021 to Q4 2022; and,
- Phase 3: Full Deployment from Q4 2022 and to Q3 2024.

Q. HAS THE COMPANY ISSUED ANY RFPS FOR THE AMI PROJECT TO DATE?

A. Yes. The Company has issued three RFPs and has received responses from vendors. These RFPs were for: (1) AMI Meters including the Field Area Network and head-end system, (2) the MDM system, and (3) AMI Project installation. Otter Tail is currently reviewing responses to these RFPs in preparation for selecting vendors for the AMI Project. Otter Tail may issue a fourth RFP for system integration. The Company is currently assessing whether it needs system integration services.

Q. WHAT ARE THE COMPANY'S PRIORITIES IN ISSUING RFPS AND SELECTING BIDS FOR THE AMI PROJECT?

A. Otter Tail has stressed in all of the RFPs that any hardware and software solutions that are implemented must be futureproof focused and must be compatible with and enable future Demand Response programs. This will ensure the installed AMI network can be used not only for meter reading and outage detection, but also for distribution automation and Demand Response. As described above, the AMI network is a key technology enabler for future distribution automation and Demand Response efforts, and therefore a key factor in evaluating bids for the AMI Project is that the system support these programs in the future.

Q. WHAT IS THE COMPANY'S DEPLOYMENT PLAN?

A. Otter Tail is currently reviewing responses to the installation RFP and is considering the appropriate deployment plan that will best serve our customers. The Company is considering variables such as efficiency, cost effectiveness, realization of benefits, and customer impact.

VII. CONCLUSION

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. In Otter Tail's ongoing desire to provide affordable solutions to our customers and at the same time improve our system, the Company has determined that it is now prudent to take advantage of the benefits of an AMI project. The AMI Project will save our customers money by reducing meter related O&M expenses. The system will offer increased opportunities to customers and the Company. At the same time, it will provide a communications and information technology infrastructure that will facilitate various other programs in ways that promote safety and reliability, provide greater information and control, and reduce costs.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.

STATE OF NORTH DAKOTA
BEFORE THE PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Determination of Prudence –
AMI Project

Case No. PU-21-___

VERIFICATION

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

Al Koeckeritz, being first duly sworn on oath, deposes and says that he is the Manager of Advance Concepts, Metering, and Land Rights at Applicant Otter Tail Power Company, a Minnesota corporation, in the above-captioned matter, that the testimony submitted in the above-captioned matter under his name was prepared under his direction, that he knows the contents thereof, and that the same is true and correct to the best of his knowledge and belief.

State of Nevada
County of Clark

Alan Koeckeritz
Al Koeckeritz

Subscribed and sworn to before me on this 12th day of February, 2021
by Alan Koeckeritz

Gilbert J Augustine
NOTARY PUBLIC
STATE OF NEVADA
Appt. No. 20-0885-01
Expires September 23, 2024

G. Augustine
Notary Public

My Commission expires: 09/23/2024

Notarized online using audio-video communication

Before the North Dakota Public Service Commission
State of North Dakota

In the Matter of the Application of Otter Tail Power Company
For Advance Determination of Prudence
AMI PROJECT

Case No. PU-21-

DEMAND RESPONSE TESTIMONY

Direct Testimony and Schedules of

KIRBY KUGLER

February 15, 2021

TABLE OF CONTENTS

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Kirby Kugler. I am the Manager System Operations Support for Otter Tail Power Company (Otter Tail or the Company).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have worked for Otter Tail since 1981. I started with the company as an Electrical Engineer with responsibilities for the development and support of engineering related software. I advanced to the Software Engineer role in 1988 and then became a Senior Software Engineer in 1993, reflecting increased responsibilities in the engineering software area. In 1998, I became Supervisor, Energy Management Systems reflecting my responsibility for support of the Energy Management and Demand Response Systems. I have been in my current position as Manager System Operations Support since 2009.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. In my current role, I manage the team that is responsible for the support of the Engineering Management System (EMS) and the Demand Response System. The EMS is used to monitor and control Otter Tail's transmission system and the Demand Response System is used to facilitate the Company's Demand Response programs.

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

A. The purpose of my testimony is to provide support for Otter Tail's application for an Advance Determination of Prudence (ADP) for the Company's proposed Advanced Metering Infrastructure (AMI) Project. Specifically, I address the ways in which the AMI Project will benefit Otter Tail and its customers by allowing the Company to continue and expand upon its Demand Response programs.

Q. HOW IS YOUR TESTIMONY STRUCTURED?

A. In my testimony, I address the following topics:

- Otter Tail's Existing Demand Response Programs;
- How the AMI Project Interacts with the Demand Response Programs; and,
- Plans for Modernization and Expansion of the Demand Response Programs.

II. OTTER TAIL'S EXISTING DEMAND RESPONSE PROGRAMS

Q. WHAT IS DEMAND RESPONSE?

A. Demand Response refers to a variety of programs used to shift or reduce load on the electric grid during periods when energy prices or demand for electricity is high. High energy prices or demand can be the result of extreme weather conditions or transmission and/or generation-related constraints. Demand Response programs are used to shift or reduce load by controlling the load using radio-controlled Load Management System (LMS) switches or by encouraging customers to voluntarily reduce load through pricing options that vary by time. Otter Tail also uses Demand Response tools to manage reliability events on the transmission system.

The alternative to Demand Response is to purchase additional energy from the market during periods when prices are high and to secure additional accredited capacity through either contracts or the construction of new generation. This alternative can be more costly than effective Demand Response programs. Reducing capacity requirements through Demand Response also provides potential to lessen or delay transmission and/or distribution investments.

Q. DOES OTTER TAIL HAVE DEMAND RESPONSE PROGRAMS?

A. Yes, the Company currently provides ten different offerings within its Demand Response portfolio. The multiple offerings provide our customers the flexibility to choose a program that reduces their energy costs while still meeting their needs. At the same time, the Company and customers benefit from the capacity accreditation obtained through Demand Response and by avoiding the cost of higher-priced energy purchased on the market.

Q. PLEASE DESCRIBE THE COMPANY'S EXISTING DEMAND RESPONSE PROGRAMS IN GREATER DETAIL.

A. Otter Tail has a variety of both direct load control (DLC) and time of use (TOU) Demand Response offerings for residential and non-residential customers. In a DLC program, customers receive a discounted rate or bill credit in return for the installation of switching equipment that can be used to stop operation of energy-intensive equipment during peak events. For example, Otter Tail's CoolSavings program offers customers a monthly bill credit in return for customers agreeing to the installation of a Load Management System (LMS) switch that cycles their air conditioners or heat pumps on and off in 15-minute cycles during system peak events. To take another example, the Residential Demand Control program offers a significant rate discount (based on actual demand) in return for customers agreeing to the installation of an LMS switch and a Demand Controller that reduce demand by curtailing the use of certain energy-intensive equipment, such as home dryers and water heaters, during peak events.[1]

TOU programs provide customers prices for electricity that differ based on the time of use. This can be as simple as different rates for daytime and nighttime loads or can involve providing TOU rates that are sensitive to peak pricing events, with day-ahead notification of such events. One example of a TOU rate is the Fixed Time of Service rate, which offers reduced pricing from 10 am to 6 am. Another example is Otter Tail's General TOU program, which offers TOU rates to non-residential customers with day-ahead notification of upcoming declared peak events.

Q. HAVE CUSTOMERS BEEN RECEPTIVE TO THE COMPANY'S DEMAND RESPONSE OFFERINGS?

A. Yes, approximately one-third of Otter Tail customers system-wide participate in a Demand Response program; customers have invested in space heating, water heating, and space cooling technologies that are compatible with the Company's Demand Response programs

[1] Additional information regarding some of the Company's Demand Response can be found at Money Saving Rates | Otter Tail Power Company (otpco.com).

and that provide energy cost savings to the participating customer and system reliability benefits to Otter Tail and its customers.

The load avoided by reducing demand at each individual home or businesses is relatively small. However, the aggregate effect of all those individual reductions at thousands of customer premises is sufficient to meaningfully shift and/or reduce demand for electricity on the Otter Tail system during peak events. During a winter peaking occurrence for Otter Tail, the Company has the capability to reduce load by between 10 and 15 percent using DLC programs (TOU programs can further reduce load, but the extent of such reductions is subject to customer behavior).

Q. PLEASE DESCRIBE THE BENEFITS OF DEMAND RESPONSE IN GREATER DETAIL.

A. There are several benefits of Demand Response for both Otter Tail and its customers. One obvious benefit for customers is that by choosing to participate in Demand Response programs customers receive lower rates and can reduce their bills. In effect, these customers are purchasing less electricity during periods when electricity costs are higher. They do this by responding to the price signals offered through TOU pricing or by agreeing in advance to an automatic curtailment of demand during periods of high electricity costs through a DLC program. Otter Tail's Demand Response programs allow the Company to respond appropriately to price signals, which promotes efficiency and cost savings across the system.

On a system-wide basis, Demand Response reduces the amount of energy that Otter Tail is required to purchase during higher pricing periods, saving money for all customers. Otter Tail also receives capacity accreditation from the Midcontinent Independent System Operator, Inc. (MISO) for the amount of interruptible load on the system, fulfilling a portion of the Company's requirement under Module E of the MISO Open Access Transmission, Energy, and Operating Reserve Markets Tariff. Load serving entities, like Otter Tail, are required to satisfy mandatory capacity reserve requirements set forth in Module E to meet peak demand on the Transmission system. Demand Response helps the

Company meet those capacity reserve requirements, lessening the need to purchase capacity or construct generation resources.

Q. Please describe the systems the Company currently uses for its Demand Response programs.

A. The Company's Demand Response programs use a radio communication system, IT infrastructure, and LMS switches to enable load control through a Demand Response software application. The Demand Response software is used to model each of the Demand Response offerings and to support the load control strategies used by Otter Tail to shift and/or reduce the demand for electricity on the Otter Tail system during peak events. At the customer level, radio-controlled LMS switches can be used to shut off the electrical load from certain equipment.

Q. CAN YOU DESCRIBE THE RADIO COMMUNICATIONS SYSTEM USED TO SUPPORT THE COMPANY'S CURRENT DEMAND RESPONSE PROGRAMS?

A. Yes, the radio communications system in question was originally built for voice communications with Otter Tail personnel in the field. The system uses an array of 39 towers located throughout the Otter Tail service territory to transmit radio signals. Although it was designed for voice communication, Otter Tail successfully adapted the radio communications system to also support the data communications to the LMS switches located at customer premises. However, a significant limitation is that the system is outgoing only (one-way). The Company does not receive confirmation that the Demand Response signals are received by the LMS switches, nor does it get confirmation that demand is reduced. To provide some level of confirmation that communication to the LMS switches is working as intended, Otter Tail installed LMS switches at select substation locations throughout its service territory. Equipment at these substations is monitored by the Company's EMS, which can determine whether those LMS switches received the Demand Response signals. This provides confirmation as to whether communication to the LMS switches in the substation locations is functioning but does not confirm that LMS

switches at customer locations are operational. A two-way network is required to achieve confirmation at the customer premise level.

Q. What is the current condition of the Company's Demand Response System?

A. Although Otter Tail has been successful in operating its Demand Response programs for decades, the software, hardware, and equipment used to operate those programs is at the end of life.

Otter Tail procured its current Demand Response software in 2003 and now, more than 17 years later, only receives limited support from the vendor. As a result, the Company faces a heightened risk that the Demand Response software will lose functionality or even stop working altogether. In addition, the limited vendor support only extends to maintaining existing functionality. There is no support for new or enhanced functions, which constrains Otter Tail's ability to grow and enhance its Demand Response offerings.

Moreover, several specific components of the Demand Response System are no longer available for sale, which means replacement units cannot be purchased, and/or are no longer supported by their manufacturers. Further, the firmware for this hardware is no longer updated, and manufacturer assistance with repairs is not available. The components in question include analog modem banks, multiplexers, channel banks, and Remote Transmit Controllers (RTCs). Fortunately, Otter Tail is still able to acquire LMS switches, but only replacement units are available, which means the Company cannot acquire switches with enhanced functionality.

Other examples of outdated and no longer supported Demand Response System equipment are the model 505 and model 515 Palm Pilot devices. Otter Tail uses the Palm Pilots to program and provide local control of the LMS switches. While the devices were up-to-date technology when purchased, they are no longer available for sale, nor does the manufacturer support them. In fact, Hewlett-Packard, which purchased Palm, Inc. in 2010, announced in 2011 that it was discontinuing production and support of Palm devices. The Company's Palm Pilot units have thus been out of support for approximately 10 years. While Otter Tail has been able to continue without the manufacturer's support, it now needs

new equipment. Of the 16 Palm Pilots that Otter Tail originally purchased, only 6 remain operational.

Given the limitations of the one-way radio communication system, the obsolescent equipment, such as the RTCs and Palm Pilots, and the outdated Demand Response software, at this point Otter Tail needs to upgrade and replace the Demand Response System. If the Company does not do so, there is a risk that the system will degrade to the point at which it is no longer usable. The AMI Project, if approved and implemented, will provide a new communications network supporting the system upgrade.

Q. YOU HAVE DISCUSSED THE RISK OF FAILURE; ARE THERE OTHER DISADVANTAGES TO CONTINUING TO USE THE COMPANY'S EXISTING DEMAND RESPONSE SYSTEM?

A. Yes, there are. Otter Tail currently has a limited ability to determine the amount of load that it is controlling, which prevents the Company from fine-tuning its load control activity. In addition, because no signals are received back from LMS switches, Otter Tail is unable to identify and proactively address problems that arise with that equipment. Finally, Otter Tail needs to be conservative in seeking accreditation for MISO Module E capacity because of the Company's limited ability to ascertain the amount of load being controlled.

In addition to those disadvantages resulting from the use of one-way data transmission using the radio communications system, Otter Tail's Demand Response programs are also limited by the current software and hardware. As I noted above, new functionality is not supported, which hampers the Company's ability to offer new programs for customers. In addition, the current system is not as well suited to controlling newer equipment, which can have more sensitive electronics and controls. For example, newer heat pumps have variable speed compressors and demand from such equipment could be reduced by lowering speeds without completely shutting off units, but Otter Tail's system generally only allows the Company to completely cut the power.

III. THE AMI PROJECT AND DEMAND RESPONSE

Q. HOW WILL THE AMI PROJECT INTERACT WITH OTTER TAIL'S DEMAND RESPONSE PROGRAMS?

A. One of the critical components of Demand Response programs is the communications network. Using that network, Otter Tail has the ability to control load by using LMS switches to curtail customer load or to notify customers of a peak pricing period to encourage voluntary load reduction. However, as noted above, the aging radio communications system that only allows for one-way communications.

The AMI Project will provide a new communications network that Otter Tail can use to operate its Demand Response programs.

Q. HOW WILL A NEW COMMUNICATIONS BACKBONE IMPACT OTTER TAIL'S DEMAND RESPONSE PROGRAMS?

A. With the AMI Project, especially the new communications network, Otter Tail will be able to continue to provide its current Demand Response programs and expand upon them.

Otter Tail anticipates that a new communications network, along with other capital improvements, will allow Otter Tail to enhance its response to MISO market pricing and capacity information by providing expanded Demand Response offerings to our customers. For example, with the availability of interval metering from the AMI meters and two-way data communication using the AMI Project infrastructure the Company will be able to offer additional TOU rates. As with the existing Demand Response programs, new programs will give customers greater flexibility by allowing them to make choices that keep their energy costs low in ways that fit their business or household needs, while also allowing Otter Tail to keep its revenue needs lower through limiting peak energy purchases and reducing the need to acquire peak generation capacity.

Using the AMI Project's two-way communications system and the functionality of the AMI meters, the Company will have a more accurate and granular understanding of the impacts of its Demand Response programs. Otter Tail will then be able to better calibrate its control activity, and more accurately identify the Demand Response capacity for which it receives credit from MISO.

Q. HOW DOES THE AMI PROJECT FIT INTO THE COMPANY'S BROADER LONG-TERM DEMAND RESPONSE PLANS?

A. The communication network upgrades Otter Tail is planning as part of the AMI Project are necessary for the Company to maintain its successful Demand Response programs, address existing limitations to the Demand Response programs, and enable future expansion. Without a new communications network, the Company's ability to continue Demand Response will degrade over time.

Q. IS THE AMI PROJECT THE ONLY SET OF INVESTMENTS NEEDED TO FULLY IMPROVE AND EXPAND THE DEMAND RESPONSE PROGRAMS?

A. No. The AMI Project will provide the critical two-way data communications network for the Demand Response System. However, Otter Tail plans on making additional capital improvements that will allow for the continuation and expansion of the Demand Response programs. Once Otter Tail has implemented the AMI Project and the new communications network is operational, the Company will follow with the installation of a new suite of software to manage Demand Response. The Company may also install new LMS switches; however, applications running on the new AMI meters may allow Otter Tail to provide Demand Response control and/or notification using the meters themselves.

Otter Tails plans to improve the Demand Response System are underway and are included in the Innovation 2030 (I2030) roadmap. As Otter Tail Witness Mr. Al Koeckeritz discusses in his testimony, the Company is informing vendors that AMI Project hardware and software must be compatible with the Company's plans to preserve and expand its Demand Response programs.

Q. WHAT ARE SOME OF THE OTHER IMPROVEMENTS IN THE DEMAND RESPONSE PROGRAMS THAT COULD BE IMPLEMENTED AS A RESULT OF THE AMI PROJECT?

A. As I noted above, one possibility is that applications run on the AMI meters themselves could replace the need for traditional LMS switches at select locations. Similarly, the Company could use applications running on the meters to provide notification to TOU

customers of peak pricing events. Another possibility is that with the availability of interval data for residential customers, we could expand the use of TOU pricing for residential customers. In that scenario, customers could view their interval data on our website and then select the most optimal rate plan based on their load profile and willingness to shift their usage.

IV. CONCLUSION

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. The AMI Project will provide a crucial two-way data communication system for Otter Tail's Demand Response programs. The AMI meters are an essential part of that communication system and applications installed on the meters will likely provide additional Demand Response functionality in the future. Along with other planned capital improvements, Otter Tail needs the AMI Project in order to continue and expand upon the Company's successful Demand Response programs.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.

STATE OF NORTH DAKOTA
BEFORE THE PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Determination of Prudence –
AMI Project

Case No. PU-21-

VERIFICATION

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

Kirby Kugler, being first duly sworn on oath, deposes and says that he is the Manager System Operations Support for Applicant Otter Tail Power Company, a Minnesota corporation, in the above-captioned matter, that the testimony submitted in the above-captioned matter under his name was prepared under his direction, that he knows the contents thereof, and that the same is true and correct to the best of his knowledge and belief.

Kirby Soren Kugler
Kirby Kugler

Subscribed and sworn to before me on this 12th day of February, 2021

XIOMARA J GIANNELLI
Notary Public - State of Florida
Commission # HH153
Expires on July 21, 2024

Notary Public

Notarized online using audio-video communication

My Commission expires: 07/21/2024

Before the North Dakota Public Service Commission
State of North Dakota

In the Matter of the Application of Otter Tail Power Company
For Advance Determination of Prudence
AMI PROJECT

Case No. PU-21-

ECONOMIC ANALYSIS

Direct Testimony and Schedules of

BRYCE C. HAUGEN

February 15, 2021

TABLE OF CONTENTS

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Bryce C. Haugen and I am the Supervisor Regulatory Analysis, Regulatory Administration for Otter Tail Power Company (Otter Tail or the Company).

Q. PLEASE DESCRIBE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I am Otter Tail's Supervisor Regulatory Analysis, Regulatory Administration. My primary responsibilities in this position are to lead the work team responsible for the preparation and financial analysis used to determine revenue requirements associated with various state and federal cost recovery mechanisms and to lead development of regulatory filings associated with these cost recovery mechanisms.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to present the economic analysis supporting Otter Tail's application for an Advance Determination of Prudence (ADP) for the Company's proposed Advanced Metering Infrastructure (AMI) Project; specifically, I am providing the estimated impact of the proposed AMI Project on Otter Tail's revenue requirement.

Q. HOW IS YOUR TESTIMONY STRUCTURED?

A. In my testimony, I address the following topics:

- Economic Overview;
- Summary of the Modeling/Analytic Approach; and,
- Results of Economic Analysis.

II. ECONOMIC OVERVIEW

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

A. In this section, I briefly provide an overview, on a conceptual level, of the economic impacts of the proposed AMI Project for the Company and its customers.

Q WHAT ARE THE KEY FACTORS YOU CONSIDERED IN ANALYZING THE ECONOMIC IMPACT OF THE AMI PROJECT?

A. In analyzing the economic impact of the AMI Project, I considered the estimated capital costs of the Project, ongoing costs the Company expects to result from implementation of the Project, which includes O&M costs for the advanced meters and other project infrastructure, the savings the Company expects to result from implementation of the AMI Project, and the jurisdictional allocation of costs and expenses. Using those inputs, I developed an estimate of the expected impact of the AMI Project on a net revenue requirement basis.

Q. ARE YOU SPONSORING THE CAPITAL INVESTMENT AND O&M EXPENSE ESTIMATES USED IN YOUR ANALYSIS?

A. No, I am not. The estimated capital investment and O&M costs associated with the AMI Project were developed by others involved in the project and are presented in this matter by Company witness Al Koeckeritz in his direct testimony. I took the information presented by Mr. Koeckeritz and used it as inputs in my economic modeling of the AMI Project.

In my testimony, I distinguish between O&M costs and net expenses. O&M costs include: labor associated with the systems, AMI system maintenance and licensing, contracted services, and hardware. Net expenses include the O&M costs as well as property tax, income tax, and depreciation expenses.

Q. WHAT ESTIMATED EXPENSE BENEFITS DID YOU USE IN YOUR ANALYSIS?

A. The Company estimates that implementation of the AMI Project will result in average annual O&M savings of approximately $6.9 million system-wide from the beginning of initial deployment in 2022 through the 20-year expected life of the advanced meters as shown below in Table 1, Column E, Line No. 14. The average annual North Dakota O&M savings are $3.1 million for the same period.

The estimated O&M savings and the basis for it are presented in the direct testimony of Mr. Koeckeritz. The savings largely result from Otter Tail no longer having to manually read meters across its service area in North Dakota, South Dakota, and Minnesota. While there are O&M costs associated with AMI meters and other components of the AMI Project, as with any systems, those costs are less than the Company's current O&M costs with existing meters due to the reduction in meter reading and associated expenses. The Company has a large and sparsely populated service area and it is expensive to physically visit individual customer meters.

The Net expense savings are estimated to begin in 2028 when they will be $2.92[1] million system-wide. In North Dakota, the savings are also estimated to begin in 2028 when they will be $1.30[2] million. After 2028, the savings will then increase annually thereafter as Otter Tail avoids the projected inflation in O&M costs for the manually read meters as shown in Table 1, Column H, Line No. 4.

[1] Table 2, Column H, Line No. 3.

[2] $2.92 million x 44.67973 percent (North Dakota's C6 allocation factor from Case No. PU-17-398)

Table 1
AMI Project Estimate of
Annual Revenue Requirements for Expenses (in millions)

Line	A	B	C	D	E	F	G	H	I
1	**Annual Revenue Requirement (OTP Total)**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
2	O&M cost/benefit	$ 1.25	$ (0.06)	$ (3.66)	$ (5.68)	$ (5.85)	$ (6.02)	$ (6.21)	$ (6.39)
3	Other Expenses	$ 0.23	$ 4.95	$ 6.33	$ 7.30	$ 7.20	$ 7.11	$ 3.29	$ 3.25
4	**Net Expenses**	$ 1.48	$ 4.89	$ 2.67	$ 1.62	$ 1.35	$ 1.09	$ (2.92)	$ (3.14)
5	**Annual Revenue Requirement (OTP Total)**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**
6	O&M cost/benefit	$ (6.58)	$ (6.78)	$ (6.99)	$ (7.19)	$ (7.41)	$ (7.63)	$ (7.86)	$ (8.11)
7	Other Expenses	$ 3.21	$ 3.18	$ 3.14	$ 3.11	$ 3.07	$ 3.04	$ 3.00	$ 2.96
8	**Net Expenses**	$ (3.37)	$ (3.61)	$ (3.84)	$ (4.09)	$ (4.34)	$ (4.60)	$ (4.86)	$ (5.14)
9	**Annual Revenue Requirement (OTP Total)**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
10	O&M cost/benefit	$ (8.35)	$ (8.61)	$ (8.87)	$ (9.14)	$ (9.41)	$ (9.71)	$ (10.00)	$ (10.31)
11	Other Expenses	$ 2.93	$ 2.89	$ 2.86	$ 2.82	$ 2.79	$ 2.75	$ 2.31	$ 1.42
12	**Net Expenses**	$ (5.42)	$ (5.71)	$ (6.01)	$ (6.32)	$ (6.63)	$ (6.95)	$ (7.68)	$ (8.88)

Time Period Annual Average

13	**Annual Revenue Requirement**	**2022-2045 (OTP Total)**	**2022-2045 (OTP ND)***	**2022-2045 (OTP Total)**	**2022-2045 (OTP ND)***
14	O&M cost/benefit	$ (165.57)	$ (73.97)	$ (6.90)	$ (3.08)
15	Other Expenses	$ 85.15	$ 38.04	$ 3.55	$ 1.59
16	**Net Expenses**	$ (80.42)	$ (35.93)	$ (3.35)	$ (1.50)

*Based on OTP's C6 jurisdictional allocation of 44.67973 percent as approved in Case No. PU-17-398

Q. DOES YOUR ECONOMIC ANALYSIS ACCOUNT FOR THE BENEFITS OF MAINTAINING AND EXPANDING OTTER TAIL'S DEMAND RESPONSE PROGRAMS?

A. No, it does not. Although the Company (and ratepayers) benefit from Otter Tail's current demand response program offerings and the implementation of the AMI Project, along with other investments, will allow us to maintain and expand those programs, as is discussed in the testimony of Company witness Kirby Kugler, Otter Tail determined that those benefits are not sufficiently quantifiable to include in my analysis.

The economic impacts of demand response programs depend on several factors, some of which are difficult to estimate at this time with a sufficiently high degree of certainty to include in a regulatory filing, including the new or expanded demand response programs the Company may implement once the AMI meters are installed (which depends, in part, on decisions made regarding other contemplated capital investments), the proportion of customers of various classes who will choose in the future to use various

demand response programs, and potential future changes in the Midcontinent Independent System Operator, Inc.'s capacity requirements. Accordingly, while the Company believes that it and its customers will benefit financially because the AMI Project will allow for the continuation and expansion of the Company's successful demand response programs, Otter Tail is not providing an economic estimate of the amount of such benefits.

Q. ARE THERE OTHER PROJECTED OR POTENTIAL BENEFITS OF THE AMI PROJECT THAT ARE NOT INCLUDED IN YOUR ANALYSIS?

A. Yes. In his direct testimony, Mr. Koeckeritz describes a variety of benefits or potential benefits of the AMI Project including safety, better information for customers regarding energy usage, business process improvements, and improvements in reliability. As with the demand response benefits discussed above, these benefits are not included in Otter Tail's economic analysis.

III. SUMMARY OF MODELING / ANALYTICAL APPROACH

Q. HOW DID THE COMPANY ANALYZE THE EXPECTED ECONOMIC IMPACTS OF THE PROPOSED AMI PROJECT?

A. As I noted above, in broad terms Otter Tail considered the capital and expense expected costs and expected benefits. More specifically, the Company analyzed the impacts of those expected costs and benefits if the AMI Project is approved and implemented by calculating the annual revenue requirements over the life of the project.

IV. RESULTS OF ECONOMIC ANALYSIS

Q. PLEASE SUMMARIZE THE RESULTS OF THE COMPANY'S ANALYSIS?

A. Table 2 below presents the revenue requirement impacts of the scenario in which the AMI Project is implemented. It shows total revenue requirement savings of approximately $43.44 million system-wide over the 20-year life of the meters. On a North Dakota basis, the total revenue requirement savings are $19.41 million over the same period using North

Dakota's 44.67973 percent C6 allocation factor approved in the Settlement Agreement[3] by the Commission in Otter Tail's last general rate case.

Table 2
AMI Project Estimate of
Annual Revenue Requirements (in millions)

Line	A	B	C	D	E	F	G	H	I
1	**AMI Project (OTP Total)**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
2	Return on Rate Base	$ 0.86	$ 2.25	$ 3.31	$ 3.50	$ 3.10	$ 2.72	$ 2.45	$ 2.30
3	Net Expenses	$ 1.48	$ 4.89	$ 2.67	$ 1.62	$ 1.35	$ 1.09	$ (2.92)	$ (3.14)
4	**Annual Revenue Requirement**	$ 2.34	$ 7.14	$ 5.98	$ 5.12	$ 4.45	$ 3.80	$ (0.47)	$ (0.85)
5	**AMI Project (OTP Total)**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**
6	Return on Rate Base	$ 2.14	$ 1.99	$ 1.84	$ 1.69	$ 1.54	$ 1.39	$ 1.24	$ 1.09
7	Net Expenses	$ (3.37)	$ (3.61)	$ (3.84)	$ (4.09)	$ (4.34)	$ (4.60)	$ (4.86)	$ (5.14)
8	**Annual Revenue Requirement**	$ (1.23)	$ (1.61)	$ (2.00)	$ (2.40)	$ (2.80)	$ (3.20)	$ (3.62)	$ (4.05)
9	**AMI Project (OTP Total)**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**	**2044**	**2045**
10	Return on Rate Base	$ 0.94	$ 0.80	$ 0.65	$ 0.50	$ 0.35	$ 0.21	$ 0.09	$ 0.02
11	Net Expenses	$ (5.42)	$ (5.71)	$ (6.01)	$ (6.32)	$ (6.63)	$ (6.95)	$ (7.68)	$ (8.88)
12	**Annual Revenue Requirement**	$ (4.47)	$ (4.92)	$ (5.36)	$ (5.82)	$ (6.28)	$ (6.75)	$ (7.59)	$ (8.86)

Line	AMI Project (OTP Total)	2022-2045 (OTP Total)	2022-2045 (OTP ND)*
13	**AMI Project (OTP Total)**		
14	Return on Rate Base	$ 36.98	$ 16.52
15	Net Expenses	$ (80.42)	$ (35.93)
16	**Annual Revenue Requirement**	$ (43.44)	$ (19.41)

*Based on OTP's C6 jurisdictional allocation of 44.67973 percent as approved in Case No. PU-17-398

Q. WHAT IS THE PRIMARY FACTOR DRIVING THESE ESTIMATED SAVINGS?

A. The primary factor driving the expected savings is the reduction in meter reading costs, which are an O&M expense for the Company.

Q. DOES THE AMI PROJECT INCREASE THE COMPANY'S ANNUAL REVENUE REQUIREMENT IN THE NEAR-TERM?

A. Yes. Table 2 shows that the Company's annual revenue requirement is expected to increase in 2022-2027 due to the substantial capital investment in AMI meters and associated infrastructure. This increase to rate base takes several years to depreciate but beginning in 2028, the O&M savings associated with the AMI Project will outweigh this depreciation

[3] Commission's September 26, 2018 Order on Settlement, Case No. PU-17-398, In the Matter of the Otter Tail's Application of Otter Tail Power Company for Authority to Increase Rates for Electric Service in North Dakota.

expense, and the Company's annual revenue requirement savings will continue to grow thereafter.

Q. HOW DID OTTER TAIL ALLOCATE THE IMPACT OF THE AMI PROJECT JURISDICTIONALLY?

A. For simplicity, Otter Tail assigned the total costs of the project based on the 44.67973 percent C6 allocation factor approved by the Commission in its last general rate case. This factor is based on the weighted installed cost of meters in service, and meters make up roughly two-thirds of the total cost of the project. This is the allocation method that Otter Tail has traditionally used for meter-related expenses with the approval from the Commission and its counterparts in Minnesota and South Dakota.

Q. WOULD THE ALLOCATION WITHIN A JURISDICTIONAL COST OF SERVICE STUDY UTILIZE DIFFERENT ALLOCATION FACTORS?

A. Yes. A jurisdictional cost of service study will assign the meters based on the 44.67973 percent C6 allocation factor while other costs would fall under a plant related allocation factor such as P60, which was 45.428898 percent in Otter Tail's last general rate case. Given these allocation factors are relatively close, and for the sake of simplicity, I utilized the C6 factor for all North Dakota share estimates in my analysis.

Q. DO THE ECONOMIC IMPACTS OF THE PROJECT CHANGE OVER TIME?

A. Yes, as described by Mr. Koeckeritz, Phase I of the AMI Project is currently underway with full deployment of the advanced meters expected to take place beginning the fourth quarter of 2022 through the third quarter of 2024.

As shown in Tables 1 and 2 above, the annual revenue requirement peaks toward the end of the deployment phase in 2023 and 2024 and continues to decrease from that point forward until 2028 when it becomes a benefit primarily due to the net benefit in O&M expenses projecting to be $2.92 million in savings system-wide and $1.30 million in North Dakota savings.

V. CONCLUSION

Q. PLEASE SUMMARIZE YOUR CONCLUSIONS.

A. The Company's analysis shows that it and its customers will benefit economically if the AMI Project is approved and implemented. The benefits in question result from the reduction in O&M costs and would be in addition to the demand response program benefits discussed in the direct testimony of Mr. Kugler and the other benefits discussed in the direct testimony of Mr. Koeckeritz.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.

STATE OF NORTH DAKOTA
BEFORE THE PUBLIC SERVICE COMMISSION

Otter Tail Power Company
Advance Determination of Prudence –
AMI Project

Case No. PU-21-

VERIFICATION

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

Bryce C. Haugen, being first duly sworn on oath, deposes and says that he is the Supervisor Regulatory Analysis, Regulatory Administration for Applicant Otter Tail Power Company, a Minnesota corporation, in the above-captioned matter, that the testimony submitted in the above-captioned matter under his name was prepared under his direction, that he knows the contents thereof, and that the same is true and correct to the best of his knowledge and belief.

Bryce Charles Haugen
Bryce C. Haugen

State of Florida, County of Manatee

Subscribed and sworn to before me on this 11th day of February, 2021

Appeared by means of A/V technology, Presenting D/L as I.D.

SHERRI JOY SMALL
Notary Public - State of Florida
Commission # GG 981136
Expires on April 23, 2024

Sherri Joy Small
Notary Public Sherri Joy Small

My Commission expires: 04/23/2024

Notarized online using audio-video communication