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July 1, 2020

Ms. Patricia Van Gerpen
Executive Director
South Dakota Public Utilities Commission
Capitol Building, 1st Floor
500 E. Capitol Ave.
Pierre, SD 57501-5070

Subject: Otter Tail Power Company's Ten-Year Biennial Plan - 2020

Dear Ms. Van Gerpen:

Pursuant to the rules of the South Dakota Public Utilities Commission Energy Facility Plans ARSD 20:10:21 and Guidelines issued October 1977, Otter Tail Power Company hereby files its Biennial Ten-Year Plan with the Commission. Ten Copies are being sent to you by U.S. mail. .

Notice of Filing of the plan is being sent to each of the state agencies and officers designated in Section 23 of the Energy Facility Plans. If additional copies of the plan are required, or you have any other questions regarding this filing, please contact me at 218 739-8417 or bhdraxten@otpc.com.

Sincerely,

/s/ BRIAN DRAXTEN
Brian Draxten
Manager, Resource Planning

kaw

Enclosures

By electronic filing

c: Ms. Nicole Kivisto, MDU
Mr. Robert Rowe, NWPS
Ms. Judy Proferl, XCEL
Mr. Linden Evans, Black Hills Corp.

SOUTH DAKOTA
TEN-YEAR
BIENNIAL PLAN



Report RP20
Resource Planning Department
June 2020

By: Nathan Jensen

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INTRODUCTION

In accordance with the rules and regulations of the South Dakota Public Utilities Commission Energy Facility Plans ARSD 20:10:21, Otter Tail Power Company (Otter Tail or the Company), hereby files its Biennial Ten-Year Plan. This filing is structured to coincide sequentially with the Commission rules as defined in the Form for Plans, ARSD 20:10:21:25 Section 4 through Section 18, therefore, coincide with ARSD 20:10:21:04 to ARSD 20:10:21:18, respectively.

Notice of Filing of the plan is being sent to each of the state agencies and officers designated in Section 23 of the Energy Facility Plans.

SECTION 4 -- EXISTING ENERGY CONVERSION FACILITIES

A. **Big Stone Plant**

1. The Big Stone Plant is located in Grant County, South Dakota, approximately two miles west-northwest of Big Stone City, 1-3/4 miles from Big Stone Lake, and approximately two miles north of U.S. Highway 12. The site is in the central portion of Section 12, Township 121 N, Range 47 W.
2. The turbine-generator was built by Westinghouse and has a nameplate capacity of 414,590 kW at the generator terminals with inlet steam conditions of 2,400 psig, 1000 degrees F, a condenser pressure of 3.25 inches HgA, and 0% makeup.
3. Big Stone Unit #1 has a cruise rating of 475 MW using the sub-bituminous coal. Net generation for the year 2018 was 2,343,295 MWh, and for 2019 was 2,619,088 MWh.
4. The Big Stone Plant appropriates its entire supply of water from Big Stone Lake. During calendar year 2018, 3,111 acre-feet of water was appropriated, and during 2019, 2,823 acre-feet was appropriated.
5. The Big Stone Plant continued to burn sub-bituminous coal in 2018 and 2019. The amount of sub-bituminous coal burned in 2018 was 1,560,379 tons and 1,778,453 tons in 2019.

Big Stone Plant burned alternative fuels from 1989 to 2009. Deliveries of alternative fuels peaked in the mid to late 90s. After a thorough review of the Big Stone Plant use of alternative fuels, the plant decided to end the program at the end of 2009. Several factors led Big Stone to this decision. Capital repairs were required for the handling facility, primarily new walking floors. Supplies of the various fuels have dwindled, with BSP being the outlet of last resort in many cases. Maintenance costs for routine upkeep remained consistent, even with a lower number of tons moving through the facility. Tire derived fuel continued to create problems in the fuel conditioners, resulting in higher than expected maintenance costs. Finally, new EPA requirements for combusting non-hazardous secondary materials made it difficult to determine which fuels can be burned.

The owners of Big Stone Plant approved the addition of environmental retrofits to the plant. The plan called for selective catalytic reduction (SCR) to reduce emissions of nitrogen oxide and a dry-scrubber to reduce sulfur dioxide. It also called for the installation of Activated Carbon Injection (ACI) for the control of mercury emissions. Nitrogen dioxide, sulfur dioxide and mercury have been reduced 80 to 90 percent. Construction began in 2013 and was substantially completed in 2015.

6. Otter Tail does not have a projected date of removal from service for the Big Stone unit.
7. An ethanol plant built adjacent to Big Stone Plant became operational in March 2003. Big Stone Plant provides steam, fire protection, and access to its rail line for transporting the ethanol.

NOTE: Big Stone Plant is jointly owned by Otter Tail, Montana-Dakota Utilities Co., and Northwestern Public Service. Otter Tail serves as the operating agent for the unit.

B. Lake Preston Peaking Plant

1. The Lake Preston Peaking Plant is located in the city of Lake Preston, South Dakota, west of the intersection of 4th Street NW and Preston Street.
2. The generating unit consists of a G.E. frame 5 fuel oil fired combustion turbine connected to an electrical generator with a rated capacity of 23.95 MW at 59 degrees F. ambient temperature.
3. In 2018, the unit had net generation of 496 MWh, and 251 MWh in 2019.
4. Water source does not apply for this unit.
5. In 2018, 78,825 gallons of #2 fuel oil were consumed and in 2019, 52,645 gallons were consumed.
6. Otter Tail does not have a projected date of removal for this unit.

SECTION 5 -- PROPOSED ENERGY CONVERSION FACILITIES

The Company currently has two generation projects under construction, and one in the planning phase.

1. A 250 MW frame natural gas combustion turbine located at Astoria, SD, scheduled to be complete in December of this year.
2. A 150 MW wind facility located near Merricourt, ND, scheduled to be complete in October of this year.
3. A 30 to 50MW solar facility is being considered with a possible construction start date some time in 2021.

SECTION 6 -- EXISTING TRANSMISSION FACILITIES

Otter Tail currently owns nine high-voltage transmission line sections in South Dakota described as follows:

1. A section of the Canby – Toronto 115 kV line starting from a point on the South Dakota line in Section 34, Township 114, Range 47, to a substation one mile west of Toronto, a distance of 13.1 miles, all in Deuel County. This is a wood-pole, H-frame line. No date has been projected for the removal of this line.
2. A section of the Big Stone – Blair 230 kV line starting from a point 0.76 miles north of County Road #18 in Section 4, Township 118, Range 47, to a 230 kV substation four miles north of Gary in Section 16, Township 116, Range 47, a distance of 14.96 miles, 5.76 miles in Grant County and 9.2 miles in Deuel County. This is a wood-pole, H-frame line. No date has been projected for the removal of this line.
3. A section of the Big Stone – Hankinson 230 kV line starting at a point on the South Dakota line in Section 26, Township 129, Range 50, to a point 0.3 miles north of Roberts County Highway #23 in Section 11, Township 127, Range 50, a distance of 22.62 miles, all in Roberts County. This is a wood-pole, H-frame line. No date has been projected for the removal of this line.
4. A 115 kV line from Toronto to Hetland starting at the Toronto Substation in Section 24, Township 113, Range 49 (approximately 1 mile west of Toronto) and continuing generally south and west terminating at the Hetland Substation in Section 28, Township 111, Range 53 (approximately 1 mile east and 1 mile north of Hetland), a total distance of 38.8 miles, with about 3 miles in Deuel County, 32 miles in Brookings County, and 4 miles in Kingsbury County. This is a single pole line composed of both wood and steel structures. No date has been projected for the removal of this line.
5. A 115 kV line from Hetland to Lake Norden starting at the Hetland Substation in Section 28, Township 111, Range 53 (approximately 1 mile east and 1 mile north of Hetland) and continuing generally north terminating at the Lake Norden Substation in Section 20, Township 113, Range 53 (approximately 0.25 miles west of Lake Norden), a total distance of 14.3 miles, with about 3.2 miles in Hamlin County and 11.1 miles in Kingsbury County. This is a single pole line composed of steel structures. No date has been projected for the removal of this line.
6. A percentage of the CapX2020 Brookings County – Hampton 345 kV line starting on the South Dakota line in Section 34, Township 112, Range 47, and continuing generally south and then west terminating at the Brookings County Substation in Section 25, Township 111, Range 48, a total distance of 10.75 miles, all in Brookings County. This is a single pole line composed of steel structures with double circuit capability. No date has been projected for the removal of this line.

7. Two parallel 230 kV lines from Big Stone Plant to Big Stone South, starting at the Big Stone Plant substation in Section 12, Township 121, Range 47, and continuing south and terminating at the Big Stone South substation in Section 24, Township 121, Range 47, a total distance of 1.7 miles, all in Grant County. Both of these lines are comprised of steel-pole, H-frame structures. No date has been projected for the removal of this line.
8. A percentage of the CapX2020 Big Stone South – Brookings 345 kV line starting at the Big Stone South substation in Section 24, Township 121, Range 47 (approximately 2 miles west of Big Stone City) and continuing generally south, terminating at the Brookings County substation in Section 25, Township 111, Range 48 (approximately 11 miles east and 5 miles north of Brookings), a total distance of 71.6 miles, with about 22 miles in Grant County, 37 miles in Deuel County, and 13 miles in Brookings County. This is a single pole line composed of steel structures; a portion of which include double circuit capability from Big Stone South to a location near Gary. No date has been projected for the removal of this line.
9. A percentage of the Big Stone South – Ellendale 345 kV line starting at the Big Stone South substation in Section 24, Township 121, Range 47 (approximately 2 miles west of Big Stone City) and continuing generally west and north, terminating at the Ellendale (ND) substation in Section 9, Township 129, Range 63 (approximately 2 miles west of Ellendale, ND), a total distance of approximately 163 miles with 152.7 miles in South Dakota, with about 41.4 miles in Grant County, 51.0 miles in Day County, and 60.3 miles in Brown County. This is a single pole line composed of steel structures. No date has been projected for the removal of this line.

SECTION 7 -- PROPOSED TRANSMISSION FACILITIES

New Effington 230/41.6 kV Substation

Otter Tail's 41.6 kV transmission system between Hankinson, North Dakota, and Browns Valley, Minnesota needs infrastructure improvements in order to reliably serve increasing loads in the area. Specifically, continued load growth occurring in the Rosholt, South Dakota area, is causing the existing 41.6 kV transmission system to exceed its current load serving capability, especially during winter peak conditions.

Through Otter Tail's transmission planning studies of this area, Otter Tail identified the need for a new 230/41.6 kV substation near New Effington, South Dakota, in order to maintain reliability of the transmission system for the growing loads in this area. The New Effington 230/41.6 kV substation project involves tapping the existing 230 kV line from Hankinson, North Dakota to Big Stone, South Dakota and building a new 230/41.6 kV substation. This project location, near the middle of the 41.6 kV system between Hankinson and Browns Valley, will maximize the benefits of the new project which include: increasing the load serving capability of the system in order to serve the growing loads in the area; increasing voltages; off-loading the existing 41.6 kV system

leaving more room for load growth; decreasing line exposure; and helping to mitigate interruptions to customers in this area.

The New Effington 230/41.6 kV Substation Project was approved by MISO through its 2019 MISO Transmission Expansion Plan (MTEP19) and is currently under construction with an anticipated in-service date of November 30, 2020.

Lake Norden Area Transmission Improvements

Otter Tail owns and operates an extensive 41.6 kV transmission network in northeastern South Dakota. As a result of load growth occurring in the general Lake Norden area and the lack of sufficient capability of the existing 41.6 kV transmission network, Otter Tail identified the need for a new 115 kV transmission project to maintain reliability for the growing load in that area.

The Lake Norden Area Transmission Improvements include construction of approximately 58 miles of 115 kV line, along with upgrades to the existing Hetland, Lake Norden and Toronto substations, to provide an additional 115 kV transmission path to the area in the event the existing 115 kV transmission path is unavailable. This project benefits the system by increasing reliability, decreasing line exposure, as well as adding operational flexibility to perform routine maintenance on facilities in the local area without putting as many customers at risk for a service interruption. MISO has reviewed this project through its stakeholder process and approved this project through their 2018 MISO Transmission Expansion Plan (MTEP18) in December 2018.

Otter Tail energized Phase 1 of this project in March 2019, which included a new 14.3 mile 115 kV line from Hetland to Lake Norden along with upgrades to the existing Hetland and Lake Norden substations. Work is currently underway on Phase 2 of the project, which involves construction of the remaining 43.65 miles from Lake Norden to Astoria and upgrades at the Toronto 115 kV substation and a 345/115 kV transformer addition at the Astoria Switch Station, with a plan to finish the project in mid-2021.

Generation Interconnection Projects

Otter Tail continues to see a lot of activity within South Dakota related to on-going interests in new wind generation development. During 2020, Otter Tail is planning to energize three new 345 kV switching stations; one of which was energized in May near Twin Brooks, South Dakota along the Big Stone South – Ellendale 345 kV line with two additional switching stations along the Big Stone South – Brookings 345kV line planning to be energized this fall near Astoria and Gary, South Dakota.

Additional wind and solar projects are currently being evaluated as part of MISO's interconnection process. If these projects are developed, it is likely that additional transmission projects will be required. Future transmission projects identified through MISO's interconnection process will be included in future biennial reports.

Load Expansions/New Load

Otter Tail is regularly contacted by customers that have an interest in adding new load to its transmission system. Most load requests are usually related to commercial load expansions at existing sites, ag processing facilities, pipelines or data mining facilities. These load additions are evaluated carefully by Otter Tail and oftentimes identify that the existing transmission system needs to be reinforced in order to continue providing reliable service with the new load addition. To date, several new load additions have not come to fruition, but in the event that a future load addition does proceed and requires a new transmission project, Otter Tail will include that type of transmission project in future biennial reports.

Age/Condition Upgrades to Existing Facilities

Otter Tail tracks the reliability performance of its transmission system on an on-going basis. As part of its annual capital budgeting process, Otter Tail targets line improvements to specific line segments each year that are aimed at improving the on-going reliability performance of its system. Otter Tail prioritizes line improvements across its system each year by comparing the relative performance of each line segment in terms of both momentary and sustained interruptions. As such, Otter Tail undertakes certain line improvement projects each year on line segments that have been determined as ‘worst performers’ on its transmission system. In addition, Otter Tail reviews overall line condition, accessibility, and other risks that may impact future reliability performance and develops projects accordingly. Upgrades to improve the performance of existing line segments may vary from adding lightning arrestors or upgrading line insulators, to the most robust upgrade of rebuilding existing lines with new structures, conductor and shield wire.

At the current time, Otter Tail has identified the following 41.6 kV line improvement project in SD over the next 1 – 3 years:

- Veblen – Summit 41.6 kV Line (in the vicinity of Lake City)

As Otter Tail’s transmission system continues to age, Otter Tail expects more of these types of upgrades/replacements to occur for existing lines in the future. Going forward, Otter Tail will plan to identify future age/condition type projects that are being done to improve the reliability performance of its transmission system in future biennial reports.

SECTION 8 -- COORDINATION OF PLANS

Otter Tail conducts transmission planning in a coordinated environment involving neighboring utilities, load serving entities, state regulatory commissions and members of the public.

There are several different efforts underway within the region that are investigating the feasibility of expanding the capability of the transmission grid. Otter Tail continues to actively participate in these efforts to ensure that a reliable and economic transmission system is built across the region in a coordinated manner.

Regional Coordination through the MISO Process

As a transmission-owning member of MISO, Otter Tail participates in various transmission planning efforts, the most significant of which is the annual MISO Transmission Expansion Planning (“MTEP”) process. The MTEP process involves a variety of planning analyses to determine the performance of the transmission system for a wide variety of conditions. Through the MTEP process, MISO, with input from various stakeholders, evaluates the system for both reliability and economic needs. The MTEP process is designed to ensure the most efficient and cost-effective or “best fit” transmission expansion plan is developed, considering input from all stakeholders.

Local planning of Otter Tail facilities less than 100 kV is primarily coordinated on a sub regional level. Otter Tail’s locally planned projects are then reviewed by MISO and become part of the MTEP. Developing local transmission plans at a sub regional level and rolling them up to MISO provides for regional coordination of local transmission plans, which leads to transmission projects being built in a coordinated manner to address the transmission needs of the larger region. This coordination with MISO maximizes the benefits of the new projects and, in many cases, reduces the number of new transmission projects that are needed than if transmission planning was done solely on an individual basis. Regional coordination of local transmission plans also results in study efficiencies by keeping a broader group of utilities, states, and stakeholders informed through the transmission planning process.

During the course of the MTEP process, MISO seeks opportunities to coordinate or consolidate, where possible, individually defined transmission projects into more comprehensive cost-effective plans. MISO coordinates with Transmission Owners and considers the input from various stakeholder groups (through Sub regional Planning Meetings, Technical Studies Task Forces, Planning Subcommittee Meetings, and Planning Advisory Committee Meetings) to develop expansion plans to meet the needs of the transmission system. This multi-party collaborative process allows for all projects with regional and inter-regional impacts to be analyzed for their combined effects on the transmission system. Moreover, this collaborative process is designed to ensure the most efficient and cost-effective transmission expansion is developed, while giving consideration to the inputs from all stakeholders.

Additionally, sub regional, state, and non-MISO coordination is necessary because the Otter Tail transmission system is highly interconnected with neighboring non-MISO transmission owners. The Otter Tail transmission system is nearly the farthest, most western border of the MISO footprint; therefore, it is interconnected with several transmission-owning utilities that are not members of the MISO, but rather Southwest Power Pool (SPP).

Regional Coordination with non-MISO Transmission Owners

Otter Tail has a highly integrated system with several of its neighboring utilities. Much of this integration stemmed from legacy agreements called Integrated Transmission Agreements (ITA) that provided for the joint use of transmission facilities in common areas of service. This high level of integration requires utilities to jointly plan and coordinate new facilities required for the common service area. Otter Tail currently has ITAs with Minnkota Power Cooperative and Great River Energy. Otter Tail had ITAs with Missouri River Energy Services, East River Electric

Power Cooperative, and Central Power Electric Cooperative that have since expired and have transitioned to taking transmission service from the regional transmission organizations (MISO and/or SPP). Otter Tail also has other coordination agreements with others such as Xcel Energy, Montana-Dakota Utilities, Manitoba Hydro, NorthWestern Energy and Western Area Power Administration. Regardless of the types of agreements, or status of agreements that exist between utilities, Otter Tail closely coordinates transmission planning activities with its neighboring utilities to identify the least cost transmission plans that are needed to maintain reliability.

Otter Tail also participates in the CapX2020 effort, which is a joint initiative of transmission-owning electric utilities in Minnesota and the surrounding region (including cooperatives, municipal utilities and investor-owned utilities). The CapX utilities recently released the CapX2050 Transmission Vision Report, which highlights the challenges transmission planners and operators may face to maintain a safe and reliable system as energy production in the region evolves to include more non-dispatchable resources.¹ This collaborative process and the planning studies performed as part of this effort are coordinated with the MISO.

Summary of Regional Coordination

As discussed above, Otter Tail coordinates extensively with its neighboring utilities to share system plans and identify system enhancements through MISO and through participation in other coordinated transmission planning efforts. Otter Tail's participation in the MISO study process provides coordinated planning for the entire MISO footprint while participation in various working groups and committees provides for coordinated planning on a sub regional basis, which includes both utilities that are MISO members and utilities that are not MISO members.

SECTION 9 -- SINGLE REGIONAL PLANS

The proposed facilities mentioned in Section 7 comprise a part of the MISO Transmission Expansion Plan.

SECTION 10 -- SUBMISSION OF REGIONAL PLAN

MISO compiles a MTEP report on an annual basis. The regional planning process within MISO concludes with a final report that is ultimately approved by the MISO Board of Directors. Currently, MTEP20 is underway with MTEP19 being the last approved report available on the MISO website for public viewing at:

<https://cdn.misoenergy.org//MTEP19%20Executive%20Summary%20and%20Report398565.pdf>

¹ http://capx2020.com/documents/CapX2050_TransmissionVisionReport_FINAL.pdf.

SECTION 11 -- UTILITY RELATIONSHIPS

Refer to Section 8 for a listing of the coordinated efforts in which Otter Tail is involved.

As mentioned previously, Otter Tail either had, or currently has, Integrated Transmission Agreements (ITA) with several utilities. These agreements resulted in a highly integrated system and provided for a common transmission system in overlapping service territories. These agreements require joint studies and coordination of transmission planning activities and facility additions to provide high reliability of service at the minimum cost. Otter Tail has interconnections and transmission agreements in South Dakota with the following utilities: NorthWestern Energy, Montana-Dakota Utilities Co., East River Electric Power Cooperative, Great River Energy, Missouri River Energy Services, Xcel Energy and Western Area Power Administration.

SECTION 12 -- EFFORTS TO MINIMIZE ADVERSE EFFECTS

The Regional Haze Rule requires emissions reductions from certain sources that are deemed to contribute to visibility impairment in Class I air quality areas. Based on a South Dakota Department of Environment and Natural Resources (SD DENR) determination and the final South Dakota Regional Haze State Implementation Plan (SIP) approved by the EPA on March 29, 2012, Big Stone Plant was required to install Selective Catalytic Reduction and separated over-fire air to reduce NO_x emissions, dry flue gas desulfurization to reduce SO₂ emissions, and a new baghouse for particulate matter control. The Big Stone Plant compliant AQCS equipment was placed into commercial operation on December 29, 2015.

Condenser cooling at Big Stone is accomplished by using a 340-acre closed-cycle cooling pond. Use of such a pond eliminates any plant thermal discharges to public bodies of water.

Dikes surround oil storage tanks and larger chemical storage facilities to prevent contamination of large areas of soil or water should rupture of a storage tank occur. All underground petroleum storage tanks have been removed and replaced where necessary with above ground storage tanks. All above ground tanks are in compliance with existing requirements of the SD DENR.

The SD DENR has issued Big Stone Plant a permit for disposal of coal combustion residuals and other solid wastes. Additionally, on December 19, 2014, EPA announced a final rule to further regulate coal CCRs under the Subtitle D nonhazardous provisions of the Resource Conservation and Recovery Act (RCRA). The rule has required Otter Tail to meet several new requirements, including installing additional groundwater monitoring wells, publishing data on our CCR units on a website, and developing several new plans. Also in response to this rule, during a fall 2018 outage, a new bottom ash conveyor dry handling system was installed and Otter Tail completed clean closure of the lone plant surface impoundment by removing all CCR from the impoundment.

Otter Tail continues to cooperate with the South Dakota Public Utilities Commission (SDPUC) and the SD DENR in an effort to site and operate future power plants and transmission lines in an

environmentally acceptable manner, contingent with the needs of a reliable supply of electrical energy. To that end, Otter Tail worked extensively with the SDPUC in preparation for the construction of Astoria Station, due to come online in late 2020, which culminated in SDPUC granting of Otter Tail's Energy Conversion Facility Site Permit Application on July 12th, 2018.

Social and Economic Effects

Social and economic effects are very closely related. In fact, they are often referred to as "socioeconomic" effects. Because of their close relationship, the socioeconomic effects will be discussed jointly.

From experience gained in past construction projects, such as Big Stone Plant and Coyote Station located near Beulah, North Dakota, Otter Tail has been made aware of the socioeconomic effects of large construction projects. Pre-construction and post-construction socioeconomic monitoring was conducted in the vicinity of Big Stone in order to evaluate the effect of a large construction force on such things as the business community, housing, and essential services such as hospital and dental care. This type of monitoring was also employed in conjunction with the construction of Coyote Station. For Astoria Station, prior to construction, a socioeconomic study was performed for the area by a Local Review Committee. Otter Tail took the Local Review Committee's recommendations into account when preparing for and during construction.

In order to aid the economy in the area of construction, it has been Otter Tail's policy to utilize the local labor force and local contractors as much as possible. Local contractors also provide essential services during plant operations.

Health Effects

Various governmental regulations, including, for example, primary and secondary ambient air quality standards and water quality standards, have been promulgated to protect the public health and welfare. Otter Tail will comply with these regulations. In addition, Otter Tail contributes to organizations, such as the Edison Electric Institute, which work to identify potential health and environmental problems as they relate to the electric utility industry.

Public Safety

Otter Tail is very concerned about public safety. All readily accessible substations and major plant sites are fenced to prevent unescorted access by the public who might be unfamiliar with electric energy or associated generation facilities.

In addition, Otter Tail complies with all applicable construction codes for the construction of electrical transmission lines and generation facilities.

Otter Tail also inspects its facilities periodically to help safeguard against failures of vital components and prevent any unnecessary exposure to the general public. Included in the inspections are electric transmission lines, circuit breakers, capacitors, and transformers.

Otter Tail also coordinates as needed with local law enforcement, emergency responders, and local governments.

Historic or Aesthetic Preservation Effects

Aesthetic effects have been considered in the design of transmission lines and power plants and will be considered in the design of future facilities. Transmission line routing considerations include visual effect on surrounding terrain. The design of Big Stone Plant included the choice of a color scheme that would blend with the surrounding countryside.

In addition to considering aesthetic effects, before construction began at Astoria Station, Otter Tail commissioned a detailed Cultural Report to document any historical or archeological sites of significance at the site and consulted with the South Dakota State Historical Preservation Office.

SECTION 13 -- EFFORTS RELATING TO LOAD MANAGEMENT

The main objective of the Otter Tail's "Load Management System" is to turn off a variety of selected customer loads at times when our system is experiencing peak or near peak loads. This system has allowed Otter Tail to delay the need for the addition of new generating facilities and to permit the power system to be more efficiently operated.

Otter Tail began the development of a load management program and control system in September of 1975. The Company investigated and tested several control systems and, in 1980, started the installation of the FM Radio Load Management System. In 1992, the new PC Based Automated Control System was completed. Over a 4-year period from 2003 to the summer of 2007, Otter Tail replaced all of our load management equipment. This included over 40,000 radio receivers on customers' premises along, with software and hardware to allow the secondary use of the office to truck and truck to truck voice radio system for load management transmissions.

The update of the radio load management system was necessary since our existing system was based on over 20-year old technology, and thus difficult to find replacement receivers. We had also experienced a continued reduction in the overall effectiveness of the system, thus a reduction in the total megawatts of controlled load.

The load management system replacement has improved the amount of controllable load and thus given us the confidence in the system needed to accredit this load modifying resource with MISO as of June 1, 2010.

Winter season manageable loads are in several categories and can reach as high as 120 MW. These tariffs include electric water heaters, thermal storage, RDCs (residential demand controllers), general service time of use, small dual fuel heating systems, and large dual fuel (industrial and bulk interruptible loads).

The radio load management system also has the capability of interrupting as high as 21 MW of summer peak load. These summer loads consists primarily of water heaters, irrigation, the large dual fuel industrials and residential air conditioning.

Total installations of the load management system include 43,183 radio receivers on the Otter Tail system with 4,185 of these radio receivers located on our customers' premises in the state of South Dakota.

Otter Tail has registered its load management system with the MISO as a Demand Response Resource. The MISO has certified Otter Tail’s load management system at 18 MW during the summer season.

SECTION 14 -- LIST OF REPORTS

Otter Tail is not aware of any reports or studies filed or proposed to be filed with federal or other state agencies relating to proposed energy conversion or transmission facilities other than those required for the transmission projects noted above in Section 7.

SECTION 15 -- CHANGES IN STATUS AT FACILITIES

Big Stone Plant was recently changed to an economically dispatched unit. In the past the unit was considered must-run and was online every available hour regardless of what the locational marginal price (LMP) was. Big Stone Plant will now cycle offline when it is economically justifiable. Lake Preston continues to be operated during peak demands and line stability conditions.

SECTION 16 -- PROJECTED ELECTRIC DEMAND

For the 2019 winter season, Otter Tail had an unmanaged system peak of 924 MW on January 31, 2019 for the hour ending at 9 a.m. The projected unmanaged winter season demand for the Otter Tail system is shown in Table 1. Winter data reflects the MISO planning year in which the winter season begins in November of the listed year and extends through April of the following year.

Table 1: Projected Unmanaged Winter Season Peak Demand¹ for Otter Tail System

Year	Unmanaged Peak (MW)
2020	930
2021	974
2022	977
2023	980
2024	982
2025	985
2026	988
2027	991
2028	994
2029	997

¹ Peak values are prior to new conservation program impacts.

Table 2 on the next page shows the projected unmanaged winter season peak demand for the South Dakota portion of Otter Tail’s system. Again, in Table 2, winter data reflects the MISO planning year in which the winter season begins in November of the listed year and extends through April of the following year.

Because the South Dakota portion of the Otter Tail system demand is not metered, Table 2 unmanaged peak demand was estimated by applying the ratio of projected South Dakota energy sales and projected system energy sales to projected system peak demand.

Table 2: Projected Unmanaged Winter Season Peak Demand¹ for SD Portion of Otter Tail System

Year	Unmanaged Peak (MW)
2020	89
2021	94
2022	94
2023	94
2024	94
2025	95
2026	95
2027	95
2028	95
2029	96

¹ Peak values are prior to new conservation program impacts.

Otter Tail has registered its load management system with the MISO as a Demand Response Resource. The MISO has certified Otter Tail’s load management system for 18 MW during the summer season.

As a company, Otter Tail will continue to use a combination of load management and purchase agreements with other utilities to meet any future deficits. Otter Tail also continues to study and assess the potential for future additions to its generation resources.

Further detailed information may be obtained from Otter Tail’s Resource Plan documents that were filed with the South Dakota Public Utilities Commission on June 1, 2016.

SECTION 17 -- CHANGES IN ELECTRIC ENERGY

The projected increase of winter season unmanaged peak demand for Otter Tail’s system and South Dakota is shown in Table 3.

Table 3: Projected Increase of Winter Season Unmanaged Peak Demand¹ for Otter Tail System and South Dakota Portion

Year	System Load Increase (MW)	South Dakota Load Increase (MW)	South Dakota Percent Increase
2021	44	4	4.73%
2022	3	0	0.31%
2023	3	0	0.31%
2024	2	0	0.20%
2025	3	0	0.31%
2026	3	0	0.30%
2027	3	0	0.30%
2028	3	0	0.30%
2029	3	0	0.30%

¹ Load values are prior to new conservation program impacts.

SECTION 18 -- MAP OF SERVICE AREA

A map of the Otter Tail service area is shown in Figure 2 below.

Figure 2: Otter Tail Service Area

