Application for Resource Plan Approval 2017 - 2031

PUBLIC DOCUMENT – NOT PUBLIC DATA HAS BEEN EXCISED

Submitted to

Minnesota Public Utilities Commission
Docket No. E017/RP-16-386

North Dakota Public Service Commission

South Dakota Public Utilities Commission

June 1, 2016

Otter Tail Power Company
# Table of Contents

1 Preface ........................................................................................................................................ 1-1
2 Resource Plan Non-Technical Summary .............................................................................. 2-1
  2.1 Synopsis .......................................................................................................................... 2-1
  2.2 Stakeholder Group Meetings ....................................................................................... 2-4
  2.3 Multi-State Jurisdictional Complexity ......................................................................... 2-5
  2.4 Load Forecast .............................................................................................................. 2-5
  2.5 Future Resource Needs ............................................................................................... 2-6
  2.6 Resource Plan Development ....................................................................................... 2-7
  2.7 Resource Alternatives ................................................................................................. 2-7
  2.8 Preferred Resource Plan .............................................................................................. 2-8
  2.9 Preferred Plan is in the Public Interest ....................................................................... 2-12
  2.10 Externality Values ....................................................................................................... 2-13
  2.11 Preferred Plan Rate Impacts ....................................................................................... 2-13
  2.12 Five-Year Action Plan ............................................................................................... 2-14
  2.13 Conclusion .................................................................................................................. 2-15
3 Current Outlook .................................................................................................................. 3-1
  3.1 Completion of the Big Stone Plant AQCS and the Hoot Lake Plant MATS .................. 3-1
  3.2 Installation of an approximate 248 MW natural gas fired combustion turbine ......... 3-1
  3.3 Midcontinent ISO Module E Resource Adequacy Obligation ................................ 3-3
  3.4 Market Conditions in the Midcontinent ISO .............................................................. 3-4
  3.5 New EPA Emission Standards for Stationary Engines .............................................. 3-4
  3.6 Clean Power Plan Uncertainty ..................................................................................... 3-4
  3.7 Renewable Energy Objectives and Standards ............................................................ 3-5
  3.8 DSM and Conservation Requirements ........................................................................ 3-5
  3.9 Projected Load and Capability ...................................................................................... 3-6
4 Plan Development .............................................................................................................. 4-1
  4.1 Plan Objectives .............................................................................................................. 4-1
  4.2 Planning Tools ............................................................................................................... 4-1
  4.3 Planning Process ............................................................................................................ 4-2
5 Preferred Resource Plan ...................................................................................................... 5-1
  5.1 Preferred Resource Plan Description ......................................................................... 5-3
  5.2 REO/RES Compliance ................................................................................................. 5-3
  5.3 Load Growth Scenarios ............................................................................................... 5-4
  5.4 Environmental Externalities ......................................................................................... 5-5
  5.5 Emissions and Greenhouse Gas Reduction Goal ......................................................... 5-5
  5.6 50% and 75% Conservation and Renewable Scenarios ........................................ 5-8
  5.7 Energy Conservation Sensitivities .............................................................................. 5-8
  5.8 Oil Peaker Evaluation Sensitivities ............................................................................ 5-9
  5.9 Limited Market Sensitivities ....................................................................................... 5-10
  5.10 Additional Sensitivity Scenarios ............................................................................... 5-11
6 Conclusion ........................................................................................................................... 6-1
  6.1 Preferred Plan is in the Public Interest ....................................................................... 6-1
## Table of Contents

6.2 Socio-Economic Impacts of the Preferred Plan .......................................................... 6-1  
6.3 Five-Year Action Plan............................................................................................... 6-2
iii. List of Appendices

Appendix A: Plan Cross Reference and Checklist
Appendix B: Electric Utility Report
Appendix C: Existing Resources
Appendix D: Potential Resources
Appendix E: Assessment of Federal and State Environmental Regulation
Appendix F: Assumptions for Strategist Modeling Scenarios
Appendix G: Otter Tail’s REO/RES Compliance Strategy
Appendix H: Update on C-BED Progress
Appendix I: Integrated Resource Plan Sensitivity Summary
Appendix J: Navigant Electric DSM Market Potential Study
Appendix K: Distributed Renewable Generation Evaluation
iv. List of Tables

Table 2-1: Current Preferred Plan compared to last resource plan order ................................................... 2-3
Table 2-2: Summer 2017-2031 Base Case Projected Load and Capability Prior to Resource Plan Information ................................................................................................................... 2-6
Table 2-3: List of Resource Alternatives Included in Strategist Model .......................................................... 2-7
Table 2-4: Preferred Resource Plan Summary .............................................................................................. 2-8
Table 2-5: Five-Year Action Plan Activities .................................................................................................. 2-14
Table 3-1: Summer 2017-2031 Load and Capability Prior to Preferred Plan Information .......................... 3-8
Table 5-1: Preferred Plan Resource Additions ............................................................................................... 5-1
Table 5-2: 50% and 75% Renewable and Conservation as Percent of Total New MN Energy Requirements ......................................................................................................................... 5-8
Table 6-1: Five-Year Action Plan Activities .................................................................................................. 6-2
v. List of Figures

Figure 2-1: Preferred Plan Capacity Resources and Reserve Obligation 2017-2031 (MW) ........................................ 2-9
Figure 2-2: Preferred Plan Energy Resources and Requirements with Externalities Applied 2017-2031 (GWh) .... 2-9
Figure 2-3: Preferred Plan Energy Resources and Requirements without Externalities Applied 2017-2031 (GWh) 2-10
Figure 2-4: 2017 Energy by Fuel Source (same for both externality scenarios) ................................................... 2-11
Figure 2-5: Preferred plan 2031 Energy by Fuel Source with Externalities Applied ................................................... 2-11
Figure 2-6: Preferred plan 2031 Energy by Fuel Source without Externalities Applied ........................................ 2-12
Figure 2-7: Preferred Resource Plan Estimated Rate Impacts ............................................................................... 2-13
Figure 2-8: Preferred Resource Plan Estimated Rate Impacts by Class ................................................................. 2-14
Figure 3-1: Historic and Forecast Unmanaged 50/50 Non-coincident Summer Peak Demand ............................... 3-6
Figure 3-2: Historic and Forecast Annual Retail Sales Before EE (Losses are not included) .................................. 3-7
Figure 3-3: Projected Summer Capacity Needs through 2031, by Calendar Year ...................................................... 3-8
Figure 5-1: 2017-2031 Capacity Resources and Reserve Obligation for Preferred Plan (MW) .................................. 5-2
Figure 5-2: 2017-2031 Energy Resources and Energy Requirements for Preferred Plan with Externalities (GWh) ... 5-2
Figure 5-3: 2017-2031 Energy Resources and Energy Requirements for Preferred Plan without Externalities (GWh) 5-3
Figure 5-4: Compliance with REO/RES Regulation in All Jurisdictions ................................................................. 5-4
Figure 5-5: Load Growth Sensitivities – PVSC/PVUC impact ................................................................................ 5-5
Figure 5-6: SO₂ and NOₓ Emissions ....................................................................................................................... 5-6
Figure 5-7: CO₂ Emissions ..................................................................................................................................... 5-6
Figure 5-8: Mercury Emissions ............................................................................................................................... 5-7
Figure 5-9: Preferred Plan CO₂ Emissions and the CO₂ reduction Goal ................................................................. 5-7
Figure 5-10: Energy Efficiency Costs in 2016$ ....................................................................................................... 5-9
Figure 5-11: Energy Efficiency Sensitivities Compared to Base Case PVSC/PVUC .................................................. 5-9
Figure 5-12: Oil Peaker Retirement in 2023 Compared to Base Case PVSC/PVUC .................................................... 5-10
Figure 5-13: Limiting Market Energy Purchases Compared to Base Case PVSC/PVUC ........................................ 5-11
Figure 5-14: Sensitivity Comparison (PVSC/PVUC) ............................................................................................... 5-12
Figure 5-15: Sensitivity Comparison to Base Case (PVSC/PVUC) ....................................................................... 5-13
1 Preface

Otter Tail Power Company (“Otter Tail” or “Company”) respectfully files this resource plan with the Minnesota Public Utilities Commission (“Commission”) for approval under Minnesota Statute §216B.2422 and Minnesota Rules Part 7843. Additionally, Otter Tail will submit this plan to the North Dakota Public Service Commission and the South Dakota Public Utilities Commission. While the Commissions in North and South Dakota are not required by law to review resource plans for pre-approval, in those states resource plans are filed and considered in certificate of need, siting, and rate recovery proceedings to demonstrate that resource additions are needed and part of a prudent and cost-effective plan. About fifty percent of Otter Tail’s load is in North and South Dakota; the remaining fifty percent is in Minnesota.

The plan presented in this filing identifies the anticipated demand and energy needs of the Company's customers. It also details specific actions that Otter Tail intends to complete within the first five years of the planning period and the potential actions that Otter Tail might take in the following ten years.

This resource plan is intended to identify Otter Tail’s likely courses of action that are designed to meet the requirements of applicable statutes and rules, satisfy the Commissions’ goals in implementing its responsibilities, and allow the Company to continue providing reliable, low-cost electricity to meet the service requirements and the desires of customers, while minimizing potential adverse environmental and socio-economic impacts in an increasingly competitive industry. Considerable unknowns and variables outside of Otter Tail’s control will impact the actual resources the Company selects and implements in the future. Any long-range plan is subject to change because it represents an optimal plan based on numerous forecasts and assumptions at a specific point in time.

This resource plan is in large part an execution of the action items authorized by the Minnesota Public Utilities Commission in its December 5, 2014 Order approving Otter Tail’s last resource plan (“the 2013 Resource Plan”). In the 2013 Resource Plan, the Commission authorized several generation additions for construction in the time period covered by this new plan filing. Otter Tail’s resource needs have not materially changed since the 2013 Resource Plan was approved in December of 2014.

Since Otter Tail’s 2010 Resource Plan and related Baseload Diversification Study was approved on March 25, 2013, Otter Tail has added 62.4 megawatts (MW) of wind generation and entered into a capacity-only purchase power agreements (PPA) for Midcontinent Independent System Operator (“Midcontinent ISO”) Zone 1 capacity that will cover the bulk of Otter Tail’s capacity needs until June 2021. In addition, the Company has included in this new plan an energy efficiency goal of 1.5 percent to meet Minnesota state goals.

To prepare for the Strategist modeling that forms the foundation for this resource plan, the Company conducted eight stakeholder group meetings in Fergus Falls, St. Paul, Bismarck, ND, and Pierre, SD. Each party who was actively involved in Otter Tail’s last resource plan proceeding was invited to participate in this stakeholder process. Consequently, Otter Tail believes it has developed a resource plan that addresses the concerns of stakeholders.

Details of the underlying assumptions and descriptions of significant components, activities and issues associated with this resource plan are documented within the appendices to this filing.

---

2 March 25, 2013, ORDER APPROVING BASELOAD DIVERSIFICATION STUDY AND SETTING REQUIREMENTS FOR NEXT RESOURCE PLAN, in In the Matter of Otter Tail Power Company’s 2011-2025 Resource Plan, Docket No. E017/RP-10-623. The Baseload Diversification Study was a study required by the Commission for the purpose of examining alternatives for decommissioning and replacing or repowering Otter Tail’s Hoot Lake Power Plant. The March 25, 2013 Order authorized Otter Tail to decommission and replace Hoot Lake Plant at the end of 2020.
2 Resource Plan Non-Technical Summary

The plan identifies the anticipated electric service needs of the Company's customers for the 2017-2031 planning period. The plan details specific action items that Otter Tail intends to complete within the first five years of the planning period.

In its Order concerning Otter Tail's initial resource plan filing in 1992, the Commission stated that it considers the characteristics of the available resource options and the proposed plan as a whole. In Minnesota Administrative Rules, Chapter 7843.0500, Subp.3, it states that “Resource options and resource plans must be evaluated on their ability to:

A. maintain or improve the adequacy and reliability of utility service.
B. keep the customer's bills and the utility's rates as low as practicable, given regulatory and other constraints.
C. minimize adverse socio-economic effects and adverse effects upon the environment.
D. enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations.
E. limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control.”

Otter Tail has incorporated these objectives into this resource plan. Otter Tail has continued to operate its existing facilities as efficiently and economically as possible, which has helped to maintain the reliability of the electric system and kept Otter Tail’s rates low. The plan is designed to reduce the financial risks of future environmental regulation or taxes, to reduce adverse socio-economic effects and effects on the environment, and to position the Company to respond to change. This resource plan evaluates a blend of supply-side and demand-side resource options to meet customer needs that cannot be met with existing resources.

2.1 Synopsis

Preferred plan reflects that Otter Tail is continuing to execute on plan approved by Commission in December 2014

Our preferred 2017-2031 resource plan is consistent with the Commission’s December 5, 2014 Order approving our 2013 Resource Plan filing. This 2017-2031 resource plan reflects Otter Tail’s execution of the action items authorized by the Commission in that 2014 Order. In that Order, the Commission authorized several generation additions for construction in the time period covered by this new plan filing, and it set out the parameters of what was to be included in this filing. Otter Tail has followed those parameters and this filing shows that Otter Tail’s resource needs have not materially changed since the time of the 2014 Order. Therefore, modifications have not been required for this new plan filing. As it was in our approved 2013 Resource Plan, our preferred plan in this filing is our least-cost option, aside from the addition of 30 MW of solar to meet Minnesota’s Solar Energy Standard, and it meets Minnesota’s energy policy and regulatory requirements. Furthermore, it minimizes issues resulting from differing
regulatory policies and philosophies in the three states we serve. If the price of solar continues to decline, it is quite possible that in our next resource plan, an addition of solar could be included in our least-cost plan scenario.

Otter Tail also notes that its least-cost plan scenario identifies 200 MW of wind additions, 100 MW added in 2018 and 100 MW added in 2020. The approved 2013 Resource Plan authorizes up to 300 MW of wind. Otter Tail’s request in this case is for the Commission to repeat the authority granted in 2013 IRP Plan. Specifically, Otter Tail requests that the Order state as follows:

“Otter Tail is authorized to obtain up to 300 MW of wind in the 2017–2021 timeframe if cost-effective and to the extent consistent with reliable system operation” (December 5, 2014 Order in Otter Tail’s 2013 IRP Plan proceeding, Ordering paragraph 1.b.).

As was recognized in that prior Order, there are scenarios where up to 300 MW of wind is cost effective and reasonable to add to the plan (for example see Sensitivity #4 from Appendix I in this current plan filing), and therefore it is reasonable to grant Otter Tail the additional authority at this time so that Otter Tail can take action if such an opportunity presents itself (and provided the conditions meet the cost-effectiveness and reliability requirements reflected in the Ordering paragraph).

As earlier indicated, Otter Tail’s current wind resources are adequate to serve approximately 19 percent of its customers’ total energy needs. Each additional 100 MW increment of additional wind generation increases that amount by approximately 5 percent, so with 200 MW of additional wind, Otter Tail will generate approximately 29 percent of its customer’s energy needs through wind resources. With a third 100 MW added, Otter Tail would increase that amount to 34 percent.

Table 2-1 depicts a comparison of the major elements of the 2013 Resource Plan and Otter Tail’s Preferred Plan in this filing. As the table depicts, the current Preferred Plan is for Otter Tail to continue to focus on executing on the Commission’s December 2014 Order approving Otter Tail’s 2013 Resource Plan.
Table 2-1: Current Preferred Plan compared to last resource plan order

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Otter Tail shall obtain approximately 200 MW, subject to need, of intermediate capacity (and associated energy) in the 2019-2021 time frame</td>
<td>Add a 248(^3)-MW simple-cycle natural gas combustion turbine in 2021 (energy to come from wind addition below)</td>
</tr>
<tr>
<td>Otter Tail is authorized to obtain up to 300 MW of wind in the 2017–2021 timeframe if cost-effective and to the extent consistent with reliable system operation</td>
<td>Add 100 MW wind in 2018 Add 100 MW wind in 2020 Additional authority up to a total of 300 MW, provided cost-effective and consistent with reliable system operation</td>
</tr>
<tr>
<td>Otter Tail shall add enough solar to comply with Minnesota’s SES</td>
<td>Add 30 MW solar by 2020 to comply with Minnesota’s SES</td>
</tr>
</tbody>
</table>

- **Acquisition activities relating to the Intermediate Capacity addition authorized by the 2013 Resource Plan approval:** We have purchased a site and entered the MISO interconnection process simple-cycle combustion turbine located at that site. High-voltage electric transmission and a large natural-gas pipeline exist already on the parcel—so this turbine site will not require construction of additional transmission lines or gas pipeline. Additional pre-development activities are underway. We expect to begin site permitting by early 2017 and to issue requests for bids for turbine supply, engineering, and elements of construction beginning in late 2018.

- **Acquisition activities relating to the Wind Generation addition authorized by the 2013 Resource Plan approval:** We’re discussing potential wind projects in North Dakota with developers. Each of the projects will be able to achieve commercial operation in 2018. While the status of the Clean Power Plan remains uncertain, we believe that siting renewable generation in North Dakota in this timeframe best mitigates the Company’s risks under the Clean Power Plan while maximizing the value of Production Tax Credits.

- **Acquisition activities relating to the solar generation addition authorized by the 2013 Resource Plan approval:** We are in discussions with possible solar developers. By 2020, we plan to have sufficient solar energy procured, either through ownership or purchase, to meet Minnesota’s Solar

---

\(^3\) 248 MW is a proxy size. The actual size of the unit will be determined after the bidding process for turbine supply.
Energy standard. We believe that the capital cost of solar will continue to decline and the efficiency of those panels will continue to increase as we get closer to 2020. We are also exploring the possibility of early compliance through the purchase of Solar Renewable Energy Credits (Solar RECs) in order to best take advantage of continued cost declines of solar components and to accommodate the different requirements of Otter Tail’s three state jurisdictions.

- **Continued Progress on Hoot Lake Plant Transition:** Consistent with the Commission’s approval of the Baseload Diversification Plan, we are planning to retire Hoot Lake Plant at the end of the MISO Planning Year 2020 —coincident with commencement of operation of the large simple-cycle turbine described above (the MISO planning year ends on May 31, 2021).

- **Satisfaction of the Minnesota’s Greenhouse Gas Reduction Goal:** Our preferred resource plan will result in Otter Tail generating approximately 30% of our energy from renewables by 2021. After the wind, solar, and natural gas additions and the Hoot Lake Plant retirement, we’ll meet Minnesota’s greenhouse gas reduction goal at least until 2025.

- **Conservation and Renewable Energy:** Minnesota Statutes §216B.2422, Subd. 2, states that “a utility shall include the least-cost plan for meeting 50 and 75 percent of all new and refurbished capacity needs through a combination of conservation and renewable energy resources.” Our preferred plan, which includes 1.5% CIP, 200 MW wind, and 30 MW solar, exceeds the 50 percent and 75 percent targets.

In summary, our preferred resource plan furthers the vision set by the Commission in its Order approving Otter Tail’s 2013 Resource Plan. Consistent with that prior ruling, the preferred plan meets all legal requirements and allows the Company to continue providing reliable, low-cost electricity to meet our customers’ requirements.

### 2.2 Stakeholder Group Meetings

As indicated, prior to filing this resource plan, Otter Tail met with various stakeholders to solicit their input into the modeling assumptions used in the resource plan. Several groups travelled to our company headquarters in Fergus Falls for the stakeholder meetings. We believe it was valuable for stakeholders to experience first-hand the small-towns and the rural areas that make up our service territory. We greatly appreciate the time these participants took to travel to our area of the state. In our opinion, this approach yielded our most effective stakeholder process to date.

Representatives from the organizations and agencies listed below participated in this stakeholder process. The list identifies the dates and locations of our meetings:

- North Dakota Public Service Commission and Staff (March 18, 2016, Bismarck, ND)
- South Dakota Public Utilities Commission and Staff (March 31, 2016, Pierre, SD)
The goal of these stakeholder meetings was to make our resource plan filing as complete as possible and streamline the proceeding. We believe that the meetings were productive for both the Company and the parties. As a result of the meetings, we added several sensitivities and made adjustments to our modeling assumptions to address issues and perspectives brought forward by the parties.

2.3 Multi-State Jurisdictional Complexity

Otter Tail operates in a service territory that spans three states, and from economic and demographic perspectives, the towns and areas Otter Tail serves in these three states are very similar. Both east and west of the Red River, Otter Tail serves very small rural towns—the average population of our communities in Minnesota is approximately 630 people. Nevertheless, very different policy perspectives can be in play at times in each of these three jurisdictions. About fifty percent of Otter Tail’s load is in Minnesota, North Dakota makes up roughly forty percent and South Dakota comprises the remaining ten percent.

Continuing to operate as a single cost-effective multi-state utility is an important priority for Otter Tail’s customers. Otter Tail is already one of the smallest vertically integrated utilities in the country. To give some perspective, in terms of Minnesota customer count, Xcel Energy is approximately 20 times the size of Otter Tail. Because of this already very small size, splitting Otter Tail into multiple separate and even smaller utility systems would result in harmful inefficiencies and an increased cost of service. Therefore, we are pleased that the preferred plan presented in this filing satisfies the regulatory requirements in each of our jurisdictions, and we feel strongly that it can be supported in all the states we serve. In fact, as described above, the preferred plan is, in practical terms, just a continuation of the 2013 Resource Plan that was approved by the Commission only eighteen months ago. Otter Tail’s request in this case is for authority to continue to execute on that previously-approved plan.

2.4 Load Forecast

The process of developing this resource plan began with an econometric peak demand and energy requirements forecast, which provided base forecast, low forecast, and high forecast scenarios.

The forecast peak demand and energy requirements are detailed in Appendix B. The energy requirements forecast represents an approximate .85 percent average annual growth rate, prior to new demand side
management ("DSM") programs, and is the key component in determining the type of resources to be added, whether baseload, intermediate, or peaking. Peak demands are anticipated to average an annual growth rate of 1.23 percent in the summer, prior to new DSM programs. The peak demand will determine the size of capacity resources required for the system. As a participant in the Midcontinent ISO, Otter Tail is currently required to maintain a 7.6 percent planning reserve margin on the forecasted summer peak demand coincident with the Midcontinent ISO’s peak demand, after accounting for plant accreditation ratings as defined by the Midcontinent ISO.

### 2.5 Future Resource Needs

Table 2-2 provides the Company’s summer season resource needs showing the Company’s projected load and capability according to Midcontinent ISO Module E rules for resource adequacy. Please see Section 3 for discussion of Midcontinent ISO Module E and further detail regarding the resource adequacy obligation calculation. 4

The total accredited capacities, shown as Zonal Resource Credits ("ZRCs"), represent the Midcontinent ISO’s capacity ratings for the Company’s resources based on the 2016 planning year accreditation levels. Adjustments were made to the coal facilities to account for the abnormally low accreditation levels in 2016 caused by major outages in 2015. Capacities for transactions are shown separately. Resource, transaction, and demand response accreditations are based on historical summer performance and do not vary monthly.

#### Table 2-2: Summer 2017-2031 Base Case Projected Load and Capability Prior to Resource Plan Information

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
<th>2029</th>
<th>2030</th>
<th>2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>488.4</td>
<td>492.4</td>
<td>502.6</td>
<td>506.2</td>
<td>506.2</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
<td>369.8</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>41.9</td>
<td>41.6</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
<td>41.2</td>
</tr>
<tr>
<td>Oil</td>
<td>54.5</td>
<td>51.4</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
</tr>
<tr>
<td>Wind</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
<td>58.2</td>
</tr>
<tr>
<td>Solar</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Hydro</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>BTMG</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Purchased</td>
<td>89.5</td>
<td>89.5</td>
<td>59.5</td>
<td>59.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Load Management</td>
<td>33</td>
<td>33</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>772.2</td>
<td>772.8</td>
<td>761.3</td>
<td>761.3</td>
<td>574.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
<td>575.9</td>
</tr>
</tbody>
</table>

4 The Module E resource adequacy calculation is:

\[
\text{Reserve Obligation} = (\text{Coincident Peak Demand Forecast-Demand Response}) \times (1+\text{Load Based Reserve Margin}) + \text{Transmission Losses},
\]

where the reserve margin is currently 7.6 percent. Total Accredited Capacity is the sum of Aggregate ZRCs, Local ZRCs, External ZRC’s and Net Transaction ZRCs, where ZRCs are MWs that have been converted to “Zonal Resource Credits.” Under Module E, only ZRCs are eligible for designation toward the Reserve Obligation.
The data in the tables illustrates the capacity deficits that exist prior to plan development, based on the Company’s existing resources as of May 31, 2016. The table shows that Otter Tail is capacity deficient beginning in the summer of 2017, and this deficiency grows dramatically in the summer of 2021 when Hoot Lake Plant is retired and power purchase agreements (“PPAs”) expire.

2.6 Resource Plan Development

The software model used for developing Otter Tail’s resource plan is Strategist. The long-range peak demand and energy forecasts were incorporated into the Strategist database, along with the supply-side and demand-side resources available to the Company over the course of the study period. Strategist was then executed to develop a series of least-cost resource plans. Otter Tail defined the objective function as minimizing total utility costs (zero externality scenario) or total societal costs (externality value scenario).

The Proview module within Strategist was executed to develop an optimized resource plan for each scenario for the time period 2017 through 2031. Resource plans were developed in accordance with the resource planning rules, including evaluation of sensitivities that varied load growth, applied externalities, and achieved specified renewable and conservation objectives.

2.7 Resource Alternatives

Otter Tail considers both demand-side and supply-side resources in long-term planning analysis. Appendix D provides a more detailed discussion of the resources that the Company evaluated. Table 2-3 provides a list of the alternatives evaluated within the Strategist model.

<table>
<thead>
<tr>
<th>Resource Alternatives Modeled</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Simple Cycle - Small</td>
<td>Generic 49 MW nameplate capacity aeroderivative type simple cycle unit</td>
</tr>
<tr>
<td>Natural Gas Simple Cycle - Large</td>
<td>Site Specific 248 MW nameplate capacity frame type simple cycle unit</td>
</tr>
<tr>
<td>Natural Gas Combined Cycle*</td>
<td>Generic 319 MW nameplate capacity utility-frame type combined cycle unit</td>
</tr>
<tr>
<td>Wind</td>
<td>Generic 100 MW nameplate capacity utility-scale wind resource</td>
</tr>
<tr>
<td>Solar</td>
<td>Generic 30 MW nameplate capacity utility-scale solar resource</td>
</tr>
</tbody>
</table>

* This alternative was included in early modeling runs but was not selected in any of the sensitivities. This alternative was removed from the final modeling runs to allow for additional superflous wind and solar alternatives.
2.8 Preferred Resource Plan

The Company’s preferred resource plan (sensitivity #1 from Appendix I) includes all of the resources that are common between the two base case scenario plans (with externalities and without externalities) plus a solar resource to comply with the Minnesota Solar Energy Standard (SES). Table 2-4 shows the Company’s preferred plan which includes the addition of 200 MW of wind (100 MW in 2018 and 2020, and additional authority for up to 100 MW of wind if cost effective and reliable), 30 MW of solar in 2020 along with a 248 MW simple cycle frame unit in 2021. The preferred plan uses the 1.5 percent CIP energy goal in Minnesota.

Table 2-4: Preferred Resource Plan Summary

<table>
<thead>
<tr>
<th>Year (MW)</th>
<th>Resource Plan (MW) - Based on Nameplate ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>100 MW Wind</td>
</tr>
<tr>
<td>2019</td>
<td>100 MW Utility Scale Wind</td>
</tr>
<tr>
<td>2020</td>
<td>100 MW Wind &amp; 30 MW Solar</td>
</tr>
<tr>
<td>2021</td>
<td>100 MW Utility Scale Wind &amp; 30 MW Utility Scale Solar</td>
</tr>
<tr>
<td>2022</td>
<td>248 MW Frame NG CT</td>
</tr>
<tr>
<td>2023</td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td></td>
</tr>
<tr>
<td>2025</td>
<td></td>
</tr>
<tr>
<td>2026</td>
<td></td>
</tr>
<tr>
<td>2027</td>
<td></td>
</tr>
<tr>
<td>2028</td>
<td></td>
</tr>
<tr>
<td>2029</td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td></td>
</tr>
<tr>
<td>2031</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2-1 shows the capacity resource additions along with existing resources over the study period. Figure 2-2 and Figure 2-3 shows the energy contribution by fuel category for 2017-2031 for the preferred plan under the two externality scenarios. The application of externality penalties to the unit dispatch results in significant differences in the energy mix between the two scenarios even though both scenarios have the same set of resources available. In Figures 2-2 and 2-3, the Purchases category (red) is primarily comprised of day-ahead market opportunity purchases, while the Forward Purchases (yellow) represents longer term bi-lateral contractual purchases.
Figure 2-1: Preferred Plan Capacity Resources and Reserve Obligation 2017-2031 (MW)

Figure 2-2: Preferred Plan Energy Resources and Requirements with Externalities Applied 2017-2031 (GWh)
Figure 2-4 shows the projected energy contribution by fuel category for the year 2017. There is no difference between externality scenarios for the year 2017. Figure 2-5 shows the expected energy contribution by fuel category for the preferred plan for the year 2031 with externalities applied. Figure 2-6 shows the expected energy contribution by fuel category for the same preferred plan for the year 2031 without externalities applied. The preferred plan shows a reduction in percentage of coal energy and an increase in the percentage of energy from natural gas and renewable energy.
Figure 2-4: 2017 Energy by Fuel Source (same for both externality scenarios)

![2017 Energy by Source](image)

Figure 2-5: Preferred plan 2031 Energy by Fuel Source with Externalities Applied

![2031 Energy by Source](image)
2.9 Preferred Plan is in the Public Interest

Otter Tail Power Company is committed to operating its generation facilities as efficiently as practicable while minimizing adverse effects on the environment. New resources have been selected that will meet the Company’s needs while maintaining flexibility and limiting the risk of exposure to changes in financial, social, and technological factors beyond its control. This resource plan satisfies the legal and regulatory requirements in the multi-state service territory and allows Otter Tail and its customers to realize the benefits of operating as a single system while satisfying requirements in all states served by Otter Tail.

The preferred resource plan represents a cost-effective plan developed with a model that successfully integrates demand-side and supply-side resource analysis. Otter Tail serves customers in three states. To provide operating efficiencies, the Company operates and plans its system as a single entity to the benefit of all customers. Maintaining compliance with the many statutes, rules, and regulations in three separate states and three separate regulatory commissions can be challenging at times. Otter Tail believes that this resource plan meets that challenge, successfully providing a plan that reasonably satisfies the needs of all three states.

In compliance with Minnesota Statutes, the Company evaluated low (sensitivity #19 from Appendix I), mid (28 sensitivities), and high (sensitivity #20 from Appendix I) externality sensitivities for this resource plan and as defined by the Commission’s May 27, 2015, Notice of Updated Environmental Externality Values. Each externality case also assumed a CO2 tax starting in 2022 and escalating annually. In addition to the externality sensitivities, the Company evaluated 27 sensitivities with zero externalities.

Minnesota Stat. §216B.2422 also requires evaluation of the resource plan for low and high load growth sensitivities and for sensitivities that evaluate meeting 50 percent and 75 percent of future resource needs using demand side management and renewable resources. Like the externality sensitivities, the load growth sensitivities also varied from the preferred plan in total cost and resource selection. The Company
plans for the most likely forecast, recognizing that this plan can adapt as time progresses to accommodate variations in actual load growth from the present long-range forecast. The preferred plan meets 216 percent of new energy requirements for Minnesota customers using renewable resources and energy efficiency and conservation.

2.10 Externality Values

Two dockets relating to externality values are open in Minnesota. Docket No. E999/CI-13-796, deals with the estimate of the costs of future carbon regulation. Docket No. E999/CI-14-643 is evaluating proposed updates to environmental cost values. Neither of these proceedings was completed in time for Otter Tail to incorporate the results into its 2016 resource plan. However, it appears that in the docket that deals with the estimate of the future cost of carbon regulation, all parties are in agreement that the $9-$34 range should be continued and the year to start applying these costs should be 2022. We have incorporated this assumption into our Strategist modeling for this case. The Company does not anticipate that these proceedings would have an impact on the five year action plan. The outcome of the above listed proceedings will be incorporated in future resource plans.

2.11 Preferred Plan Rate Impacts

Figure 2-7 shows the potential estimated overall rate impact of the preferred resource plan.

The data shown is the average annual rate based on the Strategist model for the total system and represents total revenue divided by total sales. Figure 2-8 shows the potential estimated rate impacts of the preferred resource plan by customer class. A number of parameters in the operation of the model will impact rates. The Strategist model assumes automatic rate increases each year to meet the targeted rate of return; but in reality, rate cases take place as needed and have an inherent amount of regulatory and administrative lag. The Strategist model rate impact calculation has taken into account the generation additions in the preferred plan. But it does not include all projected capital expenditures, asset based sales, or projected CO$_2$ costs.
2.12 Five-Year Action Plan

Table 2-5 identifies specific major items that require action in the first five years of the planning period. The five-year action plan is for the years 2017-2021; however, the action items in 2016 also are provided. As shown, the major activities during the five-year period are construction of the 248 MW CT and two 100 MW wind projects to replace Hoot Lake Plant plus the addition of 30 MW of solar generation to meet Minnesota’s solar energy standard.

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity</th>
</tr>
</thead>
</table>
| 2016 | June 1 Triennial CIP filing for 2017, 2018, 2019  
      | MISO interconnection process for CT  
      | Preparation for permitting effort for CT |
| 2017 | Permitting and approvals for 248 MW CT  
      | MISO interconnection process for CT  
      | Begin construction on 100 MW wind project |
| 2018 | Commercial operation of 100 MW wind project  
      | Permitting and approvals for 248 MW CT  
      | MISO interconnection process for CT  
      | Initiate work on utility-scale solar project to meet the Minnesota Solar Mandate by 2020 |
| 2019 | June 1 Triennial CIP filing for 2020, 2021, 2022  
      | Engineering and procurement for 248 MW CT  
      | Begin construction on 100 MW wind project  
      | Construct or obtain PPA for an approximate 30 MW solar installation |
| 2020 | Construction of 248 MW CT  
      | File MISO Attachment Y for retirement of Hoot Lake Plant  
      | Commercial operation of 100 MW wind project  
      | Commercial operation of 30 MW solar project |
| 2021 | Start-up and commercial operation of 248 MW CT  
      | Retirement of Hoot Lake Plant |
2.13 Conclusion

Otter Tail Power Company has continued to optimize existing resources and obtain supplemental capacity and energy through bilateral contracts in the wholesale market to meet both customer needs and resource adequacy requirements. This strategy will continue while balancing risk and economics. Cost-effective energy efficiency and demand response is used throughout the study period. The preferred resource plan presented here accomplishes the goal of meeting customer needs and regulatory requirements in the three jurisdictions that Otter Tail serves.
3 Current Outlook

The following list provides a brief overview of the most prevalent changes that have occurred since the 2013 resource plan filing. These changes include both regulatory and economic factors that have had very tangible effects on the Company's current outlook.

3.1 Completion of the Big Stone Plant AQCS and the Hoot Lake Plant MATS

The Big Stone air quality control system (AQCS) was completed and commenced commercial operation in December 2015. The final cost of the project was over $100 million below the original budget. The Hoot Lake Plant Mercury and Air Toxics Standards (MATS) project was completed and commenced commercial operation in September 2014.

3.2 Installation of an approximate 248 MW\(^5\) natural gas fired combustion turbine

As approved in the course of the 2010 IRP proceeding and related Baseload Diversification Study, Docket, No. E017/RP-10-623, Otter Tail is planning to retire the approximately 140 MW Hoot Lake Plant at the end of the MISO Planning Year 2020 (May 2021). In addition, 50 MW of capacity purchase agreements expire at the same time.

The December 5, 2014 Order in Otter Tail’s 2013 Resource Plan authorized: “Otter Tail shall obtain approximately 200 MW, subject to need, of intermediate capacity (and associated energy) in the 2019-2021 timeframe ...” Furthermore, the Commission required Otter Tail to “File a proposal to replace Hoot Lake Plant, including expected dates for filing a certificate-of-need application with the Commission, an Attachment Y with MISO, and an interconnection request with MISO for its proposed new facility...”

In 2015, the Company completed an extensive internal evaluation of both combined-cycle (CC) and combustion turbine (CT)/wind projects and preferred sites. There were six sites under original consideration across our three-state service territory. We also evaluated the possibility of partnering with another utility to build a larger project. While both CT and CC have their strengths, the results of the evaluation indicated that a CT located at \[\text{PROTECTED DATA BEGINS...astoria, south dakota ...PROTECTED DATA ENDS}\] provided the most benefits at the least cost to our customers.

\[\text{PROTECTED DATA BEGINS...otter tail has purchased an 80-acre site near astoria, south dakota which is located at the intersection of the northern border gas pipeline and the new big stone south to brookings transmission line. astoria's interconnection to the new 345kV transmission line provides the most robust transmission service of all the sites with superior future}\]

\(^5\) 248 MW is a proxy size. The actual size of the unit will be determined after the bidding process for turbine supply. This size turbine is consistent with the order in our last resource plan.
capacity potential. Because both electric and natural gas transmission are located on the property, interconnection costs are extremely low.

The [PROTECTED DATA BEGINS... Astoria site lies directly under the new Big Stone South to Brookings 345kV transmission line and a connection to its higher voltage level is an advantage for cost predictability but requires increased installation equipment costs. The other sites would most likely use 230kV transmission lines in their relative locations. ...PROTECTED DATA ENDS]

The North Dakota site(s) requires the construction of a natural gas lateral supply line which increases the overall cost of the project. This additional cost causes the North Dakota option to become a higher lifetime cost option. Annual property taxes in North and South Dakota are relatively close, but it is expected the Minnesota property tax would be significantly higher causing the overall lifetime costs in Minnesota to be higher.

Otter Tail has submitted a MISO interconnection request for the [PROTECTED DATA BEGINS... Astoria ...PROTECTED DATA ENDS] project and made the required deposit with MISO to take our place in the queue. We have established our DPP queue date and MISO currently estimates DPP studies to be complete in Nov-2016. Completion of studies and negotiating of a Generator Interconnection Agreement (GIA) is anticipated by the end of 2018. We are currently working with an engineering consultant on pre-development activities.

With the CPP, general public and regulatory policy, and the fact that our service territory is in the heart of a wind-rich region, we expect large amounts of renewables will be added to the already significant wind resources in this area. Those wind additions will contribute to increasingly volatile market prices when the wind blows versus when it doesn’t blow. Our new CT project will serve to hedge customers’ energy needs, so that they are not paying high market prices during periods when the wind isn’t blowing. In addition, it will afford us dispatch flexibility to serve as a price hedge for our customers at times of high energy prices.

Our industry is in a time of great uncertainty. The outcome of the CPP, allowance and Emission Rate Credit (ERC) prices, and the volatility of future energy and natural gas prices all contribute to this uncertainty. Therefore, we believe that mitigating risk and maximizing future flexibility are paramount. The addition of a CT affords us that flexibility for the following reasons:

- A CT is exempt from regulation under the CPP. By contrast, a CC comes with risks if a state chooses a mass-based plan with a new source compliment. We won’t know how each of our states will proceed until their State Implementation Plans (SIP) under the CPP are completed.

- A CT can be converted to CC in the future if circumstances so dictate but not vice versa. Our proposed site is large enough to handle a CC conversion and we will engineer the project to readily accept conversion to CC should it be needed.

- Compared to a CC project, a CT/wind combination results in significantly lower CO₂ emissions.
• Increased dispatch flexibility for a CT when compared to a CC. This allows us to better follow the fluctuations in wind and energy prices.

• A CT is a less complicated project when compared to a CC allowing for a shorter permitting and construction timeline.

Combining capital cost with adjusted 2015 annual operating costs throughout the plant’s 30 year expected life, [PROTECTED DATA BEGINS...Astoria, South Dakota ...PROTECTED DATA ENDS] has the lowest overall lifetime cost estimate of all sites under consideration.

In summary, Otter Tail has taken significant actions toward installation of a new 248MW natural gas CT generation project. These actions are necessary to complete the replacement of our retiring Hoot Lake Plant and expiring capacity purchase agreements by May of 2021. Otter Tail’s five year action plan reflects our intent to proceed with this project.

3.3 Midcontinent ISO Module E Resource Adequacy Obligation

Beginning in June 2013 the Midcontinent ISO revised its resource adequacy construct. The revisions included changing from a monthly construct based on non-coincident peak demand to an annual construct based on the Midcontinent ISO’s coincident peak demand. In addition, the Midcontinent ISO created ten capacity pricing zones to ensure capacity and transmission investments are made in the right places. The change from a non-coincident construct to a summer coincident construct reduced the Company’s reserve obligation. The Company’s customer peak demand is lower in the summer than in the winter, which is offset by the loss of winter demand response resources under the revised construct. The Company’s coincident peak demand diversity factor is approximately 8 percent of its non-coincident peak demand. For modeling purposes, Otter Tail used a zero cost capacity transaction within Strategist to reflect the impact of the coincident peak demand on reserve requirements.

The Midcontinent ISO’s planning year 2016 resource adequacy reserve obligation is 7.6 percent. For every MW of forecasted peak demand, the Company must provide 1.076 MW of accredited capability. Otter Tail’s generators are accredited based on historical plant performance. Each resource’s historical performance data is used to calculate a probability that it will be available to operate when called upon. The probability is applied to the resource’s demonstrated capability under defined conditions and lowers the accreditation of that resource from its demonstrated capability.

Resource accreditations change annually and are based on summer ratings. As stated previously, ratings for generators are based on historic generator availability data or, if that is unavailable, class averages.

Wind generation is accredited based on unit specific historical capacity factors. Accreditation for the 2016 planning year for the Company’s wind farms varied from 27 percent at the Luverne Wind Farm to 17 percent at the Edgeley Wind Farm.
Otter Tail has successfully registered the load management system and retail firm service level contracts under Module E as Demand Resources. The accredited capability of these resources is subtracted from the Company’s forecast demand prior to calculating the planning reserve margin. Otter Tail’s accredited Demand Resources for planning year 2016 totaled 32.3 MW. This accreditation is based on its summer capability, which is when Midcontinent ISO experiences its annual peak demand.

The Midcontinent ISO is discussing with stakeholders a potential transition to a two season capacity construct starting in planning year 2018. Upon initial review, the Company does not see this being a concern from a capacity perspective. Although the Company has a winter peak of roughly 100 MWs higher than its summer peak, it also has over 100 MWs of winter demand response resources available to offset the increase in winter peak load.

### 3.4 Market Conditions in the Midcontinent ISO

Wholesale energy prices remain low due to the increasing penetration of wind generation, and continuing low natural gas prices. Annual average Locational Marginal Prices (“LMP”) at the OTP.OTP load zone in the day-ahead market remain low:

- 2013: $28.23/MWh
- 2014: $34.27/MWh
- 2015: $21.97/MWh
- 2016 (YTD April 25): $18.26/MWh

Capacity values in the Midcontinent ISO centralized market have remained low due to excess reserves. However, due to pending coal plant retirements reserve margins likely will tighten. The Midcontinent ISO has recently projected the possibility of capacity shortfalls starting in 2020. The forward capacity market has seen significant upward pressure as these uncertainties weigh on market participants.

### 3.5 New EPA Emission Standards for Stationary Engines

On March 3, 2010 the U.S. Environmental Protection Agency issued new national emission standards for hazardous air pollutants for existing stationary compression ignition reciprocating internal combustion engines. The new standards include emissions limitations, operating limitations, maintenance requirements, performance tests, recordkeeping requirements, and reporting requirements. By May 1, 2016 all of Otter Tail’s engines affected by the RICE Rule will be considered emergency or blackstart in nature and therefore exempt from emissions limitations and performance tests. Only routine maintenance activities will be needed to comply with the rule.

### 3.6 Clean Power Plan Uncertainty

On October 23, 2015 the Environmental Protection Agency published the final Clean Power Plan. On February 9, 2016 the U.S. Supreme Court granted a stay of the rule pending ongoing litigation, including any eventual U.S. Supreme Court review. The stay was effective immediately and accordingly, compliance with any deadlines to file state plans and other deadlines associated with the rule are now on hold. As a result, the ultimate disposition of the Clean Power Plan remains unclear.
If the Clean Power Plan is ultimately upheld, each of Otter Tail’s states will be faced with numerous decisions that could result in a wide variety of impacts. However, in any case, Otter Tail’s preferred resource plan will result in additional renewable energy resources, the retirement of Hoot Lake Plant, and the addition of a simple-cycle CT unit that would be excluded from regulation under the Clean Power Plan. Thus, implementing this preferred plan – while not specifically designed to comply with the Clean Power Plan – would provide Otter Tail with several flexibilities for generating compliance credits/allowances should the rule be re-instated.

Additional discussion of the Clean Power Plan is included in Appendix E.

### 3.7 Renewable Energy Objectives and Standards

Otter Tail was required to make a good faith effort to comply with the state REO through 2011. In 2012 the requirement switched to an RES. To date the Company has met the REO and RES targets. The state requirements increase in a step-wise fashion, consisting of:

- 2007 – 1% of retail sales
- 2010 – 7% of retail sales
- 2012 – 12% of retail sales
- 2016 – 17% of retail sales
- 2020 – 21.5% of retail sales (1.5% from solar resources)
- 2025 – 26.5% of retail sales (1.5% from solar resources).

The Company is also obligated to meet renewable energy objectives in both North Dakota and South Dakota to generate or procure 10 percent of annual retail sales from renewable or recycled energy. Otter Tail has joined the Midwest Renewable Energy Tracking System (“M-RETS”) and uses this system to track and report compliance with REO and RES targets.

### 3.8 DSM and Conservation Requirements

The 2007 Next Generation Energy Act of 2007 established an ambitious goal for all Minnesota electric and natural gas utilities of achieving energy savings equal to 1.0 percent of retail energy sales. In 2013, the energy savings goal was modified to an annual goal of 1.5 percent of retail energy sales. The goal is based on a rolling three-year average of weather normalized historical retail sales. (Minnesota Statute §216B.241, Subd. 1c). On June 1, 2013, the Company made its 2014-2016 Minnesota CIP Triennial filing with the Minnesota Office of Energy Security. The plan as filed complied with all regulatory requirements, including a minimum of 1.5 percent energy savings. This resource plan reflects the 1.5 percent annual energy savings goal as filed in the Minnesota CIP Triennial filing. The Company also included modeling sensitivities of annual goals from 1.6 to 2.0 percent in .1 percent increments as ordered in our last resource plan.

---

6 These REO and RES requirements only apply to utilities like Otter Tail without nuclear generating assets. Utilities with nuclear generating assets have a more aggressive standard as detailed in Minn. Stat. §216B.1691.
3.9 Projected Load and Capability

Appendix B provides Otter Tail’s Annual Electric Utility Report, which includes Otter Tail’s forecast in detail. Figure 3-1 below shows the historical and projected non-coincident summer peak demand by season through the study period to 2031. Figure 3-2 shows historic and forecast annual energy requirements by customer class. The historic and forecast values have existing conservation programs embedded, whereas the forecasted values exclude new conservation programs. Otter Tail’s energy requirements are driven equally by residential and commercial customers, creating an annual load factor of approximately 70 percent. Otter Tail projects that by the end of the study period, large commercial and industrial loads will increase to roughly 60 percent of the Company’s retail sales.
Otter Tail assesses capacity need through evaluation of the Company’s load and capability under Module E of the Midcontinent ISO Resource Adequacy Construct. Capacity need is calculated by taking the difference between the planning reserve obligation, which is the coincident peak demand forecast plus the planning reserve margin and transmission losses, and the sum of accredited generating capability, net transaction capacity, and demand side resources.

The Company’s projected summer capacity needs under Module E requirements are shown in Tables 3-1 and represented graphically in Figure 3-3. The Midcontinent ISO requires the Company to designate capacity to meet the 50th percentile peak demand forecast plus reserves. The supply-side resource stack is composed of capacity that is converted to zonal resource credits (“ZRCs”) for resources that are universally deliverable within the Midcontinent ISO footprint (or aggregate), as well as for resources that are locally deliverable to Otter Tail’s load, and any bilateral transactions of ZRCs.
As shown, the Company has a small capacity deficit beginning in the summer of 2017 and expects that deficiency to grow in 2021 when the existing capacity purchase agreements end and the Hoot Lake units 2 and 3 are planned to retire. Any remaining shortfalls for 2017/2018 and 2018/2019 will be closed once the final forecast and MISO parameters are known for each planning year. Otter Tail is a winter peaking utility but for modeling purposes bases its capacity resource need on the summer season as required by Midcontinent ISO resource adequacy rules. Although the summer season drives capacity needs, the entire year is evaluated for the Company’s energy needs.
4 Plan Development

4.1 Plan Objectives

In its Order concerning Otter Tail Power Company’s initial resource plan filing in 1992, the Commission stated that it considers the characteristics of the available resource options and the proposed plan as a whole. In addition, the Commission stated that it evaluates resource plans on their ability to: (1) maintain or improve the adequacy and reliability of utility service, (2) keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints, (3) minimize adverse socio-economic effects and adverse effects upon the environment, (4) enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations, and (5) limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control. Otter Tail has worked to keep the Commission's objectives in mind while selecting resource options that will provide adequate, reliable, and reasonably priced electric power for its customers.

4.2 Planning Tools

Otter Tail Power Company uses Strategist to perform capacity expansion planning. The Strategist model is capable of providing full supply-side and demand-side integration in the optimal selection of resources, subject to a specified objective function and any imposed constraints. The objective function employed by Otter Tail was to minimize total societal cost, or revenue requirements, based on the costs incurred by both the customers and the utility, plus any externality costs, as shown in the following formula:

\[
\text{MINIMIZE Net Present Value: Total Societal Costs (or Revenue Requirements)}
\]

\[
= \text{Capital Cost} + \text{Base Revenue} + \text{Total System Cost} + \text{Emissions Externalities}
\]

Capital Costs include costs for engineering, procurement, and construction of a resource addition. Base Revenue includes the allowable return the Company is able to earn on rate base. Total System Costs include operations and maintenance expenses, fuel costs, or emissions charges. Emissions externalities include any imposed externality cost.

Emissions externalities were used in 31 of the 58 sensitivities. The remaining 27 sensitivities did not have emissions externalities applied.

The net present value of costs (societal/utility) evaluated by the model includes end-effects calculations. End-effects calculations are used to analyze differences between alternatives after the planning period's horizon. End effects are significant in determining the optimal rankings of plans based on long-run economic advantages. Differences among alternatives are due to different operating characteristics and lives and end-effects analysis ensures that those characteristics are adequately considered for capital intensive units that may be added late in the planning period. The end effects result is used to augment the planning period result to account for the cost of replacing the resources and for differences in
operating cost after the planning period. In all scenarios, the end-effects period was assumed to be 15 years. Therefore, the total societal costs, or utility costs, were considered for the study period of 2017-2031, plus end effects.

4.3 Planning Process

Otter Tail’s planning process is an iterative progression that includes the following primary steps:

1) **Modeling the Company’s system using Strategist** – This step requires representing all components of the Company’s existing fleet of generation, transactions, DSM programs, and financial structure. This is an ongoing process and many inputs are updated either annually or as changes occur.

2) **Performing capacity expansion runs** – This step requires executing the capacity expansion model to rank plans of feasible combinations of alternatives under specified constraints. The capacity expansion tool ranks the plans according to least cost. Careful review of model results for verification and validation and reasonability is essential.

3) **Developing a preferred resource plan** – The Company aims to select a least-cost preferred plan that complies with all relevant statutes and rules, resource adequacy obligations, renewable energy objectives and standards, and established environmental regulations. Additionally, the least-cost plan is weighed against scenarios that evaluate regulatory and market uncertainties in the planning horizon. The preferred plan protects the customer and the Company from unnecessary exposure to risk, while maintaining flexibility and commitment to providing electricity in an economical, reliable, and environmentally responsible manner.

Because Otter Tail’s planning process is model-dependent, a more detailed explanation of the components of the Strategist model is provided here. Otter Tail uses four modules in the Strategist model called the LFA, GAF, CER, and PRV. The following section discusses some of the major inputs and the process involved in populating these modules of the database. Greater detail on model assumptions is provided in Appendix F.

**Load Forecasting Module – (“LFA”)**

The load-forecasting process developed three uncontrolled load forecast scenarios: low, base, and high. The Company splits the load into two components for modeling purposes to represent the Company’s Minnesota load and remaining load in both North Dakota and South Dakota. The accredited load control, as registered with Midcontinent ISO under Module E as Demand Response, was also entered into the model. The load control was set up to net against the demand forecast prior to calculating the reserve obligation, it was prevented from actually dispatching. The reason for this representation was that the model is developing a capacity expansion plan based on the 50/50 or mean forecast. Load control is unlikely to occur for capacity reasons at the mean forecast level. Rather, Otter Tail aims to control for capacity reasons to protect against extreme capacity constraints during higher than anticipated load levels, more likely at the 95th percentile level or under obligation to the Midcontinent ISO for emergency conditions.
Generation and Fuel Module – (“GAF”)
Operational specifications and performance parameters of existing and potential thermal resources, hydro units, and transactions (including owned wind and power purchase agreements) were entered in the Strategist database. Capacity accreditation was based on the 2016-2017 planning year ratings by the Midcontinent ISO and any known or anticipated adjustments to accreditations in future years. The data for the thermal resources included heat rates, emissions, maintenance schedules, and maximum and minimum capability. Fuel price forecasts for oil, coal, and natural gas were also represented in the GAF. A tie line to the Midcontinent ISO energy market was represented along with a corresponding energy market price forecast. Wind generation resources were provided a profile for generation output based on historical performance. The GAF also includes cost data for fixed and variable operation and maintenance expenses and contract prices for energy and capacity.

Capital Expenditures – (“CER”)
Capital projects associated with potential resources are entered in the CER module along with an expenditure profile and specified tax life and book life.

Proview Capacity Expansion – (“PRV”)
The Proview Module in Strategist was set up to evaluate a variety of potential resource alternatives subject to the objective function to minimize total societal costs. As part of a robust planning process, the Company uses Proview to evaluate a variety of sensitivities to meet the requirements of the resource plan filing and any known or expected regulatory or economic conditions. Otter Tail ran the model from 2017 through 2031 to capture the full 15 years in the study period. Model results from the Proview runs were compared and evaluated for reasonability and compliance with all constraints.

The Company seeks to develop one preferred plan that reliably and economically meets the energy needs of its customers in all three states, while complying with all legal and regulatory obligations and managing risk. The results of the resource planning analysis are used to develop this filing as well as internal planning and evaluation.
5 Preferred Resource Plan

The preferred resource plan identifies resources that could be used to serve customer loads over the entire 2017 – 2031 resource planning period. It also details Otter Tail’s expected activities during the first five years of the planning period. This section first discusses details associated with the preferred resource plan. Then it presents the results for the scenarios required by the Minnesota Rules for resource plan filings, including high and low load growth sensitivities, externality sensitivities, and renewable and conservation sensitivities. The Company’s preferred resource plan, presented in Table 5-1, shows the resource additions anticipated for the planning period.

<table>
<thead>
<tr>
<th>Resource Plan (MW) - Based on Nameplate ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
</tr>
<tr>
<td>2018 100 MW Wind</td>
</tr>
<tr>
<td>2019</td>
</tr>
<tr>
<td>2020 100 MW Wind &amp; 30 MW Solar</td>
</tr>
<tr>
<td>2021 248 MW Frame NG CT</td>
</tr>
<tr>
<td>2022</td>
</tr>
<tr>
<td>2023</td>
</tr>
<tr>
<td>2024</td>
</tr>
<tr>
<td>2025</td>
</tr>
<tr>
<td>2026</td>
</tr>
<tr>
<td>2027</td>
</tr>
<tr>
<td>2028</td>
</tr>
<tr>
<td>2029</td>
</tr>
<tr>
<td>2030</td>
</tr>
<tr>
<td>2031</td>
</tr>
</tbody>
</table>

As Table 5-1 shows, 100 MW of wind is added in 2018 and 2020, as well as, 30 MW of solar in 2020, and a 248 MW natural gas CT is added in 2021. The 200 MW of wind additions early in the plan is due to the impact of the production tax credit (PTC) extension. In December 2015, legislation was enacted that extended the availability of the PTC associated with wind energy through 2019. The legislation also included a phase-out of the tax incentive. The wind energy price assumptions incorporate the phasing out of the PTCs from 100 percent for projects that have started construction in 2016, to 40 percent for projects that have started construction in 2019. For projects that start construction after 2019, there are no PTCs assumed.
Figure 5-1 shows the reserve obligations and the capacity resources of the Preferred Plan.

Figure 5-1: 2017-2031 Capacity Resources and Reserve Obligation for Preferred Plan (MW)

Figure 5-2 shows the energy sources in the preferred plan by fuel type with externalities applied, and figure 5-3 shows the energy sources without externalities applied. Conservation contributes a significant portion to the Company’s future energy needs, as do wind generation, continued market opportunity purchases, and natural gas generation.

Figure 5-2: 2017-2031 Energy Resources and Energy Requirements for Preferred Plan with Externalities (GWh)
5.1 Preferred Resource Plan Description

The Otter Tail preferred resource plan in the externality scenario has a present value of societal cost (PVSC) of 3.165B in 2017$. The Otter Tail preferred resource plan in the zero externality scenario has a present value of utility cost (PVUC) of $2.419B in 2017$. The Company’s preferred plan is identified as sensitivity #1 from Appendix I. Following is a description and comment on the demand response and energy efficiency resources used in the preferred plan.

- **1.5% CIP** – The model uses an annual energy efficiency and conservation alternative for Minnesota load that is 1.5 percent of average retail sales in Minnesota for the prior three years. In 2017 the energy efficiency for Minnesota is modeled at energy sales reduction of 39 GWh and the cumulative effect of the energy savings in the year 2031 is modeled at 658 GWh.

- **Demand Response** – Demand response includes both load management capability and customer contracts that allow load shedding to a firm service level. In the preferred plan, demand response capability is modeled at 33 MW in 2017 increasing to 41 MW in 2031.

5.2 REO/RES Compliance

Figure 5-4 represents the planned compliance with REO/RES regulation in all jurisdictions under the preferred plan. Otter Tail expects to have surplus renewable energy credits throughout the study period.
The solar portion of the RES is a Minnesota requirement enacted in 2013 to be effective in 2020. The preferred plan forces a solar resource as part of its compliance with the Minnesota SES. In December 2015 legislation was enacted that extended the availability of investment tax credits (ITC). Solar projects that start construction by 2019 are eligible for the 30 percent ITC. The legislation includes a step-down provision of the ITC to the 10 percent level for projects that start construction after 2021. The Company included 6 solar price sensitivities (sensitivities #4, #5, and #6 from Appendix I – With Externalities and Without Externalities), which included modeling solar purchased power agreements at different price levels to determine the resource selections at various price levels. Solar was not selected as a least-cost resource in the base case assumptions, but was selected in the following sensitivities from Appendix I:

- #4 solar with a declining price over the study period
- #15 high load growth
- #18 limited market purchases
- #30 oil peaking units retired in 2023

The estimate of the cost/benefit of RES compliance is contained in Appendix H.

### 5.3 Load Growth Scenarios

The Company included low and high load growth sensitivities (sensitivities #14 and #15 from Appendix I). As shown in Figure 5-7, the low load growth sensitivities result in lower total present value of societal cost (PVSC) and present value of utility costs (PVUC) and fewer resource additions than the base case. The high load growth sensitivities result in higher total PVSC/PVUC and more resource additions than the base case.
5.4 Environmental Externalities

The Company evaluated 31 sensitivities where environmental externalities were applied. The low and high externality sensitivities (sensitivities #19 and #20 from Appendix I) use the environmental externality values from the May 27, 2015, Notice of Revised Updated Environmental Externality Values as provided by the Commission. The Company’s thermal units located in Minnesota (Hoot Lake and Solway) use the “rural” externality values. Big Stone plant and the proposed combustion turbine use the “within 200 miles of Minnesota” externality values. Coyote station is beyond 200 miles of Minnesota and no externality values were applied to it (except CO2 starting in 2022). The high and low CO2 values were $34 and $9 respectively starting in 2022. The mid-externality values (average of high and low values) were used in most sensitivities, including the base case. Externality values were escalated 2 percent for inflation.

5.5 Emissions and Greenhouse Gas Reduction Goal

The preferred plan (with externality values applied) shows a reduction in emissions from Otter Tail’s historical levels. Figure 5-9 shows the estimated emissions for SO2 and NOx. Figure 5-10 shows the estimated emissions for CO2. Figure 5-11 shows the estimated emissions for mercury. The values to the left of the solid black line indicate historical levels of emissions (2005 to 2015) for Otter Tail-owned units. The values to right of the solid black line (2017 to 2031) indicate the estimated emissions of the preferred plan for Otter Tail-owned units.
Figure 5-6: SO$_2$ and NO$_x$ Emissions

SO$_2$ and NO$_x$ Emissions
(tons per year for OTP-owned units)

Figure 5-7: CO$_2$ Emissions

CO$_2$ Emissions
(tons per year for OTP-owned units)
Minnesota Statutes §216H.02 states that “It is the goal of the state to reduce greenhouse gas emissions to a level of at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050.” Sensitivity No. 22 from Appendix I shows that the preferred plan plus an additional 200 MW of wind resource addition meets the CO₂ reduction goal for Otter Tail’s system.

Figure 5-9 shows the preferred plan CO₂ emissions and how it compares with the CO₂ reduction goal and the 2005 level of CO₂ emissions. The 2005 level is estimated at 4,653,930 tons of CO₂ (3,745,676 tons from Otter Tail-owned units and 908,254 tons assumed for purchased energy based on the 2005 MRO west regional average CO₂ /MWh of 1,821.64 lbs). For market purchases in this resource plan, 1,425.15 lbs of CO₂ are applied to each MWh of energy purchased (based on the eGRID2012 MRO west sub regional emissions rate).
5.6 50% and 75% Conservation and Renewable Scenarios

Minnesota Statutes §216B.2422, Subd. 2, states that "a utility shall include the least-cost plan for meeting 50 and 75 percent of all new and refurbished capacity needs through a combination of conservation and renewable energy resources.” The calculation is based on the energy from future conservation and renewable resources compared to the total growth in energy requirements for Otter Tail’s Minnesota load.

Table 5-2 presents the energy calculation for determining whether the conservation and renewable energy target was met. The preferred plan achieves the 50 percent target and the 75 percent target. The preferred plan which includes 1.5 percent CIP, 200 MW of wind resources, and 30 MW solar resources exceed both the 50 percent target and the 75 percent target, assuming only 50 percent of new wind and solar resources are allocated to Minnesota load (Otter Tail notes that the specific jurisdictional allocation of the wind and solar resource might not be proportional among its jurisdictions if the resource addition is not able to be demonstrated to be part of a least cost resource plan).

<table>
<thead>
<tr>
<th>Table 5-2: 50% and 75% Renewable and Conservation as Percent of Total New MN Energy Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred Plan and the 50% and/or 75% Renewable and Conservation goal</td>
</tr>
<tr>
<td>1.5% Conservation (GWh)</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>New MN CIP</td>
</tr>
<tr>
<td>New Wind and Solar</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent of Total New MN Energy Requirements (= 402 GWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>123%</td>
</tr>
</tbody>
</table>

5.7 Energy Conservation Sensitivities

In Otter Tail’s 2013 resource plan (MN Docket E017/RP-13-961), the Commission ordered the Company in order point 2(a) to “Evaluate additional conservation scenarios that would achieve greater energy savings beyond those in the base case and provide cost assumptions for achieving every 0.1% of savings above 1.5% retail sales, up to 2% of retail sales”.

The Company engaged Navigant Consulting to conduct a DSM potential study to, among other things, evaluate the economics of energy savings at the levels ordered by the Commission. The study is contained in Appendix J. Figure 5-13 shows the incremental costs (in 2016$) associated with the different levels of energy savings.
Sensitivities #24-28 from Appendix I show the Strategist modeling results for the varying levels of energy savings. Figure 5-14 shows the impact on the PVSC/PVUC of the varying levels of conservation compared to the base case level of 1.5 percent energy savings. With externality values applied (red bars), the PVSC is lower in the 1.6 percent, 1.7 percent and 1.8 percent sensitivities, but higher in the 1.9 percent and 2.0 percent sensitivities. Without externality values applied (green bars), the PVUC of the 1.6 percent sensitivity is similar to the base case 1.5 percent, but higher in the other four sensitivities.

5.8 Oil Peaker Evaluation Sensitivities

In Otter Tail’s 2013 resource plan (MN Docket E017/RP-13-961), the Commission ordered the Company in order point 2(e) to “Include an analysis of the effects of retiring the Jamestown and Lake Preston Peaking units”.
When Otter Tail made the decision to install the Lake Preston unit in 1978 and Jamestown Units in 1976 and 1978, the primary reason for installing these units was not for additional generation. These units were installed in lieu of building a second high voltage transmission line (backup/supplemental source) into each of these areas. The Lake Preston unit is located in the Hetland Jct. – Toronto load pocket (15 MWs), which currently has a single transmission source, a 115 kV line from Big Stone, SD to Canby, MN. The Jamestown units are both located in the Jamestown load pocket (70 MWs), which also currently has a single high voltage source, a 345 kV line from Center, ND through Jamestown to the Bison station near Mapleton, ND. Today, all three of the peaking units continue to serve the purpose of which they were originally installed, to provide backup local load serving capability to the respective load pockets in the event there is a loss of the high voltage transmission source currently serving the load. If Otter Tail decides to retire any of these three units, a high voltage transmission line will need to be built prior to retirement of the unit in order to continue to provide reliable service to these load pockets. Otter Tail has evaluated two different build-out options for each load pocket. The costs of building new transmission into the Jamestown load pocket range from $10.75-$13.25 M. The costs of building new transmission into the Hetland load pocket range from $30-$32.75 M.

Sensitivity #30 from Appendix I shows the Strategist modeling results for retiring the oil peaking units (Jamestown #1, Jamestown #2, and Lake Preston units) at the end of their current book life of June 2023. This sensitivity assumes that $45 million of transmission assets would be built before the peaking units are retired. Figure 5-15 shows the PVSC increases approximately $36 million compared to the base case and the PVUC increases nearly $60 million compared to the base case. The base case has the peaking units remaining in operation throughout the study period.

5.9 Limited Market Sensitivities

In Otter Tail’s 2013 resource plan (MN Docket E017/RP-13-961), the Commission ordered the Company in order point 2(d) to “Restrict Strategist from selecting generic, wholesale capacity purchases after the first five years of the planning period, unless a specific, known, and reasonable contract exists.” For all of the sensitivities that have externality values applied, the Company limited the use of generic capacity purchases to the first five years. For sensitivities that do not apply externality values, the generic capacity
purchases are available throughout the study period. The Preferred plan does not use any generic capacity purchases after the first five years of the study.

In Otter Tail’s 2013 resource plan (MN Docket E017/RP-13-961), the Commission ordered the Company in order point 2(c) to “Include a scenario which caps MISO day-ahead market energy at ten percent of Otter Tail’s total energy needs after the first five years of the planning period”. Sensitivity #18 from Appendix I show the Strategist results when market purchases are limited to ten percent of the energy needs after the first five years. Figure 5-16 shows the PVSC increases nearly $200 million compared to the base case and the PVUC increases over $235 million compared to the base case. The base case allows for unlimited market opportunity purchases to occur throughout the study period.

![Figure 5-13: Limiting Market Energy Purchases Compared to Base Case PVSC/PVUC](image)

5.10 Additional Sensitivity Scenarios

Otter Tail evaluated additional sensitivities. They included variations in wind prices, solar prices, natural gas prices, coal prices, energy market prices, and CO₂ reductions. A comparison of the PVSC/PVUC for all scenarios is provided in Figure 5-17 while figure 5-18 shows the sensitivities compared to the base case.
Figure 5-14: Sensitivity Comparison (PVSC/PVUC)
Figure 5-15: Sensitivity Comparison to Base Case (PVSC/PVUC)
6 Conclusion

Otter Tail Power Company’s mission is to produce and deliver electricity as reliably, economically, and environmentally responsibly as possible to the balanced benefit of customers, shareholders, and employees and to improve the quality of life in the areas in which we do business. The preferred plan provides the best course of action for the Company to achieve these objectives. The preferred plan also provides flexibility to react to legislative, regulatory, and market changes that will occur during the next several years.

This resource plan results in generation additions that are nearly the same in the majority of the sensitivities: 200 MW of new wind, a new 248 MW CT, and enough solar to meet Minnesota’s solar energy standard.

The preferred plan improves environmental performance through implementation of DSM, renewable resources and simple-cycle natural gas generation. The resource plan satisfies the regulatory and statutory requirements of all three jurisdictions that it serves.

6.1 Preferred Plan is in the Public Interest

The Company is committed to operating its generation facilities as efficiently as practicable while minimizing adverse effects on the environment. New resources have been selected that will meet the Company’s needs while maintaining flexibility and limiting the risk of exposure to changes in financial, social and technological factors beyond its control. The plan maintains flexibility during a period of much uncertainty in the future of the electric industry. In addition, customers will be provided with increased opportunities to improve their energy efficiency. This resource plan satisfies the legal and regulatory requirements in the multi-state service territory and allows Otter Tail and its customers to realize the benefits of operating as a single system while recognizing the differing state requirements.

Our preferred resource plan will result in Otter Tail generating approximately 30% of our energy from renewables by 2021. After the wind, solar, and natural gas additions and the Hoot Lake Plant retirement, we’ll meet Minnesota’s greenhouse gas reduction goal at least until 2025. The preferred plan, which includes 1.5 percent CIP, 200 MW of wind resources, and 30 MW solar resources, exceeds both the target of meeting 50 and 75 percent of all new and refurbished capacity needs through a combination of conservation and renewable energy resources 2031. The plan satisfies all rules and requirements of the Minnesota statutes and rules, provides a clear concise report to interested parties of what Otter Tail intends to do to satisfy customer needs in the near term, and identifies the resources the Company is considering for viable options for the long term.

6.2 Socio-Economic Impacts of the Preferred Plan

The primary socio-economic impact of the preferred plan is that it is a cost-effective plan that meets all statutory and regulatory requirements, and provides reliable and affordable electricity to customers. Otter Tail supports economic development in the states we do business by keeping costs low and reliability high for commercial and industrial customers so that those customers can invest in greater productivity and growth. Likewise, Otter Tail keeps costs low and reliability high for the residential consumer, recognizing that electricity is a fundamental input to the overall health, welfare, and productivity of society.
6-2 Conclusion

The resource additions in the preferred plan will create construction jobs to develop the natural gas-fired peaking facility and new wind generation. This plan will foster greater awareness and participation in energy efficiency in the homes and businesses the Company serves, helping to meet future energy needs, and avoiding the addition of more expensive generation alternatives. Under this plan the Company will continue to develop an effective demand-side management portfolio, a successful collaboration among Otter Tail and residential, commercial, and industrial customers. These programs provide customers with economic rates that allow them to be more productive and invest in the regional economy while providing load shifting or shedding capability in times of emergency.

In summary, the socio-economic impacts from this plan include providing cost-effective, reliable electricity to all classes of customers, preserving and creating jobs in the utility industry, and reducing emissions. Greater detail regarding impacts of specific projects within the plan will be addressed as those projects are developed.

6.3 Five-Year Action Plan

The preferred plan will require considerable activity within the next five years to bring about the resources previously approved and those selected in the plan. Table 6-1 identifies the major activities and the approximate timelines for those activities, beginning with 2016. Some of these activities are already underway. There are many other related activities that will be taking place to support the major items identified in the table that will involve many stakeholders, regulatory agencies, and interested parties.

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity</th>
</tr>
</thead>
</table>
| 2016 | June 1 Triennial CIP filing for 2017, 2018, 2019  
MISO interconnection process for CT  
Preparation for permitting effort for CT |
| 2017 | Permitting and approvals for 248 MW CT  
MISO interconnection process for CT  
Begin construction on 100 MW wind project |
| 2018 | Commercial operation of 100 MW wind project  
Permitting and approvals for 248 MW CT  
MISO interconnection process for CT  
Initiate work on utility-scale solar project to meet the Minnesota Solar Mandate by 2020 |
| 2019 | June 1 Triennial CIP filing for 2020, 2021, 2022  
Engineering and procurement for 248 MW CT  
Begin construction on 100 MW wind project  
Construct or obtain PPA for an approximate 30 MW solar installation |
| 2020 | Construction of 248 MW CT  
File MISO Attachment Y for retirement of Hoot Lake Plant  
Commercial operation of 100 MW wind project  
Commercial operation of 30 MW solar project |
| 2021 | Start-up and commercial operation of 248 MW CT  
Retirement of Hoot Lake Plant |