

## 4 Plan Development

### 4.1 Plan Objectives

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 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 as the Company selects among resource options in order to provide adequate, reliable and reasonable electric power.

### 4.2 Planning Tools

Since 2007, Otter Tail has carefully migrated to Strategist to perform capacity expansion planning and that tool was used in the development of this resource plan filing. 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:

$$\begin{array}{r} \text{Capital Cost} \\ + \text{Base Revenue} \\ + \text{Total System Cost} \\ + \text{Emissions Externalities} \\ \hline \text{MINIMIZE Net Present Value:} \quad \text{Total Societal Costs (or Revenue Requirements)} \end{array}$$

Capital Costs include those 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 includes operations and maintenance expenses, fuel costs, or emissions charges. Emissions Externalities include any imposed externality cost. The externality is not realized by the Company or its customers, but is a cost that is included as a decision driver for economic dispatch of resources.

Emissions externalities were only included in scenarios that utilized externality values. In all other scenarios, therefore, this term was zero. Likewise, scenarios that employed a CO<sub>2</sub> tax or value would incorporate those costs into the total system cost; in all other scenarios CO<sub>2</sub> costs were not present and, therefore, did not contribute to the total societal cost or revenue requirements.

The net present value of revenue requirements 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 between alternatives are due to different operating characteristics and

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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 infinite. Therefore, the total societal costs, or revenue requirements, were considered for the study period of 2010-2025, plus end effects.

## 4.3 Planning Process

The planning process for Otter Tail is an iterative cycle 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. Along with accurately representing the existing system, this step also requires pre-screening demand- and supply-side resource alternatives, which is further described in Appendix D. 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) Development of 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 is selected to protect 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 five modules in the Strategist model called the LFA, GAF, CER, FIR, and PRV. The following section discusses some of the major inputs and the process involved in populating these modules of the database and 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 the Company's remaining load in both North Dakota and South Dakota. The accredited load control, as registered with Midwest 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 calculation of the reserve obligation, however, 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 95<sup>th</sup> percentile level or under obligation to the Midwest ISO for emergency conditions.

### **Generation and Fuel Module – “GAF”**

Operation 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 2010 ratings by the Midwest 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 Midwest 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” and Financial Information – “FIR”**

Planned capital projects unique to each resource were represented in the model. Non-project specific annual capital expenses were projected over the long-term. Capital projects associated with potential resources were also entered in the CER module along with an expenditure profile and specified tax life and book life. The Company’s assets, revenue, liabilities, debt, stock, tax information, and other financial data were represented in the FIR module and provide a starting point for the balance sheet and the projected capital structure and debt limitations for the Company as the model seeks to add resources and evaluate economic states that meet the objective function and any imposed constraints.

### **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, or revenue requirements. As part of a robust planning process, the Company utilizes Proview to evaluate a variety of scenarios to meet the requirements of the resource plan filing and any known or expected regulatory or economic conditions. Otter Tail ran the model from 2010 through 2025 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. In addition, the results are used to serve other departments’ needs at Otter Tail.