7 Plan Development

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.

The Company is also striving to position itself in the competitive electric utility industry. Competition has been present for many years in alternate fuels, and some forms of competition in electricity are also present. In recent years, Otter Tail has been faced with competition in the form of new customer load looking for a place to locate and placing its electric service up for bids. Activity with regard to retail competition, both at a federal level and in this region, has slowed.

With these forces in mind, Otter Tail places continued emphasis on making existing facilities as efficient and economical as is cost-effective. These efforts help to maintain low rates and customer bills, reduce the financial risks of future environmental regulation or taxes, reduce the environmental effects, and keep the Company well positioned to respond to change. In addition, the Company seeks to add the lowest cost new resources as necessary to meet customer loads and reserve requirements, including situations where new resources can be justified simply because of economics.

PLANNING TOOLS

The IRP-Manager software model has been used to develop the previous integrated resource plans at Otter Tail, and was again used in the development of the current plan filing. This model includes a

chronological simulation of demands and resources and an "iterative cost-effectiveness model" known as ICEM. The ICEM module is capable of providing full supply-side and demand-side integration in the selection of resources.

The utility develops a database of both supply-side and demand-side alternatives. Then ICEM performs a two phase process to develop an optimized resource plan. The first phase evaluates the cost-effectiveness of every alternative available to the model over the planning period. The user specifies the objective function[1] to be used by the model to determine cost-effectiveness. If any alternatives are cost-effective, the model will incorporate the most cost-effective alternative, and then re-evaluate all of the remaining alternatives. This process is continued until no further cost-effective alternatives are found. The model then proceeds with the second phase of the process, where the capacity requirements of the utility are considered for each season of the planning period. The model will then implement the most cost-effective alternatives for capacity reasons. By using this process, all cost-effective measures are selected incrementally, and all capacity requirements are satisfied.

PLANNING PROCESS

New Load Forecasting Model

The process of developing and compiling the resource plan began in 2003. In the Commission's Order in Otter Tail's 2002 IRP filing, the Company was ordered to implement a more rigorous method for forecasting energy and demand. Since the late 1980's, Otter Tail had used the SHAPES-PC® end-use forecasting model. The model is no longer commercially available and is not being supported. Otter Tail personnel met with staff from the Department of Commerce in April of 2003 to determine the general forecasting approach to implement. Potential consultants were also reviewed, and Otter Tail employed Christiansen Associates of Madison, WI to develop a traditional econometric forecasting model. The development of the model and a new forecast was completed in early 2004. Greater forecasting detail is provided in the forecast report included with the Minnesota Electric Utility Annual Report.

[1] For the scenarios without consideration of environmental externalities, the objective function is to minimize revenue requirements. For the scenarios including consideration of environmental externalities, the objective function is to minimize the total cost of revenue requirements plus environmental externality values. The cost-effectiveness test also includes the value of environmental externalities.

Load Forecast

The forecasting process developed three uncontrolled forecast scenarios: low, base, and high. Resource Planning personnel then pre-managed these loads with the load management system to reduce peak demands and therefore capacity requirements. This is a procedural change from previous resource plan development, and was necessitated by having to restrict the use of the load management system for capacity purposes to no more than 300 hours per year. It is not possible for the user to restrict the hours of operation of the radio load management system within IRP-Manager in a manner that allows the model to simulate actual use and operation of load management resources. Analysis showed that to optimize the use of the load management system without exceeding the hourly limits, maximum usable load management capability in the winter season must be restricted to 80 MW. This value was used to reduce peak demands where necessary.

Development of Supply-side Resource Alternatives

In late 2003, Otter Tail began contacting nearby utilities to conduct general discussions on regional resource needs and surpluses. The 2002 filing had identified potential baseload generation needs in 2010-11, and Otter Tail was seeking input from potential sources of baseload supply. As a result of those discussions, Otter Tail issued an RFP to Manitoba Hydro Electrical Board for three proposals. In compliance with MN Stat. §216B.1694 Subd. 2.(5), Otter Tail issued an RFP to Excelsior Energy and followed up verbally with telephone discussions to seek proposals for baseload generating capacity. Excelsior Energy responded verbally that it was too early in the engineering process for them to consider developing any proposals.

Since the late 1990's, Otter Tail had periodically considered the feasibility of adding baseload generation at the Big Stone Plant site near Milbank, SD. Those studies identified some of the issues, but did not result in anything else significant since the Company's previous resource plan filings did not indicate a need for near term baseload generation. Otter Tail is not large enough to construct an economically sized baseload plant without having other potential co-owners involved. In 2003-04 a number of other utilities expressed interest in studying the feasibility of a second Big Stone Plant unit. Currently seven utilities, including Otter Tail, are involved in the study. Final commitments to construction have not yet been made, but the work has identified a potential baseload option that has been included in the development of this resource plan filing. Otter Tail formed a project team to participate in the feasibility studies that have been intentionally kept separate from the resource planning function.

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Other baseload and peaking generation options have been included as alternatives based on engineering data provided by two consulting firms. These options are described in greater detail in Section 8, Potential Resources.

Conservation Resource Alternatives

The conservation alternatives are developed from a compilation of various data sources. The initial starting point was the 1994 DSM Potential Study completed by ADM Associates, Inc. This study developed gross, technical, and market potential savings from a variety of end-use technologies. The results were developed by building type and included consideration of installation in new construction, retrofit of existing structures, and replacement of equipment following failure in existing structures. Cost data was also provided.

In September 1994, Otter Tail contracted with Advanced Utility Concepts to review and refine the data for use in the resource planning process. The significant amount of data and end-use technology options were too large to incorporate all potential programs into IRP-Manager software, and have acceptable computer run times. An optimized ICEM run would take more than a week to complete a single scenario analysis. Otter Tail used DSManager, a software package developed by the same company that developed IRP-Manager, to prescreen the DSM alternatives to reduce the CPU times. All DSM technologies were evaluated in DSManager, and technologies with an indicated societal test result of less than 0.9 were eliminated from consideration by IRP-Manager in the ICEM analysis. Even with this change, CPU times are still up to six days per scenario.

An updated DSM potential study was completed in 2002. Working with the Department of Commerce, Otter Tail selected a combination of Summit Blue and Regional Economic Research (RER) to determine the gross, technical, and market potentials of a variety of DSM technologies targeted at commercial and industrial customers. This study specifically addressed technologies that are more likely to be applicable within the customer service territory, based on the typical characteristics of Otter Tail commercial and industrial customers.

For the current resource plan analysis, the effort began with the data and costs from the mid-1990's DSManager screening runs. This data was updated to include new results from the 2002 DSM potential

study. The data was also modified, where appropriate, to take into account achieved DSM results in specific technologies through the CIP programs. Data adjustments were derived from the CIP status reports as filed by the Company with the Commission. In a few instances, some DSM alternatives previously identified in the first DSM potential report were adjusted because changes in building codes made implementing a program for new construction irrational. For example, a program to encourage R-19 wall insulation in the residential sector is no longer needed for new construction. The potentials were reduced by the amount determined for new construction in the potential study. Market potentials for retrofitting existing buildings were left in place.

The cost values for implementing DSM were also updated. Where cost data from the first DSM potential study was used, the cost data was escalated by the change in the consumer price index since the time the study was completed. In some cases, the older cost data was replaced by cost data determined in the 2002 DSM potential study. And finally, if actual CIP cost data from current or recent programs was available, older cost data was replaced with current actual data.

Otter Tail has had several successful CIP programs in recent years that cannot be modeled within IRP-Manager for one reason or another. An example would be the grant program, which provides customized rebates for conservation efforts proposed by a customer. The Company does not know in advance what these proposals will be, but they have been highly successful in implementing a number of measures on a customer-by-customer basis. Another example would be educational or research and development programs. These CIP programs do not have specific kWh savings and associated costs that can be put into the model as a resource that can be selected. There are other CIP programs for which DSM potential data does not exist.

Computer Modeling Process

The ICEM module was used as an initial optimization tool in the analysis. Because IPR-Manager is not capable of correctly modeling the reserve requirements methodology as defined by MAPP, the timing of the resources may not always exactly meet Otter Tail's capacity requirements. It is possible for the ICEM results to be skewed one way or the other because of the MW sizes of the alternatives modeled. For this reason, the ICEM results are reviewed and manual scenarios may be run outside of the ICEM module to determine if a more optimum solution could be found. The initial ICEM results serve as the direction setting effort of the model around which the manual scenarios are run. For example, if ICEM selects 40

MW of a resource modeled in 20 MW blocks, the manual scenarios will determine whether the more appropriate amount might be 35, 45, or 50 MW of the selected resources. ICEM may miss the absolute optimum resource mix because the alternatives were modeled in 20 MW blocks. The final result is a preferred plan to meet the Company's capacity and energy requirements with minimum revenue requirements.

IRP-Manager was executed to develop a series of resource plans. The user specifies the objective function used both by the ICEM module and for regular scenario analysis. Otter Tail defined the objective function as minimizing total revenue requirements over the planning period plus fourteen years. The additional fourteen years were included in order to capture end effects. Thus a series of plans were developed for the 2006 to 2020 time period, but the analysis was completed through 2034.

As the base case plan was developed by using only direct costs and minimizing the present value of revenue requirements, the next step was to apply environmental externalities to the base case. Annual emission amounts for each generating unit were calculated in IRP-Manager and the appropriate environmental externality values applied on a plant-by-plant basis. In accordance with the resource planning rules, least cost plans for meeting 50% and 75% of all new and refurbished capacity needs with conservation and renewable energy were also developed.

As a contingency, preferred resource plans were also developed for both the low series and high series load forecasts. These resource plans are presented in Section 11, Contingencies.

Resource Plan Analysis Results

The results of the resource planning analysis are used to develop this filing. In addition, the results are used to populate a number of other models and filings, including:

- DSManager model for evaluation of CIP programs
- Small Power Producer tariffs in MN, ND, and SD
- Distributed Generation tariff in MN
- Economic avoided cost model for evaluation of transmission/distribution project impacts on losses
- Economic avoided cost model for power plants to evaluate efficiency improvements
- Fuel usage forecast for the Annual Electric Utility Report