Public Service Company of New Hampshire

Least Cost Integrated Resource Plan

June 21, 2013

Public Service of New Hampshire
A Northeast Utilities Company

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I. Introduction

Public Service Company of New Hampshire's ("PSNH" or the "Company") 2013 Least Cost Integrated Resource Plan ("LCIRP") is filed pursuant to RSA 378:38 and Order No. 25,459. PSNH's most-recently approved LCIRP was filed on September 30, 2010 and accepted in Order No. 25,459 on January 29, 2013. This plan is filed in accordance with the requirements expressed in Order No. 25,459, which specified that the 2013 LCIRP should be limited to PSNH's distribution and transmission planning. *Public Service Company of New Hampshire*, Order No. 25,459 (Jan. 29, 2013) at 21. The planning horizion for this LCIRP is five years, 2013-2017.

PSNH is an affiliate electric utility of Northeast Utilities ("NU") serving more than 490,000 homes and businesses in New Hampshire. PSNH's primary responsibilities include the provision of safe and reliable electric service to its customers.

Under the distribution portion of this LCIRP, PSNH describes how it fulfills its responsibilities to provide service to all of its distribution customers, operate and maintain all poles and wires, perform services to connect new customers, plan and build distribution plant for customers' peak demand requirements, and offer energy efficiency and demand side management opportunities to all of its distribution customers. That section of the LCIRP also outlines PSNH's system peak load forecasting methodolgy and how the forecast is used to assess future system needs.

The transmission portion of the LCIRP describes how PSNH, as a subsidiary of NU, provides transmission service regulated by the Federal Energy Regulatory Commission and administered by ISO-New England ("ISO-NE"). That section of the LCIRP also covers PSNH's transmission plans consistent with ISO-NE's Regional System Plan ("RSP").

Uncertainty persists with regard to any potential investment in distribution or transmission assets. PSNH operates in a changing world, where future events, be they economic, legislative, or regulatory are increasingly difficult to predict. Thus, PSNH must remain flexible throughout the planning horizion in order to shift planning priorities as the underpinning assumptions deviate from expectations.

II. Distribution Planning and Investment

Planning for capital expansion of the distribution system is determined by the System Planning Department's engineering forecast for peak demand. As the first step of the annual planning forecast process, PSNH's distribution System Planning Department provides an engineering forecast of demands for the overall system and by geographic area. The current methodology for forecasting is based upon historical data analysis, probability forecasts, and engineering judgment for PSNH's entire system as well as certain geographic areas of New Hampshire. The engineering forecast is reviewed annually, and updated based on actual peak demand data for each geographic area and overall PSNH simultaneous peak.

Ultimately, the distribution system must be capable of serving the peak load experienced; therefore, an accurate forecast methodology which results in construction recommendations at the appropriate future dates is important. A model that under-forecasts capital investment requirements will limit system capabilities during peak load periods, whereas a model that over-forecasts capital investment requirements will result in construction of facilities before they are required. Invariably, any model attempting to forecast future needs will yield an estimate that will differ from actual experience. It is important to note that the planning horizon for transmission system-connected projects is typically longer than for distribution system projects due to ISO-NE oversight and procedures. Distribution system-only projects inherently require shorter planning and construction periods and therefore allow opportunities to modify plans and adjust in-service dates as circumstances change.

A. Methodology

The first step in the development of the engineering forecast is identifying actual historical peak demands. PSNH records overall system peak load based on the highest single hour of demand as measured simultaneously at many points across PSNH's system and accumulated at the Electric System Control Center . The overall PSNH system peak is used to calculate the compounded growth rate for the entire PSNH distribution system. PSNH also records each geographic area peak, which is used to calculate a load forecast for each area. The geographic area forecast is used in PSNH's model to identify capacity addition needs. Each area represents localized distribution systems and allows for an in-depth examination of the peak demand growth specific to that discrete area. Factors that influence a planning area are likely to be similar throughout the area, such as weather, economic activity, and customer profile (i.e., number of residential, small commercial and industrial customers). Each area is modeled as electrically separate, which allows load and peak demand growth assumptions to be matched with the specific distribution system construction needs appropriate for the area.

For many years the summer forecast was developed by fitting a compounded growth rate to the system peaks associated with at least two consecutive 17 cooling degree days. This methodology was proven to be very accurate, even following economic downturns, as the system peak demands recovered to forecasted levels.

The extended economic downturn that began in late 2008 has proven to be a different phenomenon with peak demands not rebounding as previously observed. In response to this new reality, PSNH has revised its forecasting methodology. The new forecast is based upon an area peak occurring within the last five years. A growth rate for the first five years of PSNH's ten year forecast is developed using inputs from historical growth, business climate, and local area knowledge. The growth rate for years six through ten utilizes the calculated compounded growth rate of the previous ten years. This typically results in a lower longer term projected growth rate and more accurately reflects PSNH's experience when forecasting over a ten year horizon. Once the projected growth rates are applied, adjustments to area loads are made to address the impact of large customer additions (e.g. a new 5 MW customer).

Exhibit II-1 shows the historical and engineering forecast percent growth rate for the overall PSNH system and each geographic area. The Historical column shows the calculated percent growth rate based on historical recorded peaks. The Forecast column displays the percent growth rate used for planning purposes. The system loading observed in 2011 rose to within 1.6% of the all-time peak established in 2006. The economic downturn, which began in the fall of 2008, has resulted in a significant decline in the historical compounded annual growth rate.

Exhibit II-1: PSNH Summer Peak Load Forecast by Area

Area	2008-2012* Summer Peak (MW)	Compound Annual Growth Rate (%)	
		Historical	Forecast
		2002-2012	2013-2017
Lakes Region	187.3 (2011)	1.3	2.0
Derry	136.0 (2011)	2.0	3.0
Dover/Rochester	175.2 (2011)	1.9	2.5
Manchester	375.1 (2008)	1.5	2.6
Sunapee	42.5 (2011)	1.4	1.8
Berlin/Lancaster	56.4 (2011)	-3.1	0.5
Portsmouth	260.8 (2011)	2.1	3.8
Nashua	409.2 (2008)	0.4	1.0
Western	170.2 (2010)	1.9	2.7
Conway/Ossipee	81.0 (2010)	1.9	2.1
Seacoast	167.4 (2011)	1.6	**
Concord	131.4 (2011)	1.0	**
CVEC	32.1 (2011)	1.2	1.4
PSNH System * **	**1,920.6 (2011)**	**1.1**	**2.0**

*Historical summer peak was 1,952.2 MW set in 2006
** Unitil provides load data for these areas
*** PSNH system data includes former CVEC load as well as NHEC and municipal load served at the distribution level

B. Planning Use of the Engineering Forecast

System planning is performed for PSNH's main 34.5 kV distribution system by incorporating the engineering forecast loads into a computer model. Capital investment needs are identified in an annual system planning loadflow study. This study scales the system load annually according to the engineering forecast report. System overloads and operating constraints are identified per year based on PSNH's ED-3002 Distribution System Planning and Design Criteria Guidelines. [1] Long-term solutions are developed by incorporating criteria such as good engineering design, reliability, power quality, and operating strategies. These guidelines provide the basis for least cost planning for the distribution system.

[1] ED-3002 was provided to the Commission in response to Q-TECH-006 in the Groton Wind matter.

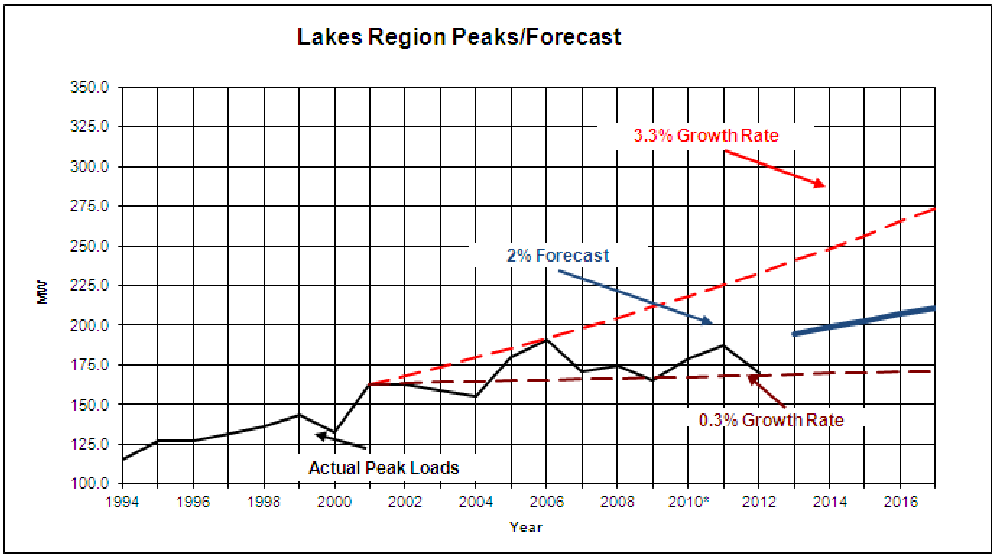
The annual system study is a ten-year forecast analysis identifying capacity needs for the PSNH distribution system based on PSNH procedure ED-3002 as shown in Appendix A. The first five years of the ten-year report are used for detailed short term planning and budgeting. The second five years of the report are used to identify longer term loading and system issues. The long-term system issues are analyzed by the System Planning Department to determine what type of overall strategy for an area is best. In some cases, completing smaller projects over many years to address short and long term needs is chosen as the best option, and in other instances major system expansion is recommended. Many factors are included in determining the best option for correcting problems identified; however, the cost-benefit analysis always carries the most weight. Opportunities to delay capital expenditures, including targeted conservation and load management and distributed generation, are included in the analysis and are discussed further in sections II-F and II-G.

C. Planning by Area

The construction requirements for the electrical system are based upon each area's load growth and the area engineering forecast. Some areas experience peak demand growth rates that are higher than other areas and higher than the regional average, while other areas see essentially no peak load growth or even a reduction in peak load. Since additional distribution capacity is required where the load growth is located, the planning process generally results in total system capital investment requirements that exceed what would be required if planning was simply performed based on PSNH's total system load growth. The summer peak demand history by area is shown in Appendix B.

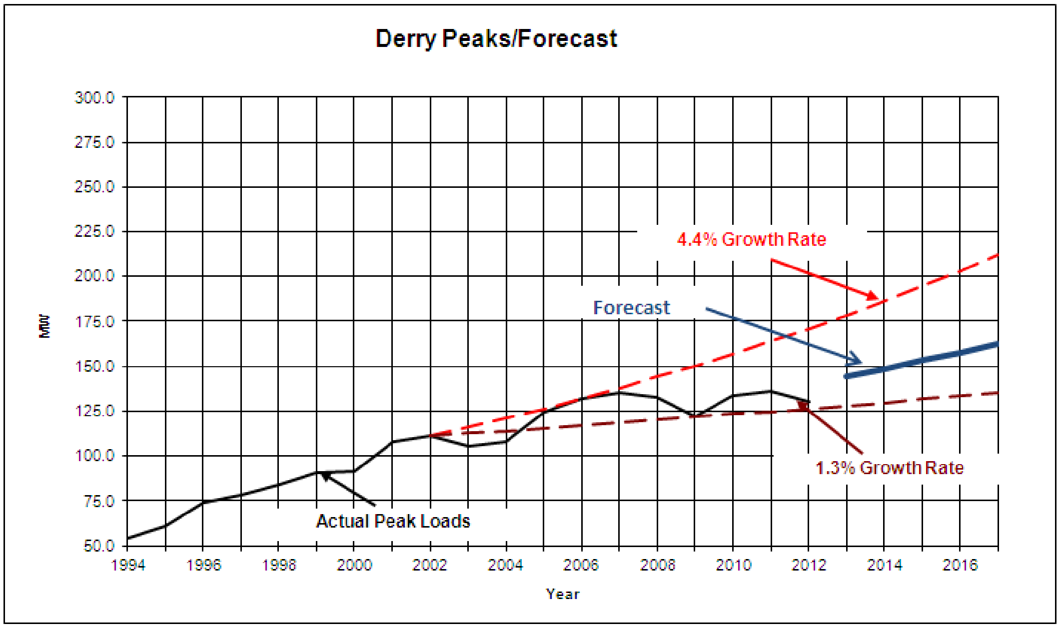
In general, the recent economic slowdown impacted all PSNH planning areas. PSNH is seeing signs of future demand growth with a combination of new large manufacturing facilities, the addition of manufacturing at existing customer locations, commercial development, and customers taking electric service in place of existing diesel generation. A discussion of each planning area and the corresponding engineering forecast is provided below.

Lakes Region
Peak load in the Lakes Region has flattened since 2006. A large industrial customer located in this region has added equipment, which will increase its load by 2.5 MW in 2013. This area is expected to experience a modest 2% growth for the next five years.



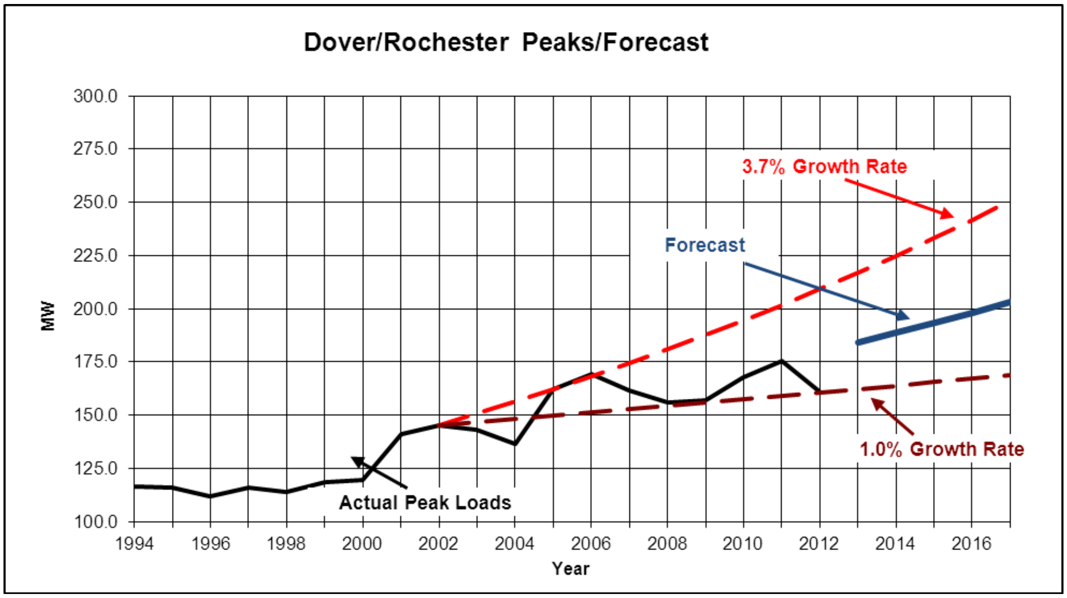
Derry

Load in the Derry region has been essentially flat since 2006. As the economy improves, the area is expected to have a growth rate of 3% in years 2013-2017.



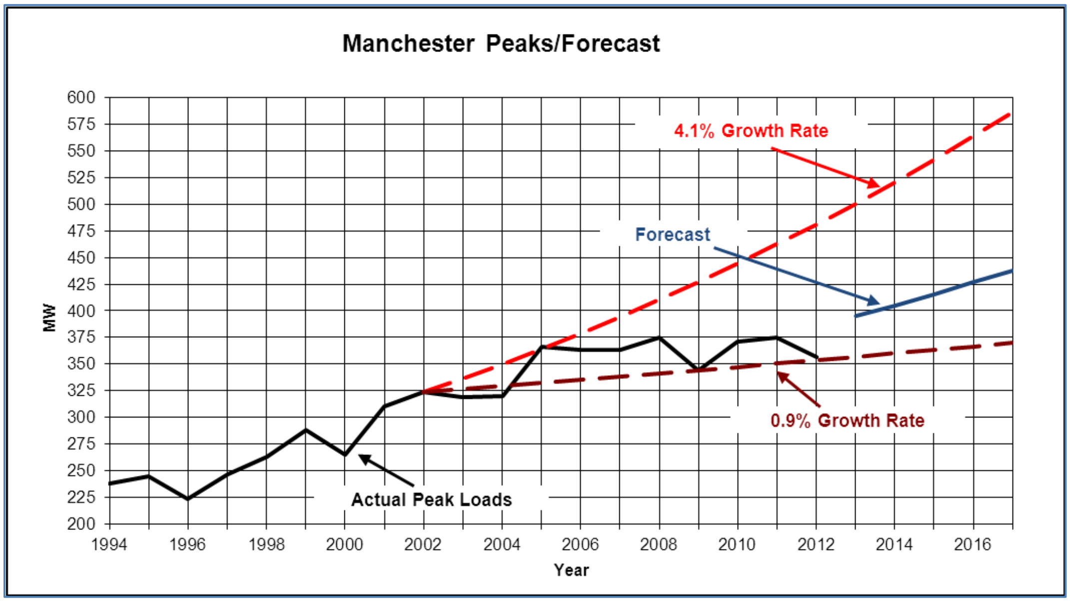
Dover/Rochester

The Dover/Rochester area experienced a new peak in 2011 (the previous peak occurred in 2006). A major industrial customer in the area is constructing a new facility and is expected to increase load in the area by 5-7 MW over the next five years. Another large customer has relocated and built a new facility in the region, which is expected to increase load by 8-10 MW over the next couple of years. These increases in load are incremental to the 2.5% growth that is expected in the area.



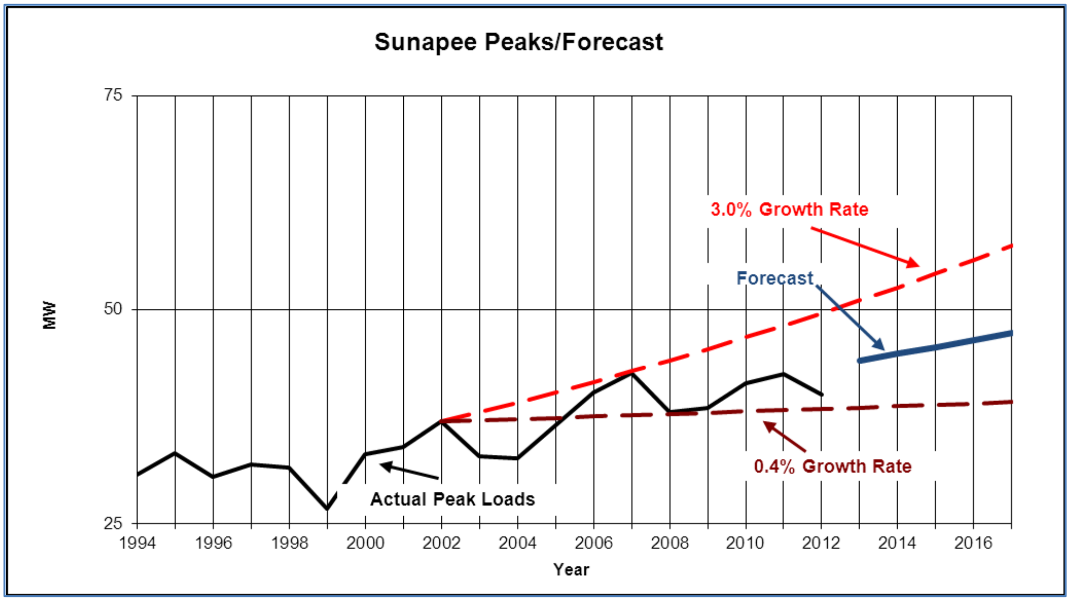
Manchester

Load has been essentially flat in the Manchester area since 2005. The improving economy is expected to result in a growth rate of 2.6% in years 2013-2017. Recent completion of the airport access road has the potential to bring additional growth to the area.



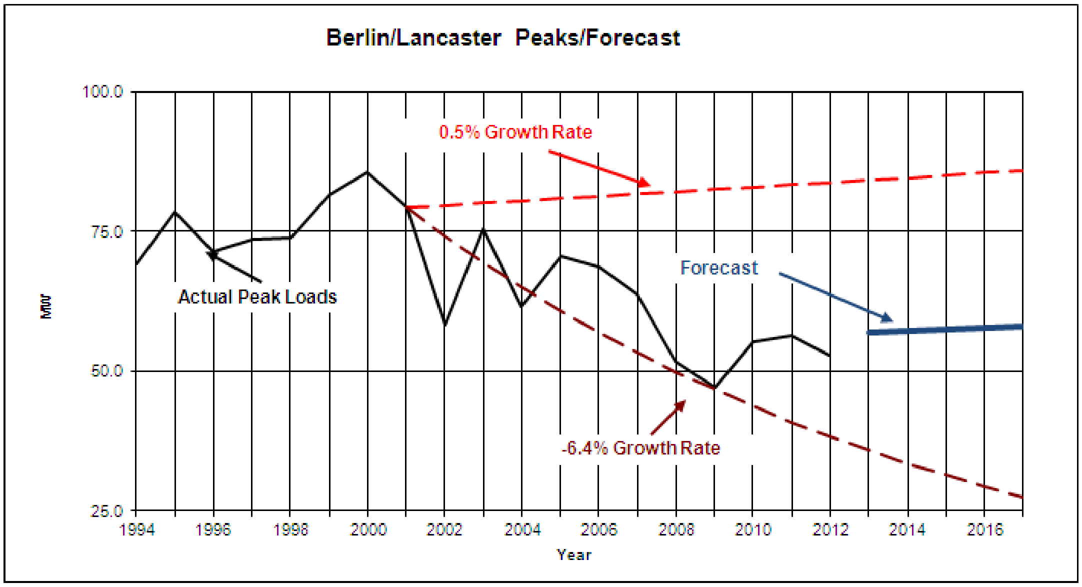
Sunapee

The Sunapee area peak load has flattened since 2006. This area is expected to experience a modest growth of 1.5% during the planning period.



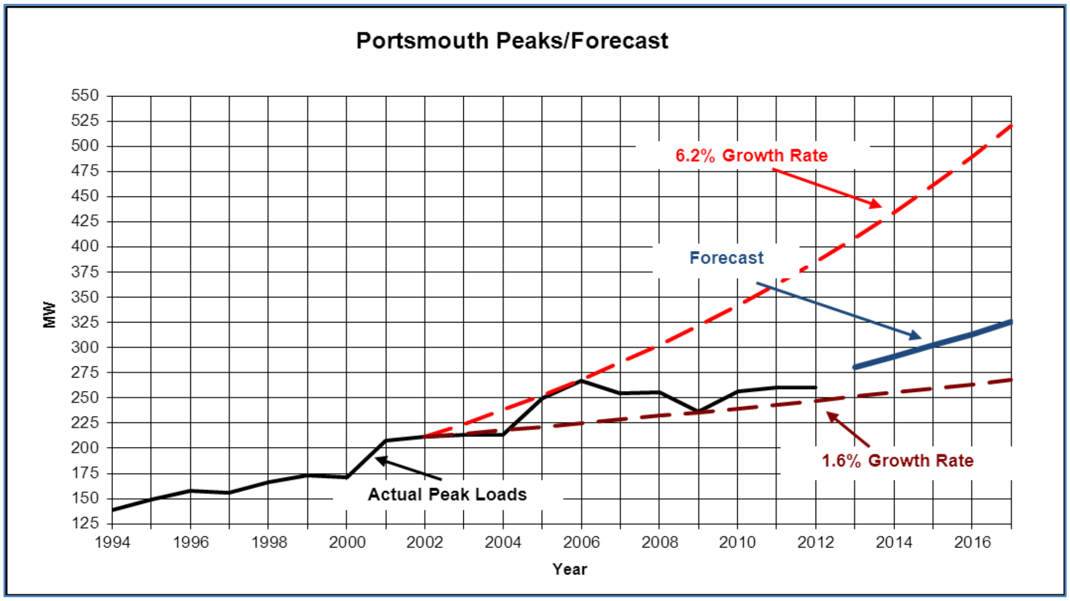
Berlin/Lancaster

Load dropped sharply in 2002, primarily caused by the closing of several paper and pulp mills. Load is expected to recover slightly due to the opening of a new federal prison in Berlin as well as the opening of a new generating plant. The forecast is 0.5% growth over the planning period.



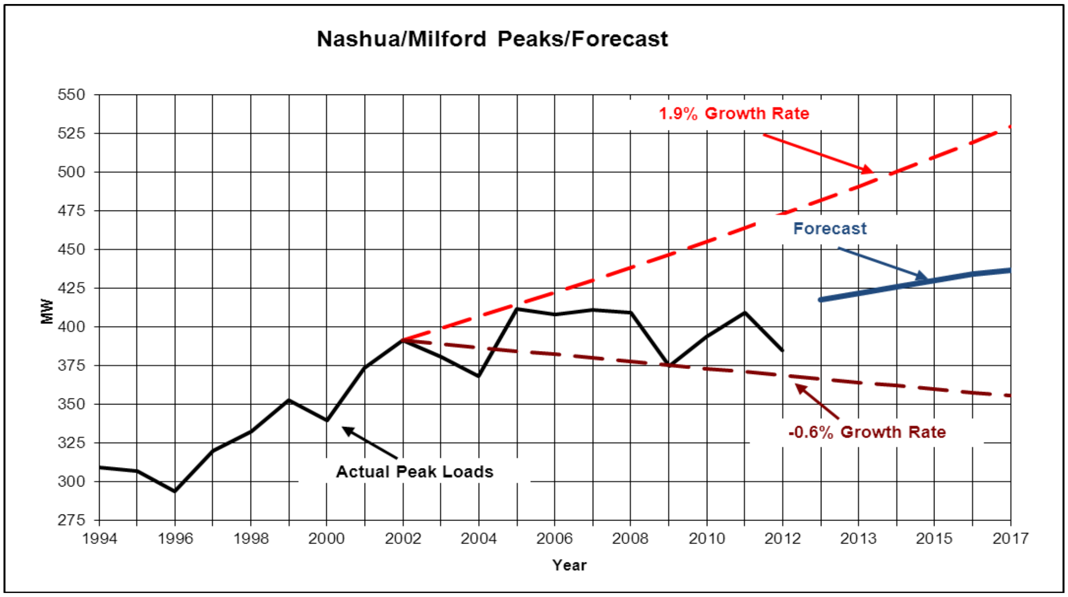
Portsmouth

Load in the Portsmouth area has recovered to 2006 levels, and it is expected to continue to grow at a rate of 3.75% over the next five years. The downtown area is being revitalized with the addition of new high end hotels. A major tenant of the Pease International Tradeport has expanded its facility and is expected to expand further. Another major manufacturer is also moving into a large facility in the Tradeport. Both expansions are expected to have a significant impact on the overall area load during the planning period.



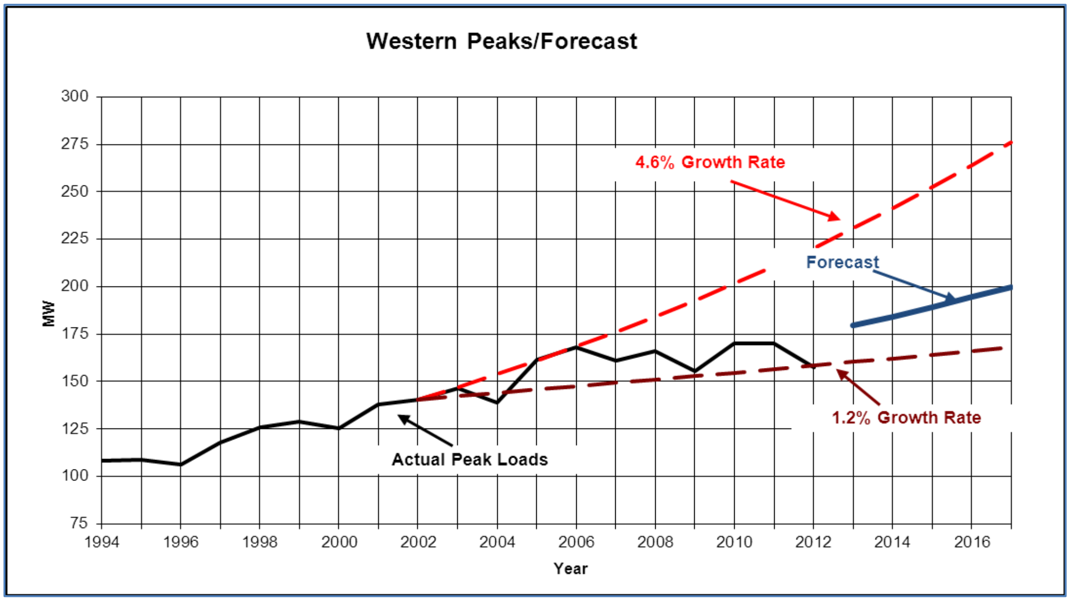
Nashua/Milford

The Nashua/Milford area load has decreased in recent years as a result of the loss of industrial customers (the area peak was set in 2005). The recent construction of the Merrimack Premium Outlets Mall and continued success of companies in the Nashua and Merrimack areas is expected to halt the decline in demand, with minimal growth expected in the coming years; 1.0% in years 2013-2017.



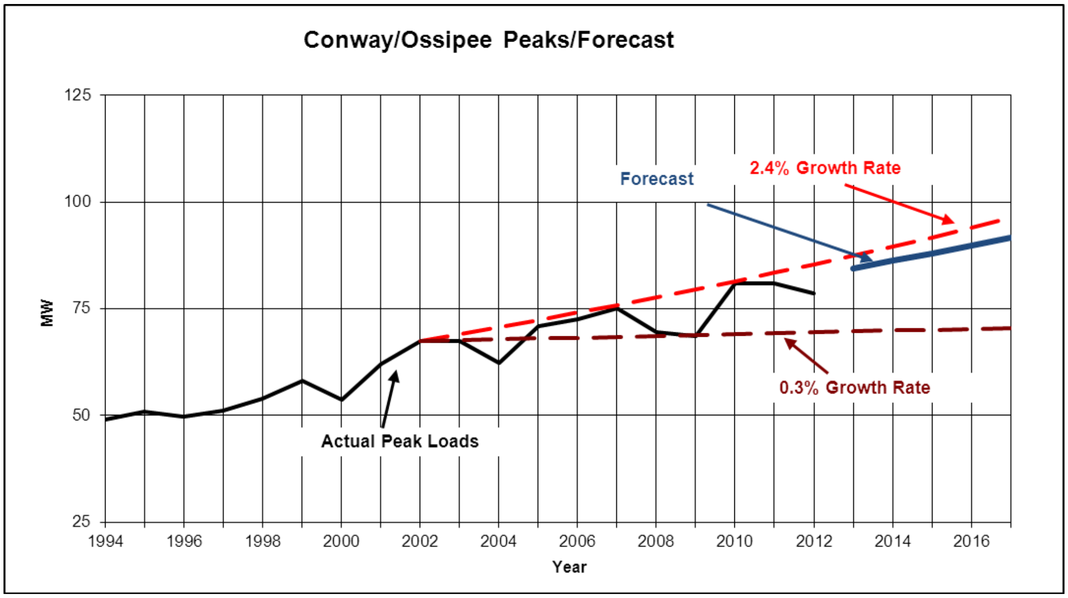
Hillsborough/Jaffrey/Keene

The Hillsborough/Jaffrey/Keene area reached a new all-time peak in 2010. This area is predominantly rural and is expected to experience 2% growth during the planning period.



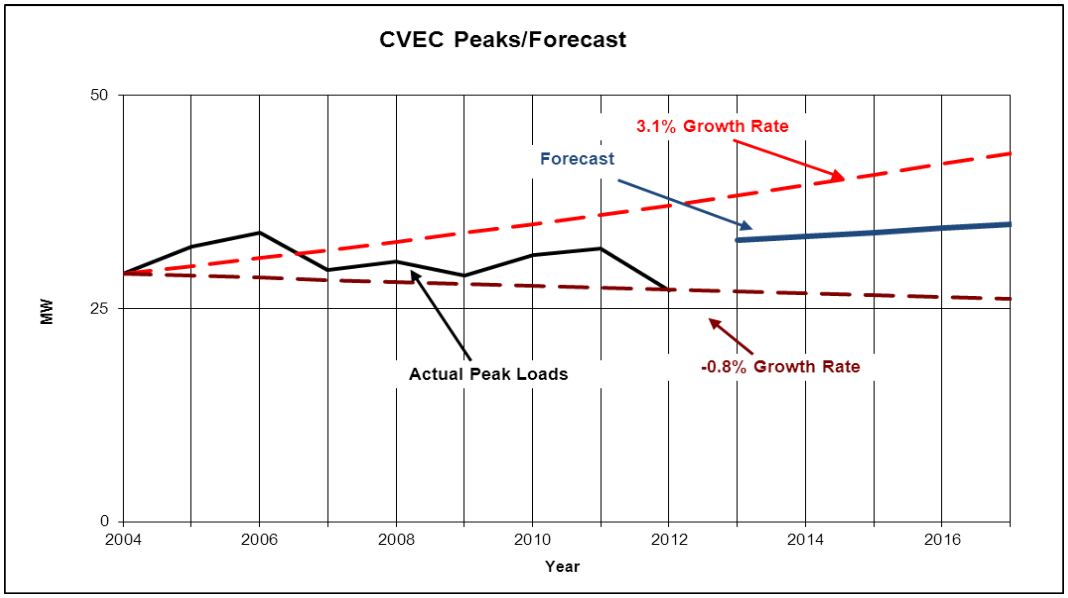
Conway/Ossipee

This area has a strong concentration of vacation homes and is a major tourist destination. The load increase seen in 2010 was a result of transferring New Hampshire Electric Coop's Melvin Village from the Lakes Region to the Ossipee area, which added 5 MW to the area load. This area is expected to experience growth of 2% during the planning period.



Former CVEC area

The former CVEC area was acquired by PSNH in 2004. The area has not recovered to the demand levels experienced in 2006. A growth rate of less than 1.5% is expected.



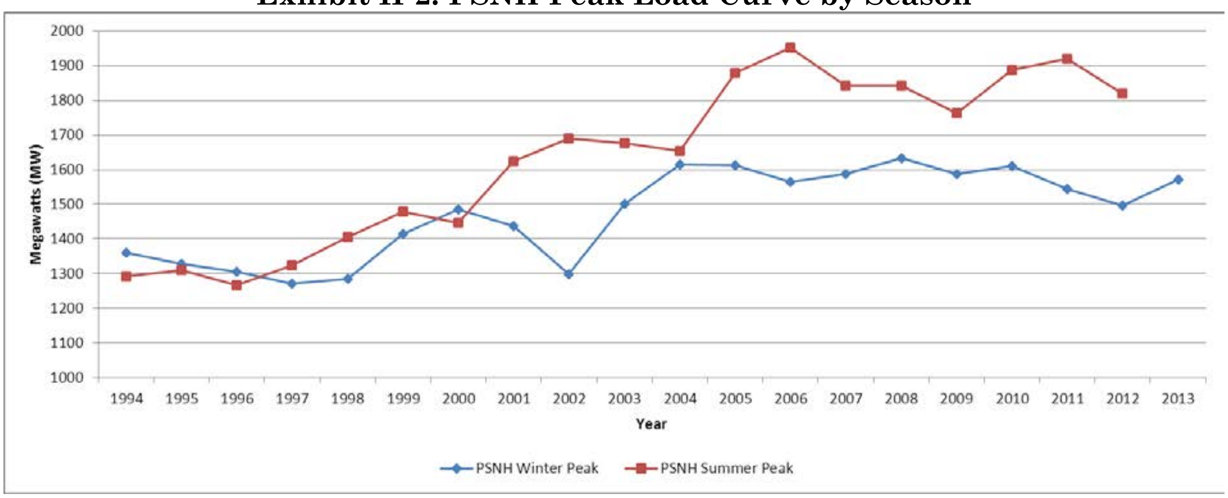
D. Joint Planning for Wholesale Delivery Service

PSNH participates in an annual review process for the integrated least cost planning of wholesale delivery facilities for the mutual benefit of New Hampshire electric distribution companies and their customers. This process is detailed in PSNH's procedure ED-3022[2] and is conducted with Unitil Energy Services (UES) and the New Hampshire Electric Cooperative. A PSNH-UES Joint Recommendations Report is generated each year. PSNH and NHEC meet periodically and perform joint planning when mutually agreed. (See section III.B, below).

E. PSNH Actual Peak Load Curves

Since 1997, with the exception of 2000, PSNH has been a summer peaking utility as depicted on Exhibit II-2. This is primarily a result of the reduction in the use of electric heat and the increase in the use of air conditioning by PSNH's customers. An increase in load related to residential air conditioning continues to be a significant factor.

Exhibit II-2: PSNH Peak Load Curve by Season



While the PSNH system peak of 2011 nearly reached the all-time peak set in 2006, a number of planning areas have set new area peaks since 2006. These include Derry, Dover/Rochester, Manchester, Sunapee, Hillsborough/Jaffrey/Keene, and Conway/Ossipee.

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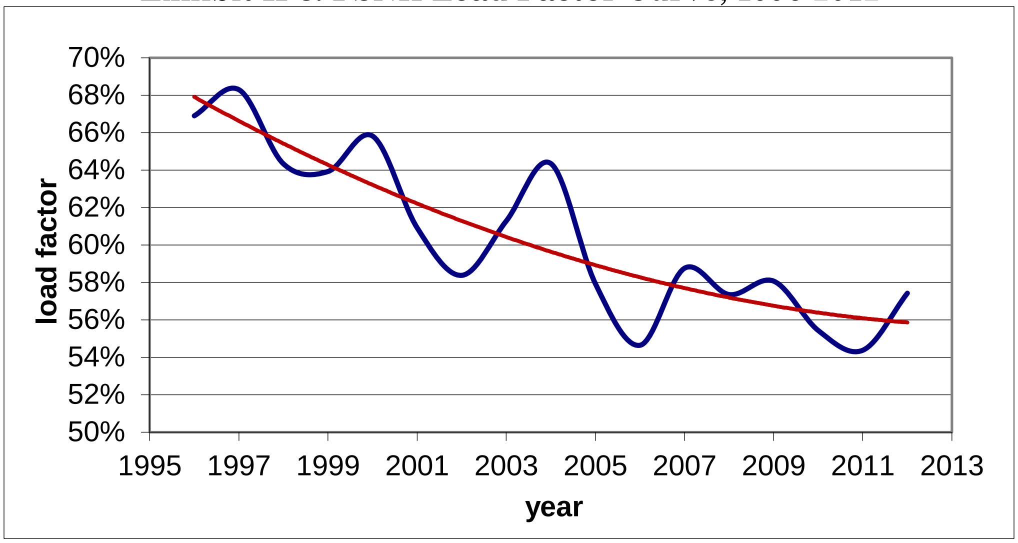
[2] ED-3022 was provided to the Commission's Staff in response to Question NSTF-02-020 in Docket No. DE 04-072.

Exhibit II-3 shows PSNH's load factor from 1996 through 2012. There has been a steady decline in load factor since 1996. The trend appears to have leveled off in recent years.

Exhibit II-3: PSNH Load Factor Curve, 1996-2012



The calculation for load factor is:

LF = kWh / (kW Peak x 8,760 Hours per Year)

The lowest values of load factor occurred in 2006 and 2011 and are attributed to low cost window air conditioning units coupled with elevated summer temperatures (cooling degree days of 21 on the peak day). This additional load created high peak demands, but relatively short operating times for the air conditioning units. Conversely, the warmest day in 2012 contained only 15 cooling degree days resulting in a relatively low peak demand and a corresponding higher load factor when compared to 2011, but still far below the load factors experienced prior to 2000. Cooler weather reduces air conditioning consumption during peak periods, which results in a lower demand during peak power consumption days. The lower load factors experienced in recent years have resulted in capital investments due to peak demand being required for fewer hours on an annual basis.

F. Conservation & Load Management Measures

Conservation and load management, as a means of deferring capital expenditures needed to address forecasted peak demand, is addressed through NU procedure TD190 – Targeted Application of C&LM Measures to Meet Peak Load Planning Needs. System Planning, Field Engineering, and Marketing Support meet in January of each year to review proposed construction projects. Projects requiring a capacity savings of 1-5 MW with an estimated need date of approximately five years are evaluated by the Marketing Support Department to determine if they are appropriate for targeted C&LM measures. Most projects proposed to address the growth of peak demand also provide reliability benefits as well as address aging infrastructure issues. C&LM measures do not provide these benefits. Implementing targeted C&LM measures utilizing System Benefits Charge funds requires explicit Commission approval and is done, initially, on a pilot program basis.

G. Distributed Generation

Distributed generation ("DG") includes the interconnection to PSNH's distribution system of: 1) PSNH-owned large scale distributed generation; 2) seasonal application of mobile generation to address peak loads; 3) customer owned generation; and 4) independently owned generation. All requests to interconnect generation follows an application process administered by the Supplemental Energy Sources department.

PSNH has no current plan to install large scale PSNH-owned DG.

PSNH piloted the use of a seasonal mobile diesel generator to defer the construction of a substation and associated distribution line construction in the summer of 2010 and 2011 in New Boston for two years. While this option may be considered in specific applications, the classification by NH DES of the use of a mobile generator in New Hampshire as a "stationary" generator requires above ground storage tank permits, as well as emissions testing, reporting, and payment of fees. Operational stability and fueling challenges also need to be considered when determining the viability as a short term solution.

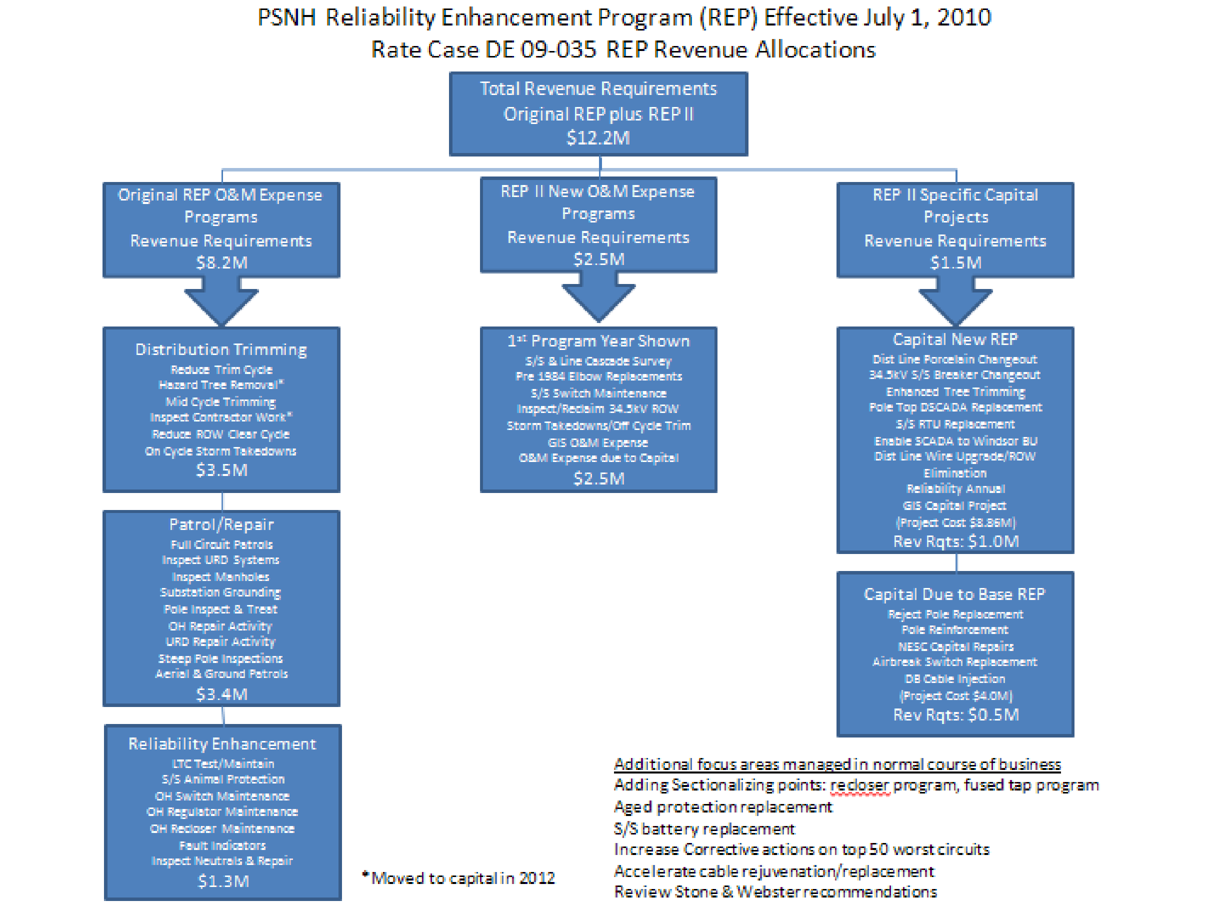
Customer-owned generation consists of small scale renewable photovoltaic ("PV") and wind, as well as a few natural gas or methane gas fueled units. There has been a modest amount of customer-owned PV and wind installations installed in PSNH's territory. The small scale and intermittent nature of these systems, however, results in a minimal impact to the planning process. As these systems go on-line, they become part of the historical trend and are assumed to continue to operate. Customer-owned DG for which the company has an obligation to provide back-up service is accounted for when performing planning studies.

Independently-owned generation interconnections to the distribution system consist of hydro, biomass, and wind generation. In recent years the majority of applications for interconnection have been proposals for wind generation. Wind generation is intermittent and therefore cannot be assumed to be available at the time of system peak in PSNH's planning studies. Hydro generation exhibits reduced output during the summer peak due to limited river flows. Biomass generation is assumed to be available for the base case model.

H. Reliability Enhancement Program

PSNH's Reliability Enhancement Program ("REP") was initially established as a 5-year effort under the settlement agreement approved by the Commission in Order No. 24,750 in Docket No. DE 06-028 and became effective July 1, 2007. The settlement established an annual funding level of $10 million which was to be allocated for targeted distribution O&M activities and distribution capital investment with the objective of short and long-term improvement in PSNH distribution system reliability and integrity. Exhibit II-4 shows PSNH's target REP allocation between O&M and capital for 2010.

Exhibit II-4: PSNH Target REP O&M and Capital Allocation for 2010



As part of the Settlement Agreement on Permanent Distribution Rates (the "Settlement Agreement") approved by the Commission in Order No. 25,123 issued in Docket No. DE 09-035, the settling parties agreed that PSNH should continue its REP expenditures from the initial REP and incorporate the revenue requirement for the O&M portion into base distribution rates. Additionally, the Settlement Agreement provided for an additional $4 million per year of revenue for the duration of the Settlement to support enhanced O&M and capital spending under the "REP II" initiative. The combined REP provides PSNH with $12.2 million in annual (program year) distribution revenue requirements to stabilize reliability through enhanced distribution capital investment and operation and maintenance (O&M) expenditures. The current O&M spending target for the combined REP is approximately $10.7 million which allows for $1.5 million of funding to support REP capital programs. The capital funding provides for a total capital expenditure of between $12.8 and $14 million of additional distribution capital investment annually. The O&M component was determined by assessing various existing maintenance and repair activities as well as new activities. The base component was also O&M-related, but focused specifically on vegetation management and National Electrical Safety Code inspections.

III. Transmission Plans

A. Regional Transmission System Planning Process

The key principle in transmission planning is to develop a regionally coordinated plan to reliably meet peak customer demands for electricity in addition to supporting the delivery of power across the region. New Hampshire transmission facilities are needed for reliability and to support the expansion of the New Hampshire economy. As noted by the Commission in Order No. 25,459, PSNH's transmission requirements are considered within the purview of the ISO-NE process. PSNH, as part of the Northeast Utilities system, actively participates in the formation of the RSP.

The regional transmission system planning process is performed in compliance with applicable planning standards of the North American Electric Reliability Corporation ("NERC") and the Northeast Power Coordinating Council Inc. ("NPCC"). The Federal Energy Regulatory Commission ("FERC") has given authority to ISO-NE to operate and perform regional system planning of the electric system in New England. This process is incorporated in the ISO-NE Open Access Transmission Tariff ("OATT" or "ISO-NE Tariff"). In 2007, ISO-NE took steps to adopt a regional transmission planning process in accordance with FERC Orders No. 890, 890-A and 890-B. This process is referred to as the "Regional System Planning Process" and is set forth in Attachment K of the ISO-NE OATT[3].

ISO-NE and New England Transmission Owners ("TOs") perform reliability assessment studies ("Needs Assessment") of the New England transmission system to identify system needs over a long-term horizon. When a system reliability problem is identified from a Needs Assessment, ISO-NE and the TO(s) develop transmission system alternatives to resolve the reliability need to ensure compliance with the national and regional reliability standards. The transmission system alternatives are evaluated to determine their environmental impacts, costs, and long-term system benefits. The alternatives and preferred solution are presented to ISO-NE and the Planning Advisory Committee ("PAC"). In parallel, market participants can develop and propose market alternatives known as Non-Transmission Alternatives ("NTAs") that would resolve the identified needs.

ISO-NE administers the Regional System Planning Process and has a number of responsibilities. For transmission, ISO-NE's primary functions are to: (1) conduct periodic Needs Assessments on a system-wide or specific-area basis, as appropriate; (2) perform solution studies to develop alternatives and define the preferred project to address the identified needs; and (3) develop an annual regional system plan using a 10-year planning horizon. Needs Assessments are designed to identify future system needs on the regional transmission system, or within a sub-area of the system, with consideration of available market solutions. Where market solutions do not exist, or where system deficiencies exist even with market solutions incorporated, ISO-NE evaluates and determines preferred regulated transmission solutions.

[3] A copy of the ISO-NE Tariff containing Attachment K can be downloaded from the ISO-NE web site at the following location: http://www.iso-ne.com/regulatory/tariff/sect_2/oatt/sect_ii.pdf

ISO-NE carries out the regional planning process through the requirements of the ISO-NE Tariff Attachment K as part of an open and transparent process involving the region's stakeholders PAC, NEPOOL Reliability Committee, and other ISO-NE advisory committees, as required. The final phase is the submittal of the PPA to ISO-NE by the project sponsor.

The transmission planning process is shown below in Exhibit III-1. As a companion to the RSP, ISO-NE has developed a transmission project listing that contains individual transmission upgrades, modifications, or the identification of new transmission facilities.[4] The project listing is periodically updated by ISO-NE to follow the progression of a project, beginning with conceptual designs under Needs Assessments, upgraded to a preferred solution following final PAC review of a Solution Study, and then finally obtaining NEPOOL review. The preferred solution changes to a planned project status during the planning process once ISO-NE approves the Proposed Plan Application ("PPA") in accordance with section I.3.9 of the ISO-NE Tariff. The planned project status changes when the project is under construction. The final status is completed when the project is placed in service and designated as such in the project listing.

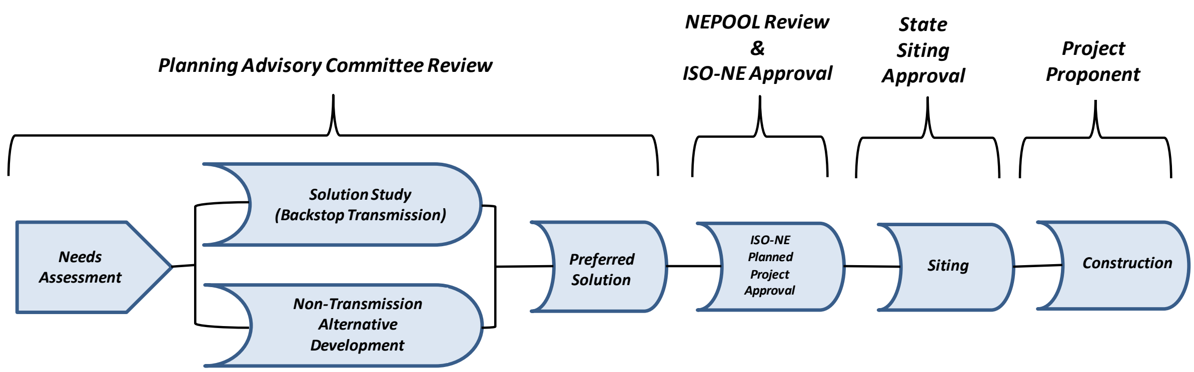


Exhibit III-1: ISO-NE Regional System Planning Process

To comply with applicable regulatory requirements, PSNH's local transmission planning process employs methodologies similar to the regional planning process. The consideration and evaluation of multiple alternatives and the final development of a recommended plan are coordinated with ISO-NE as part of the overall regional planning process and the development of the annual ISO-NE RSP. For local transmission facilities[5], NU assesses

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[4] A copy of the ISO-NE RSP project listing is available from the ISO-NE web site at the following location:
http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/projects/index.html

[5] The Local System Planning process is described in more detail in Appendix 1 to Attachment K of the ISO-NE Tariff.

and develops solutions, as required, to address the reliability needs. This information is identified in the NU Local System Plan[6] ("LSP") as reported to PAC on an annual basis.

B. New Hampshire Transmission Planning

The New Hampshire transmission plan is discussed in detail in the ISO-NE 2012 RSP (starting on page 77) and can be found at the following web site.

http://iso-ne.com/trans/rsp/index.html

The RSP notes that ISO-NE is taking action to address system issues in all six New England states and has developed studies regarding preferred solutions to serve major portions of the system, including Vermont and New Hampshire. The ISO-NE RSP recognizes that New Hampshire has the fastest-growing economy in New England.

New Hampshire is one of 13 subareas established by ISO-NE to assist in modeling and planning electricity resources in New England. Portions of New Hampshire's load are also included within ISO's ME, VT, BOSTON, and CMA/NEMA subareas.

The RSP indicates that rapid load growth has raised particular concerns in northwestern Vermont; the southern and seacoast areas of Maine and New Hampshire; various localized areas across Maine; and the tri-state "Monadnock" area of southeastern Vermont, southwestern New Hampshire, and north-central Massachusetts. The RSP specifically indicates that a number of studies of the New Hampshire portion of the system have been conducted. These studies have identified the need for additional 345/115 kV transformation capability and the need for additional 115 kV transmission support in various parts of the state.

The Commission has recognized that PSNH's transmission requirements are considered within the purview of the ISO-NE process. *See* Order No. 25,459 at 19-20. Therefore, the RSP should be consulted for a complete understanding of the New England transmission planning process.

[6] A copy of the PSNH 2012 Local System Plan can be downloaded from the NU web site at the following location: http://www.transmission-nu.com/business/pdfs/Local_Projects_List.pdf