Appendix 3-D

Potential 345 KV Expansions To Remove Current Transmission Constraint of ISO-New England's Maine-New Hampshire Interface

APPENDIX 3-D
POTENTIAL 345 KV EXPANSIONS TO REMOVE CURRENT TRANSMISSION CONSTRAINT OF ISO-NEW ENGLAND'S MAINE-NEW HAMPSHIRE INTERFACE

This paper discusses the process and potential alternatives for addressing the current transmission constraint of the Maine-New Hampshire interface ("M-NH Interface") of the New England Power Pool ("NEPOOL") transmission system that currently makes the location of a substantial additional generation project (i.e., in the range of 200 MW to 1500 MW) within the state of Maine an impracticable alternative. It will discuss (i) the process by which ISO-New England ("ISO-NE") considers NEPOOL's transmission system deficiencies and plans NEPOOL transmission system expansions, (ii) ISO-NE's current Regional Transmission Expansion Plan identifying transmission upgrades planned for the next three year period, (iii) characteristics of potential 345 KV line expansions that would eliminate the existing M-NH Interface constraint, and (iv) the practical and regulatory challenges that make it extremely unlikely that any such undertaking will be accomplished within the timelines of the proposed Cape Wind project.

I. NEPOOL's Regional Transmission Expansion Plan For The Next Three Years Does Not Include Any Construction Of The New 345 KV Lines That Would Eliminate The M-NH Interface Constraint.

A. NEPOOL's Transmission System Expansion Plan Process.

As an initial matter, the terms of the Restated NEPOOL Agreement ("RNA") provide that ISO-NE has exclusive responsibility for the planning of the upgrades and expansions to NEPOOL's transmission system. Pursuant to the RNA and the applicable rulings of the Federal Energy Regulatory Commission ("FERC,") ISO-NE has the responsibility to prepare, at least every three years, a Regional Transmission Expansion Plan ("RTEP") for NEPOOL according to the following standards:

- The RTEP must consolidate regional transmission needs into a single plan which is assessed on the basis of maintaining the NEPOOL control area's reliability while accounting for economic and environmental considerations.
- The RTEP shall be based on the results of the comprehensive transmission expansion and enhancement study conducted at least once every three years.
- The RTEP shall account for at least the ensuing five year load and capacity forecasts, proposed generation additions and retirements, proposed merchant transmission facility additions and the requirements for system restoration services.
- The RTEP shall identify for at least each of the ensuing five years a list of Upgrades. The plans will also identify any projected needs for Transfer Capability during or before the five year period for which Upgrades have not been identified.

RTEPO2 at 19 (the RTEP02 is available in it's entirety on the website of ISO-NE at www.iso-ne.com). NEPOOL's Open Access Transmission Tariff (NOATT) at Section 51 ("Regional Transmission and Expansion") similarly provides that "the NEPOOL Transmission Plan and transmission enhancement expansion studies shall be completed by the System Operator [ISO-NE]" and that such Plan shall consolidate NEPOOL's regional transmission needs into a single plan, which shall be "based on the results of a comprehensive transmission expansion and enhancement study conducted at least once every three years in accordance with Section 51.5."

B. NEPOOL's Current Regional Transmission Expansion Plan.

The current version of NEPOOL's Regional Transmission Expansion Plan ("RTEPO2") was approved by the ISO-NE Board of Directors on November 7, 2002, and by the Participants of NEPOOL at their annual meeting held in June of 2003. Although the RTEPO2 recognizes the current constraint of the Maine-New Hampshire interface, that constraint was not regarded by RTEPO2 as among the highest priority items, and three-year expansion plan does not include any new 345 KV transmission lines across the Maine-New Hampshire Interface. Rather, the RTEP02 focuses more on those transmission constraints presenting the most acute risk

of loss of electrical load, and expressly limited its study and recommendations respecting M-NH transmission system upgrades to relatively minor reinforcements that could be accomplished in the three-year time period, thus excluding any new 345 KV transmission line construction, as follows:

> The object of the ongoing study was to determine the Maine-New Hampshire (MENH) all-lines-in transfer capability of the 2002/2003 transmission system for a range of system conditions. Another requirement of the study was to determine any transmission upgrades to increase capability within a three year time period and conform with established NEPOOL transmission planning criteria. The upgrades were limited to projects such as static reactive devices, line terminal equipment, substation modifications and limited line up-rating work. New transmission line construction was excluded.

RTEPO2 at 40 (emphasis added)

The foregoing summary is consistent with the attached Memorandum prepared by ISO-NE on June 27, 2003, entitled "Maine-New Hampshire Interface Reinforcement Studies." Such paper confirms that the current RTEP limited its study of Maine-New Hampshire upgrades to relatively minor reinforcement projects (such as static reactive devices, line terminal equipment, substation modifications and limited line up-rating work), but did not include "studies of upgrades that could be implemented in the long-term," such as the construction of new 345 KV transmission lines across the interface. The ISO-NE Memo discusses the three short-term reinforcement projects that were included in the RTEP, consisting of (i) installation of static reactive devices on the Maine-New Hampshire interface, (ii) the installation of thermal upgrades in Maine and New Hampshire and (iii) study of the closure of the Y138 line from Saco Valley to White Lake, the study of which is still in process. Although these short-term fixes would provide limited relief to the interface constraints at certain hours, they fall far short of the "long-term" solution of new 345 KV lines crossing from Maine to New Hampshire that would eliminate the constraint.

The Five Year Statement ("FYS") of Transmission System Information ("Solutions 2003-2007") released by National Grid in 2003 provides a similar assessment of the shortcomings of the current M-NH Interface capability, as follows:

> The back bone of the Maine transmission network is a 345 KV overhead line route, which runs from the border with New Brunswick through Northern, Central and Southern Maine and into New Hampshire. ... The two 345 KV circuits which cross the Maine-New Hampshire interface are supported by a number of 115 KV lines. Maine has a surplus of generation and there is bottled up generation in both Bangor Hydro electric (Northern Maine) and in Southern Maine (SME). ... The capability of the Maine-New Hampshire interface also needs to be increased in order to release the bottled generation in Southern Maine. FYS at 6.18-6.19

The FYS further concludes that "an increase of 500 MW is required on the Maine-New Hampshire interface." Id. at 7.14

C. Negative Financial Implications of Exclusion From The RTEP.

It must be recognized that any potential upgrade to the NEPOOL transmission system that is not included within the RTEP is deemed to be an "Elective Transmission Upgrade," the cost of which will not be rolled-in to the NEPOOL transmission rates. Accordingly, Section 51 of the NOATT provides that any "Participant or Non-Participant that constructs and/or maintains the Elective Transmission Upgrade shall be responsible for 100% of all the cost of setup and any additions to modifications of the NEPOOL Transmission System and Non-PTF that are required to accommodate the Elective Transmission Upgrades." This requirement, which precludes the assurance of rate recovery traditionally associated with major transmission upgrades, makes it extremely unlikely that NEPOOL's transmission utilities will undertake a major non-RTEP project in the foreseeable future. In the alternative, non-utility parties could theoretically undertake the construction of such a non-RTEP project on a "merchant" basis, but they would be required to finance the entire cost of the project themselves, without the prospect of recovering revenues for such facilities through the NEPOOL transmission

rates. Any such party would have to privately finance the entire project and attempt to recover whatever revenues would be needed to support the investment through private contractual arrangements. In the current economic environment, it would be highly speculative to assume that any party would undertake such a monumental project, and the associated financial risk, on a non-RTEP merchant basis within the timelines of the Cape Wind project review.

D. Conclusion on Regional Transmission Expansion Plan.

Thus, although the existing constraints of the M-NH Interface are well recognized, NEPOOL's current Regional Transmission Expansion Plan for the upcoming three-year period does not include the construction of new 345 KV transmission line that would remove the existing constraint. Rather, the RTEPO2 has placed a higher priority on other transmission upgrades that present a greater likelihood of causing an immediate loss of electrical service to retail customers, most notably in the Southwest Connecticut zone. It would also be speculative to predict when any future version of the Regional Transmission Expansion Plan will include 345 KV transmission line expansions that would relieve the M-NH transmission constraint and, in any event, it is extremely unlikely that any such future plan could be implemented within the timelines applicable to the proposed Cape Wind project review.

II. Characteristics and Requirements Of Potential 345 KV Transmission Lines To Relieve The M-NH Interface Constraint.

A. Land-Based 345 KV Line Expansion Options.

As noted above, ISO-NE has not yet undertaken the study of new 345 KV lines that would eliminate the M-NH Interface constraint, and thus has not yet identified specific facility configurations or locations that would be most appropriate. Representatives of ISO-NE have informally indicated, however, that there have been preliminary discussions of the new 345 KV facilities that would be required. Although no publicly available study documents have yet been prepared, ISO-NE informally indicates that it has discussed a potential two-part 345 KV transmission line expansion to release bottled-up generation in Maine by upgrading both the M-NH Interface and the downstream New Hampshire-Massachusetts corridor.

Under such conceptual approach, (i) the M-NH Interface would be upgraded with a new 345 KV line of approximately 50 miles running from Buxton or South Gorham, Maine, to Deerfield or Newington, New Hampshire, at a rough approximate cost of $50-100 million, and (ii) an associated new overhead 345 KV line would be added through the downstream New Hampshire-Massachusetts corridor, at a rough approximate cost of $30-60 million. In both cases, the wide range of the cost estimates reflects uncertainty as to whether the new lines could be located within existing rights of way ("ROWs") or would require the acquisition of new ROWs. For both projects, the estimated costs equate to roughly $1 million per mile if the lines could be located in existing ROWs, and $2 million per mile if new ROWs would be required. As a general matter, these estimates are consistent with common industry cost assumptions for new 345 KV line construction. Again, these potential line extensions are in the early conceptual stage and are not included in the current RTEP for the next three years, and it would be speculative to predict whether and when such extensions will be included in any subsequent RTEP.

It is important to recognize that the construction of such 345 KV lines would be a major undertaking beyond the scope of recent New England transmission projects. While the particular facilities design has not yet been determined, typically 345 KV wood H-frame type support structures have heights in the range of 70 to 100 feet, with typical cross-arms extending approximately 54 feet across. Such lines also typically require a clear cut easement area of 150 to 180 feet in width. Typical 345 KV H-frame facilities are shown in the drawings attached hereto as Exhibit A, as extracted from The Standard Handbook for Electrical Engineers, D.Fink and H. Beaty, 13th ed., McGraw-Hill (1993). Most obviously, an expansion involving 80 miles of new overhead transmission lines and supporting towers would raise visual and aesthetic concerns, and could potentially require large-scale forest clearing, ongoing vegetation control programs, stream crossings, road crossings and wetland crossings, as well as the potential need for new service roads and facilities. Further, if it were determined that new ROWs were required, the project would also need to undertake the difficult and time-

consuming process of undertaking contested eminent domain proceedings that could involve hundreds of parcels and property owners.

B. Ocean-Based 345 KV Transmission Line Expansion Options.

In addition to the traditional land-based 345 KV line expansion options referenced above, the potential of an alternative 345 KV line expansion around the M-NH Interface through ocean waters has also been suggested. The Neptune Regional Transmission System, LLC ("Neptune") has proposed to construct and operate several thousand miles of under sea high-voltage direct current transmission systems which would connect generating capacity-rich regions in Maine, New Brunswick and Nova Scotia with capacity-constrained markets in Boston, New York, Long Island and Connecticut. Neptune estimates that the cost of this proposed transmission project, however, is in the range of $2-3 billion. Neptune originally proposed a four phase project, with Phase III thereof consisting of a 12,000 MW HVDC ocean cable from Nova Scotia to Boston. In its Background and Status Report of January 2002, Neptune explained that one of its specific objectives was to provide an alternative to land-based attempts to relieve the M-NH Interface constraint, as follows:

> The main driver for the Neptune Project is the extreme difficulty associated with moving power into New York City and Boston. There are enormous challenges to building and permitting new generation and overhead transmission in or into these load centers.
>
> ***
>
> There are significant transmission constraints on the major paths all over the system, and obstacles exist to building traditional infrastructure. Neptune is designed to overcome these constraints, and move powerful capacity rich areas in Maine and eastern Canada to major load centers.
>
> ***
>
> Currently, there is significant generation capacity located in Maine that has insufficient access to transmission capacity leading south. The amount of excess generation is increasing with over 1600 MW nearly completed. There is also significant amount of gas-fired generation planned for Maine – almost 2000 MW – that has been put on hold due to transmission constraints. Id. at 2-3 (emphasis added)

Although the Federal Energy Regulatory Commission ("FERC") approved tariff terms submitted by Neptune by Order dated July 27, 2001 (96 FERC ¶ 61,147), the Neptune projects have subsequently experienced serious setbacks and delays and their outcome (especially the Phase III projects) relevant to New England is uncertain. Although Neptune undertook an "open-season" attempt to solicit long-term customer subscriptions to finance Phase I of its project (the relatively short undersea cable from New Jersey to New York), Neptune reported to the FERC in a pleading of August 13, 2002 (available on the FERC website, http://ferris.ferc.gov, as Docket No. ER01-2099-002, document accession no. 20020814-0505), that the effort produced no customer subscriptions.

Perhaps more importantly, Neptune further reported to the FERC that general changes in the energy markets have caused considerable barriers to future open-season subscription efforts for the Neptune project, as well as for other potential merchant transmission projects, as follows:

> Both the events of September 11th and the collapse of Enron have significantly weakened a number of potential participants, particularly the independent power companies that represented a prime source of both customers and investors. Moreover, financial institutions now are significantly more cautious about investing in the deregulated energy sector, particularly with respect to merchant projects such as the Neptune project. In the changed landscape, the number of entities that have the ability to commit to the Neptune project, are either purchasing long-term TSRs or by investing capital has declined dramatically. Id. at 5

Although Neptune is now attempting a new open-season to attract potential subscribers for its proposed Phase I project consisting only of transmission lines from New Jersey to New York, the outcome of the overall project remains highly speculative, particularly with respect to any subsequent phase that could have impacts on New England. Indeed, Neptune's 2002 Status Report indicates that, even if it were able to undertake the

Phase I New Jersey-New York project, "the subsequent plan phases will be constructed to the extent supported by market demand." Although ocean-based transmission cables are a theoretical alternative, their completion and impact upon the M-NH Interface constraint within the timeline of the Cape Wind project is thus unlikely.

III. Practical Obstacles And Limitations To 345 KV Line Extensions To Eliminate The M-NH Interface Within A Foreseeable Timeframe.

Even if the 345 KV line extensions necessary to eliminate the M-NH Interface constraint were included in a subsequent RTEP of NEPOOL (or undertaken by a credible merchant transmission developer), the proposal would nonetheless still face significant regulatory, permitting, and political hurdles that would effectively preclude realization within the timelines of the current inquiry. As noted above, any such project would be of a magnitude beyond that of any New England transmission construction in recent years. The conceptual land-based option referenced above would involve approximately 50 miles of new 345 KV transmission lines from Maine to New Hampshire alone, and it is unclear whether some or all of such lines would require the establishments of new transmission rights of way ("ROWs").

Any realistic analysis of a potential land-based 345 KV line expansion project must recognize the political opposition that would likely arise. Most obviously, it would be reasonable to expect instances of local opposition to at least certain portions of such a major transmission expansion, with associated delays resulting from active intervention. Further, transmission facilities to remove an interstate constraint also present the potential for localized economic opposition. Past transmission projects have experienced repeated delays arising from the political realization that alleviating a transmission constraint will have a leveling effect upon local electric prices, with the export-constrained zone seeing price increases, and the import-constrained zone seeing price decreases. Indeed, ISO-NE expressly recognized the potential for resulting political opposition in the narrative of its RTEPO2:

> For customers within an export constrained zone where prevailing prices are anticipated to be lower than prevailing New England prices, a significant attempt to hold the surplus resources "hostage" by not allowing transmission improvements to proceed may result in market responses that are not considered in this [RTEP] analysis. RTEPO2 at 114.

It must also be noted in this regard that, unlike interstate gas pipeline facilities subject to the FERC's preemptive certification process under the Natural Gas Act, interstate electrical transmission facilities are not subject to any federal certification process that preempts state and local review, siting and permitting processes. Although there have been discussions regarding legislative proposals to give the FERC preemptive certification authority over interstate electrical transmission facilities similar to its authority over interstate pipeline facilities, no such provisions have yet been adopted.

Finally, the prospect of constructing new 345 KV transmission lines within the timelines of the current proposal would be even more remote if they could not be located entirely within existing rights of way ("ROWs"), and thereby required the taking of private land to establish the requisite transmission corridors. Under the best of situations, contested eminent domain proceedings involving potentially hundreds of property owners would likely extend beyond the timelines of the current proposal. Further, statutory grants of the power of eminent domain have traditionally been limited to transmission utilities, making the potential for a non-utility "merchant" transmission project even more remote.

IV. Conclusion.

As set forth above, the construction of new 345 KV transmission lines to eliminate the current M-NH Interface constraint would be an extremely challenging and complicated undertaking, and would be of a magnitude well beyond the scope of recent New England transmission projects. Further, ISO-NE has recently prepared and approved the Regional Transmission Expansion Plan for NEPOOL over the next three years, and no such expansion project is included in the current plan. In any event, even if such a project were undertaken in the foreseeable future, the practical time requirements (including permitting reviews, possible eminent domain proceedings, political opposition, and active intervention) would take the realistic in-service date of any such facilities well beyond the timelines associated with the review of the current Cape Wind proposal.

Exhibit A

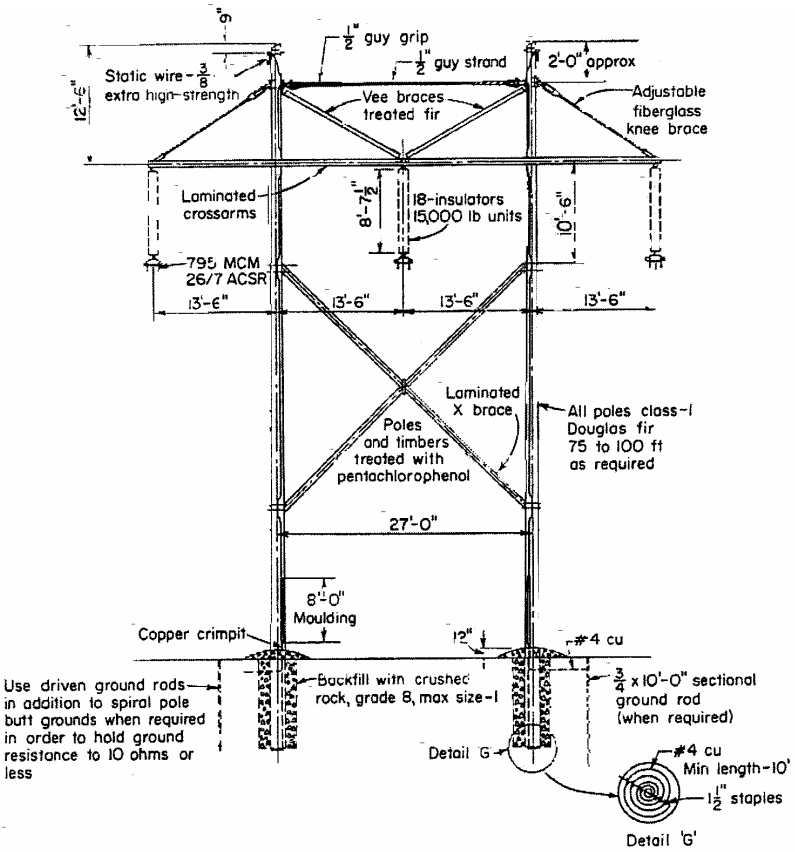

FIG. 14-44 345-kV wood H-frame structure of Kansas Gas and Electric Company.

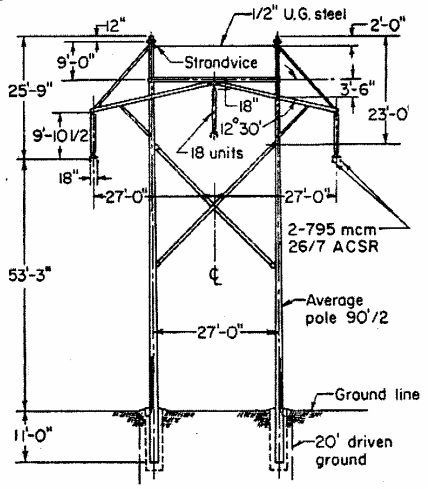

FIG. 14-45 345-kV wood K-frame structure of Northern States Power Company.

Maine-New Hampshire Interface Reinforcement Studies

The Maine-New Hampshire Interface transfers can currently be limited to between 700 MW and 1,600 MW depending on system conditions. These conditions are sensitive to load level, generation dispatch and the coincident transfer levels of other key interfaces. Studies to address potential upgrades that would increase the Maine-New Hampshire Interface have been divided into two groups. The first group consisted of studies of upgrades that could be implemented within a three-year time frame. These upgrades were limited to projects such as static reactive devices, line terminal equipment, substation modifications and limited line up-rating work. The second group consisted of studies of upgrades that could be implemented in the long term. These upgrades included dynamic reactive devices, construction of new transmission lines, etc.

The short term projects were addressed by three studies. Two of the studies have been completed and the third study is currently in progress. The long term upgrades analyses have not been initiated yet.

The Maine & New Hampshire Voltage Analysis assessed the impact of the installation of static reactive devices in Maine and New Hampshire on the Maine-New Hampshire Interface transfer capability. The report summary as presented in the 2002 New England Regional Transmission Expansion Plan is attached here in Appendix A. Of the recommendations from this study the Ocean Road and Three Rivers capacitor banks are currently under construction. Some of the other recommendations may still be implemented.

The Maine-New Hampshire Transfer Capability Study assessed the impact of the installation of thermal upgrades in Maine and New Hampshire on the Maine-New Hampshire Interface transfer capability. The report summary as presented in the 2002 New England Regional Transmission Expansion Plan is attached here in Appendix B. Of the recommendations from this study the N133 terminal upgrades have been completed. Some of the other recommendations may still be implemented.

The Feasibility Study for Closing Penh's Y138 Line – Saco Valley to White Lake Study assessed the impact of closing this normally open line to improve the reliability of the load served in that area and also the impact on the Maine-New Hampshire Interface transfer capability. The report summary as presented in the 2002 New England Regional Transmission Expansion Plan is attached here in Appendix C. This report is currently still in progress. In addition to the alternatives detailed in Appendix C the installation of a PAR is being assessed as well.

APPENDIX A

4.7 Maine & New Hampshire Voltage Analysis

The objective of this study was to analyze the 345 kV bulk power system voltage levels in Maine and New Hampshire since the addition of over 1700 MW of generation in Maine. This study was to assess the voltage response and reactive capability of the system to support heavy transfers through the Maine transmission corridors in an export condition. A primary goal of the study was to investigate whether this region had adequate voltage regulation to support transfers following major contingencies. In addition, the dependence on must-run generation under some conditions for Maine-New Hampshire 345 kV voltage control and regulation is costly and has prompted the need to assess other cost-effective system enhancements to alleviate this condition.

In the early stages of the study, results of testing indicated that Maine-New Hampshire system voltage limits could be more constraining than thermal or stability limits. Even with the addition of 450 MVARs of capacitor banks along the Maine 345 kV corridor, voltages for some normal criteria contingencies were well below established voltage criteria. These findings required a thorough operational study and development of operating guides respecting the appropriate transfer conditions, load level, and generator dispatch for real-time system operations. The guides were finalized in May, 2002, and implemented shortly thereafter.

Based on the restrictions determined in the operational study, a steady state voltage analysis was performed in accordance with established planning criteria within the "Reliability Standards for the New England Power Pool" for the peak 2002 summer load period (24140 MW). Generator resource dispatch conditions were varied to determine the most constraining dispatch condition for Maine and New Hampshire (MENH) interface transfer capability based on voltage criteria. A standard list of Maine and New Hampshire 345 kV and 115 kV transmission line, autotransformer, and stuck breaker contingencies was analyzed in the study.

The steady state and operational voltage analysis conducted for the Maine and New Hampshire 345 kV system clearly pointed to the need for additional reactive resources. The study also indicated that parts of the system were not over-compensated with static reactive capacitor banks. Therefore, the addition of static capacitors was analyzed and evaluated based on their benefit to increase Maine generation export on the MENH interface. The base limit for MENH was determined to be 950 MW in order to meet normal voltage criteria for the limiting contingencies. The

incremental benefit of alternative capacitor bank additions was determined as follows:

- Option A: Maxcys 50 MVAR Capacitor Bank

  Increase limit- 175 MW

  Estimated cost- $1.2 M
- Option B: 60 MVARs in Western Maine S/Ss

  Increase limit- 175 MW

  Estimated cost- $2.4 M
- Option C: 120 MVARs (Option B plus additional 60 MVARs) in Western Maine S/Ss

  Increase limit- 325 MW

  Estimated cost- $4.8 M
- Option D: 120 MVARs in Western Maine and Maxcys 50 MVAR Capacitor Bank (Option A plus C)

  Increase limit- 425 MW

  Estimated cost- $6.0 M

The limiting contingencies above these limits are in New Hampshire and require additional reactive support to protect for the loss of an autotransformer without critical generation dispatch. PSNH is planning to add capacitors at Ocean Road S/S (50 MVAR) and Three Rivers S/S (60 MVAR) that will contribute an additional 50 MW of transfer capability between Maine and New Hampshire.

These capacitor additions address only some of the voltage regulation and support issues on the Maine and New Hampshire transmission corridor. With the retirement of Maine Yankee and reduced operation of Wyman #4, voltage regulation on the Maine 345 kV system for light and heavy load and transfer conditions is being weakly provided only by the new merchant plants located on the 115 kV system. These plants are limited either by their interconnection point or their impact during the limiting contingencies in support of the bulk system.

A future study has been proposed to evaluate the needs and analyze the benefits for dynamic voltage control through use of a static var device such as a SVC or STATCOM located on the Maine-New Hampshire 345 kV transmission corridor. This future study is currently scheduled for completion in 2003.

APPENDIX B

4.8 Maine-New Hampshire Transfer Capability

The objective of this ongoing study was to determine the Maine-New Hampshire (MENH) all-lines-in transfer capability of the 2002/2003 transmission system for a range of system conditions. Another requirement of the study was to determine any transmission upgrades to increase capability within a three-year time period in conformance with established NEPOOL transmission planning criteria. The upgrades were limited to projects such as static reactive devices, line terminal equipment, substation modifications, and limited line up-rating work. New transmission line construction was excluded. The assessment quantified benefits provided to transfer capability and planning grade cost estimates with each upgrade scenario.

The steady state thermal analysis was performed in accordance with established planning criteria within the "Reliability Standards for the New England Power Pool" for peak and shoulder (75% of peak) summer and winter load for the study period. Generator resource dispatch conditions were varied to determine the most constraining dispatch condition for MENH interface transfer capability. An additional dispatch condition with stressed 345 kV flow across the MENH interface was created with maximum New Brunswick imports and Orrington-South interface flows and Yarmouth #4 unit fully dispatched. A standard list of Maine and New Hampshire 345 kV and 115 kV transmission line, autotransformer, and stuck breaker contingencies was analyzed in the study.

During the course of the study, there were some system modifications made that influenced the interface limits. Some of the study work completed for summer was reconstituted to determine the impact of these changes. Based on the final line rating information for the 2002 summer period, the conclusions of the study are:

- The Maine-New Hampshire all-lines-in thermal transfer capability ranges from 325 MW to 1550 MW at peak load and from 1050 MW to 1575 MW at shoulder load and is significantly influenced in actual system operation by whether the short-term emergency line ratings can be employed at the time.
- Construction has begun on PSNH's Schiller to Three Rivers 115 kV N133 line terminal equipment upgrade project, which improves MENH transfer limits when critical generation in New Hampshire is offline. This project improves limits by as

much as 900 MW and is scheduled for completion by year-end 2002.

- After the N133 Line upgrade project is completed, CMP's 115 kV line Sections 250 and 197, Three Rivers to Maguire and Three Rivers to Quaker Hill 115 kV lines, which make up the 115 kV interconnection points on the MENH interface, are the limiting elements. These lines are conductor-limited and require a reconductoring to obtain higher transfer capability. The possible need to rebuild the 250 line is being reviewed.
- Stressed 345 kV flow conditions yield higher MENH transfer capabilities with less flow across the limiting 115 kV lines on the MENH interface. The interface capabilities are 100 to 300 MW higher under these conditions.
- Buxton to Deerfield 345 kV Section 385 terminal equipment upgrades that were identified for completion prior to 2002 summer did not get completed due to operational constraints prohibiting the required outage. The work will be completed later when the line is available for an outage. Section 385 is limiting only during shoulder load with stressed 345 kV flow conditions.
- Generation resource dispatch in Maine and New Hampshire has a major influence on MENH transfer capabilities and on the limiting element/contingency pair that determines the limit.

In addition to completing the N133 and Section 385 terminal upgrades, the alternative projects being investigated to improve the limits are:

- Rebuild Section 197 and 250
- Closing White Lake to Saco Valley 115 kV Y138 line at Saco Valley (separate study already in-progress)
- Southern Maine S/S re-configuration or series reactor

Based on the original analysis and line rating information for the 2002/03 winter, the Maine-New Hampshire all-lines-in thermal transfer capability ranges from 1500 MW to 1600 MW at peak load and from 1550 MW to 1600 MW at shoulder load. The changes in Section 385 mentioned above will improve the upper limits by approximately 100 MW.

A final report has been drafted for review and is expected to be completed in the third quarter of 2002.

APPENDIX C

4.9 Feasibility Study for Closing PSNH's Y138 Line – Saco Valley to White Lake

The purpose of this ongoing study was to examine the feasibility of closing the 115 kV, Y138 Line from Saco Valley to White Lake on the Northeast Utilities-Public Service of New Hampshire (PSNH) transmission system. Currently, the Y138 Line is operated normally open with New Hampshire's Conway area load being radially served from the Maine transmission system.

Closed operation is being investigated to determine the improvement in overall system reliability for 70 MW of Maine and New Hampshire load. Operating Y138 closed would also be expected to somewhat enhance Maine-New Hampshire transfer capability and mitigate both reliability and congestion issues.

Past studies had indicated the local area power system to be incapable of supporting the line-closed mode of operation, but recent power system expansion and improvements have created a new opportunity to investigate this. In the last five years, the addition of generation in western Maine (Rumford Power Associates - 270 MW and Androscoggin Energy Center - 160 MW) and New Hampshire (AES-Londonderry - 720MW), of a new 115 kV transmission line in northwestern Maine (Kimball Road and Rumford Industrial Park) and of new 115 kV capacitors at Surowiec has created a stronger 115 kV transmission network.

The scope of this study included a thermal and voltage analysis covering the 2002 summer peak and shoulder load periods. 2001 power flow base cases with a New England peak load of 24,300 MW were used.

In order to support the Y138 line-closed operation, several projects have been identified:

- Saco Valley 115 kV breaker additions at an estimated cost of $2.0M.
- 120 MVAR of shunt reactive compensation is needed between the Maine and New Hampshire ends of the transmission system at an estimated cost of $2.4M.

- Under certain dispatch conditions, a series reactor overload. mitigation system is needed on the New Hampshire end of the Beebe to White Lake 115 kV B112 line to prevent line overloads following line contingencies at an estimated cost of $0.8M.
- Beebe S/S terminal equipment upgrades on B112 Line to change-out circuit breaker, disconnect switches, bus work and secondary equipment at an estimated cost of $1M.
- Re-rate 28 miles of 115 kV, Section 214 transmission line Kimball Road to Harrison and Lovell) in Maine at an estimated cost of $0.8M.
- Total cost of closing Y138 is estimated to be $7M.

The projected size of the series reactor is relatively large and may exceed the available space at the substations. If a reactor cannot be installed, then it may be necessary to consider reconductoring the B112 line.

With these projects, closing Y138 will have no adverse system impacts and will increase reliability and economic benefits as follows:

- 70 MW of load in Maine and New Hampshire will have a redundant, network transmission source
- Loss of load exposure for a single line contingency is reduced from 60 MW to 10 MW
- Surowiec-South voltage and stability interface flows reduced by over 100 MW which helps relieve the Maine generation export voltage operating restrictions by over 400 MW
- Maine-New Hampshire interface transfers increased 150 MW for the conditions tested

Some additional sensitivities on generation dispatch are currently being investigated, and that, coupled with the stability and short-circuit work, is anticipated to be complete by the 4th quarter of 2002.