New England States
Committee on Electricity

To: **ISO-NE**
From: **NESCOE**
Date: **May 31, 2013**
Subject: **Market Resource Alternative Analysis**

NESCOE has observed with strong interest the development of ISO-NE's Market Resource Alternative (MRA) analysis since ISO-NE indicated it would conduct such analysis in the context of its Strategic Planning Initiative and in furtherance of the need to better align planning and markets. NESCOE's is interested in the MRA analysis outputs and in how the MRA analysis will interact with the states' Non-Transmission Alternative (NTA) Framework. As discussed previously in relation to implementation of the NTA Framework, the states planned to move that work forward and to re-visit some elements of the NTA Framework when ISO-NE's MRA analysis became a consistent element of regional planning in order to avoid duplicative analysis. In the process of examining the results from ISO-NE's initial MRA analyses and considering how the analysis might be modified to be of greater practical use, NESCOE received ISO-NE's April 19, 2013 memo to the Planning Advisory Committee (PAC). In that communication, ISO-NE described its concerns with the MRA analysis and stated its intent to suspend work on MRA analysis, resuming it with an enhanced approach in 2014. NESCOE shares the concerns ISO-NE articulated about the analysis produced to date. NESCOE provides the states' perspective on the analysis done to date and hopes the views below will inform ISO-NE's future MRA work.

This memo (i) provides a brief background summarizing NESCOE's understanding of the MRA analyses performed to date, (ii) identifies questions about the analyses, and (iii) offers suggestions for possible improvements that can be incorporated in future MRA studies. We hope our views are helpful as ISO-NE considers how to move forward with the MRA analysis that will help to align planning and markets, consistent with ISO-NE's objectives as set forth in its June 2012 *Aligning Planning and Markets* whitepaper.

Brief Background of MRA Analyses and Solutions

ISO-NE has completed two MRA analyses and presented results to the PAC. Specifically, ISO-NE studied MRA solutions for the Vermont and New Hampshire study area in 2011 and then for the Greater Hartford Central Connecticut area in 2012.

Vermont/New Hampshire

ISO-NE first presented the Needs Assessment for this area to the PAC in 2008. The Needs Assessment was refined many times over several years due to changing assumptions and finally resulted in an initial Solutions Study that ISO-NE presented to PAC in April 2011. One month later, in May 2011, ISO-NE presented an alternative analysis. ISO-NE described this first analysis of this type as a "pilot study."

The NTA study divided the Vermont/New Hampshire region into subareas and analyzed what was needed to solve all identified reliability issues in those subareas individually. Supply side and demand side solutions were examined separately. Below is the final results slide showing that all violations in all scenarios could be solved by either a total of 1935 MW of supply side resources, or, separately, by a total of 1760 MW of demand side resources:

Pilot NTAs Analysis – Final Results Summary

- Results regarding potential supply-side market resource NTAs
  - Table 7 below displays the amount of optimally located, perfectly balanced and constantly available supply-side MW needed to resolve all thermal issues in eight* of the nine NH/VT study sub-areas
- Results regarding potential demand-side market resource NTAs
  - Table 8 below displays high-level estimates of the amount of effective demand-side capacity needed in four Dispatch Zones to resolve thermal issues in eight** of the nine NH/VT study sub-areas

Table 7

Sub-area	Amount in MW
Northwestern Vermont	50
Central Vermont	90
Connecticut River Corridor	170
Southern Vermont	70
Southeastern Vermont and Western New Hampshire	145
Northern Vermont and Northern New Hampshire	55
Southern New Hampshire	960
Seacoast New Hampshire	395
Total	1935

Table 8

Dispatch Zone	Approximate Amount in MW
DZ 1: Northwest Vermont	170
DZ 2: Vermont	100
DZ 3: New Hampshire	1310
DZ 4: Seacoast	180
Total	1760

*All sub-areas but Central New Hampshire (See slide #41).

**All sub-areas but Southern Vermont (See slide #9).

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Planning Advisory Committee – May 26, 2011

On November 10, 2011, ISO-NE presented a Transmission Systems Solutions Update that summarized the recommended transmission solutions for most of the study sub areas. In January 2012, ISO-NE presented the Seacoast Area preferred solution. The following table summarizes the total cost of these preferred transmission solutions:

Study Sub Area	Preferred Solution Cost
South Hero	$3.8m
Central NH	$28.2m
Southern NH	$223.0m
Northwestern VT	$221.0m
Central VT and CT River	$263.0m
Southwest VT	$5.5m
Southeast VT/Western NH	$83.6m
Northern NH/Northern VT	$22.2m
Seacoast NH	$110.7m
Total	$960.0m

At the March 2012 PAC meeting, ISO-NE presented a follow-up to the previous transmission solution update. ISO-NE's presentation indicated that several assumptions had changed since the Needs Assessment study had been finalized, including the following: 75 MW of Demand Response in VT/NH had cleared in Forward Capacity Auctions, 180 MW of Energy Efficiency (EE) projects were projected in VT/NH in the Energy Efficiency Forecast, and 75 MW (nameplate) of wind generation had received capacity obligations. As a result of these changes, $265.4 million in transmission upgrades that had been identified in November were deemed not needed within the planning period three months later, as detailed below:

Summary of Deferred Solution Elements

Region	Deferred Upgrade	Deferred Cost
Northwestern Vermont	K30 line upgrade	$113M
	K43 line upgrade	$96M
	K27 line upgrade	$12M
Connecticut River Area	K149 line upgrade	$13M
Southeastern Vermont	381-VELCO line upgrade*	$6M*
Northern Vermont	Jay Tap capacitors	$4.4M
Southern New Hampshire	O161 line upgrade	$6.7M
	Oak Hill capacitors	$2.1M
	Greggs series bus-tie breaker	$3.6M
New Hampshire Seacoast	Chester capacitors	$8.4M
Total cost of upgrades deferred:		**$265.4M**

* 381-VELCO line upgrade only deferred if Vermont Yankee remains commercial

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Planning Advisory Committee, March 15, 2012
Follow-Up Analysis to the 2011 NH/VT Needs Analysis and Solutions Study

Contains CRITICAL ENERGY INFRASTRUCTURE INFORMATION (CEII) – Do Not Release
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These avoided costs were 27% of the upgrades ISO-NE previously identified as necessary to meet the needs in the Vermont/New Hampshire area. In the case of the NW VT subarea, the entire set of recommended upgrades were avoided.

Finally, in December 2012, ISO-NE informed PAC that ISO-NE was restudying the VT/NH area because further assumptions had changed. ISO-NE presented a new Needs Assessment Scope of Work. NESCOE understands that, due to increases in EE in the region, more of the previously identified transmission upgrades may not be needed.

Greater Hartford/Central Connecticut (GHCC)

ISO-NE conducted MRA analysis for GHCC. At the November 14, 2012 PAC meeting, ISO-NE presented possible demand side market resource solutions to the needs identified previously in its Needs Assessment study. The presentation showed that, in order to solve all violations expected to occur in the region, load would have to be reduced by 100% at more than half of the load buses in the region for at least one of the dispatch scenarios studied. In the chart below, the third column labeled "%MW Reduction" states 100% in several places:

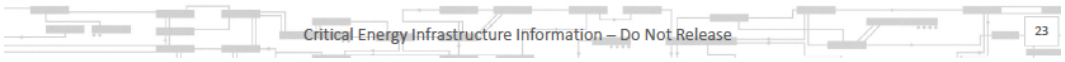
Demand-side MRA Analysis – Results, *cont.*

Load Bus Name	Net Bus Load(MW)	Total MW Reduction Required(MRA)	%MW Reduction	Frequency of Exposure to a Need for Reduction (Out of 32 Dispatches Studied)
121882 BARBOUR HILL 23.0	64.5	64.5	100%	1
121888 ROCKVILLE 13.8	62.2	16.9	27%	1
120218 P&W AIRCRAFT 115	22.8	6	26%	2
120605 N-WALLINGFRD 115	28.6	22.6	79%	3
122008 HOPEWELL 23.0	70.8	31.1	44%	1
122019 PORTLAND 23.0	52.6	27.4	52%	1
122063 DOOLEY 13.2	38.7	16.4	42%	2
122074 WEST SIDE 13.2	59	59	100%	1
122107 E-NEWBRITAIN 13.8	65.2	21.4	33%	11
122371 HADDAM 23.0	43.8	43.8	100%	1
122393 GREEN HILL 23.0	93.2	62.9	67%	2
121920 E-HARTFORD 23.0	68	60.8	89%	2
121931 RIVERSIDE PF 23.0	41.3	41.3	100%	1
121953 SW-HARTFORD 23.0	59.4	59.4	100%	1
121975 NW-HARTFORD 23.0	138.3	138.3	100%	6
121986 BLOOMFIELD 23.0	92.8	58.4	63%	1
122118 NEWINGTON 23.0	113.8	113.8	100%	23
122129 FARMINGTON 23.0	117.2	102.6	88%	3
122096 ROCKY HILL 23.0	88.5	17.4	20%	2
120307 NE-SIMSBURY 115	35.4	35.4	100%	1
122162 CANTON 23.0	96.8	96.8	100%	1
122173 FRANKLIN DR 13.2	32.2	32.2	100%	32
122195 FALLS VILLGE 13.2	8.3	8.3	100%	3
122206 NORTH CANAAN 13.2	15.9	15.9	100%	16
122228 CAMPVILLE 27.6	61	61	100%	3
122239 THOMASTON 13.2	25.6	10.9	43%	1
122250 CHIPPEN HILL 13.8	38.4	38.4	100%	2
122217 SALISBURY 13.2	10.8	10.8	100%	3

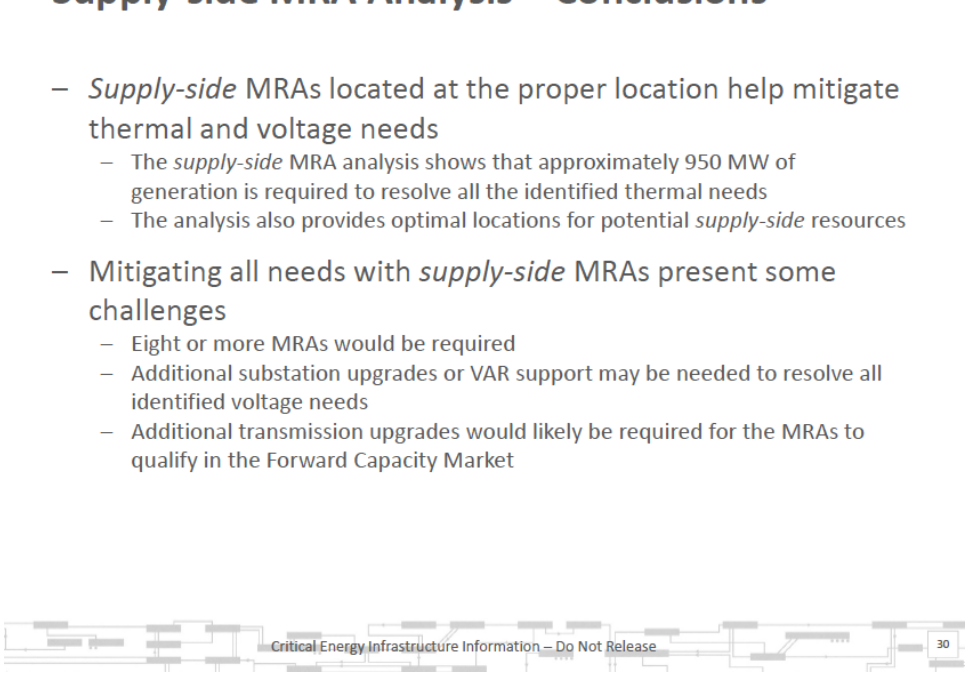
This presentation then assessed the effects of doubling the EE forecast for an additional 168 MW statewide, evenly distributed among customer classes and load buses. The analysis concluded with what ISO-NE described as infeasible solutions. Specifically, ISO-NE concluded:

Demand-side MRA Analysis – Conclusion

- To be prepared to resolve all N-1 and N-1-1 thermal issues in the study sub-areas, the analysis shows that a minimum of approximately 1,275 MW of available load reduction is required
  - Highest % load reduction are often driven by specific line-out conditions
  - Highest frequency of need are observed at East New Britain, Newington, Northwest Hartford
  - High needs in the Northwestern Connecticut sub-area, as shown on slide 17 are driven by the assumption that the 690 SPS is inactive
- For all sub-areas, the alternative approach (doubling Energy Efficiency) resulted in an infeasible solution, i.e. the amount of load reduction available to the software at each load-serving bus was not sufficient to relieve all overloads in the sub-area
- More information regarding the amount of Energy Efficiency that would be needed to resolve all needs can be determined from the Critical Load Level Analysis portion of the GHCC Transmission System Needs Assessment
  - This analysis is expected to be presented to the PAC during the 1st quarter of 2013



On December 13, 2012, ISO-NE presented supply side-focused MRA analysis. The presentation showed that solving all contingencies exclusively on the supply side would require eight new generating units totaling 936 MW. Stakeholders raised issues with the supply side methodology, particularly with the requirement that supply side MRAs must pass a Forward Capacity Market overlapping impact test (i.e., two generating resources being able to operate simultaneously). Under this requirement, a resource could not be considered as a viable alternative to transmission even if it was identical to the unit that tripped, caused the contingency, and was located at the same bus unless the transmission system could accommodate both resources operating simultaneously. In conclusion, ISO-NE stated:



Questions Raised by MRA Analyses Conducted to Date

In the context of the VT/NH study, ISO-NE removed from the transmission plan transmission upgrades that ISO-NE had earlier identified as necessary to solve needs because MRAs (active demand response, EE, and wind generation) satisfied those needs. The VT/NH experience demonstrated the importance of ISO-NE revisiting assumptions as system changes occur. It also exemplified the intended backstop nature of regulated transmission solutions. The VT/NH experience also raised a series of questions, the answers to which may be informative to the shape of future MRA analysis.

First, NESCOE appreciates ISO-NE's diligence in re-scoping the needs assessment in light of changed assumptions in that case. However, the changing need raises the question of why the alternative resources that eliminated the need for backstop transmission were not identified in the pilot NTA analysis. It would be helpful to analysis going forward if ISO-NE could identify - and correct - why the MRAs able to satisfy the identified needs were not considered in the analysis.

Second, the results of the demand-side MRA analysis in the GHCC study also raise questions. Specifically, there is a need to understand why violations cannot be solved unless there is 100% load reduction at multiple buses. It would be helpful for ISO-NE to explain to PAC how many times ISO-NE has needed to drop the entire load at multiple buses due to a contingency. Without further information, it appears possible that something may be inaccurate with the methodology, the models, or the assumptions.

Third, the results of the *supply side* GHCC analysis raise questions about whether the supply side study is reasonable and, indeed, realistic. For instance, is it appropriate for ISO-NE to require supply side MRAs to pass the overlapping impact test? If yes, then this leads to the result that transmission upgrades must be placed into service in order to connect generation, in order to avoid other transmission upgrades.

Suggestions for Process Improvements

- One suggestion for ISO-NE's MRA analysis to provide more practical value is for ISO-NE to study what could be done to eliminate some projects identified in the solutions study, instead of studying what would need to be done to solve ***all*** violations on ***all*** contingencies. A solutions study typically results in many projects, including one or two that are significantly larger than the others. Instead of trying to determine whether MRAs could replace ***all*** the transmission projects in the solution study, it would provide much higher value for ISO-NE to examine if it is feasible to replace ***any*** of the recommended upgrades.

- A second and related suggestion is for ISO-NE's MRA analysis to consider that it may not be possible or cost-effective to solve all identified needs with NTAs. Rather, it is possible that in a broad study area there will be some contingencies that are naturally solved better with, or only by, a transmission solution. Analysis that forces ***all*** violations to be solved with NTAs is likely contributing to the time consuming studies that concerns ISO-NE and to the implausible outcomes. Going forward, instead of trying to solve all violations with NTAs, ISO-NE should identify which violations should be solved by a transmission solution (small cost/high impact from transmission solution) or those needs that can only be solved by a transmission solution due to the specific technical aspects of the issue. The analysis could leave these identified portions of the transmission upgrades in place and then do MRA analysis to seek to obtain a more efficient and reasonable hybrid solution. This suggestion is consistent with ISO-NE's observations in its *Aligning Planning and Markets* Whitepaper at page 13: "*Insufficient Technical Information.* There is no mechanism to assess and provide markets with information on the locations, quantities, and other technical requirements of capacity MRAs that may substitute (*in whole or in part*) for a transmission project." (Emphasis added).

- A third suggestion is to do some MRA analysis combing supply- and demand-side solutions. The MRA analyses performed to date have examined demand-side and supply-side potential solutions in silos, without accounting for the possibility that hybrid demand/supply solutions could be the most plausible and cost-effective solution to a reliability need. In some sub areas, and for some types of contingencies, demand-side NTAs might work better; in some sub areas supply-side NTAs might work better. Coupling either or both of those with smaller scale transmission solutions is also a practical and useful approach. While it is not possible or helpful to examine all possible combinations of solutions, planning engineers should be able to select a few reasonable sets of options for illustrative

purposes. For example, this could include modeling generators in the queue that likely could be on-line in the study period, coupled with doubling energy efficiency in a given area, or combining NTA alternatives with smaller scale transmission solutions.

- Lastly, ISO-NE could consider stopping studies under certain conditions. In the case where ISO-NE planning engineers know based on experience and with a high degree of certainty that NTAs will in no case be appropriate under certain technical circumstances, ISO-NE could explain to market participants, with adequate support, why it believes there is no plausible technically feasible MRA solution before investing substantial staff time on a study. This could help preserve staff resources for analysis that is expected to be productive. ISO-NE recognized this need for resource allocation in its *Aligning Planning & Markets Whitepaper* at page 38: "First, as we convey below, identifying MRA technical requirements is apt to be a time-consuming process. This suggests the region's efforts would be best spent, at least initially, on cases where MRAs are likely to have high potential benefit relative to transmission solutions. In some cases, a 'reality check' early in the MRA analysis process may indicate that MRAs are, or are not, likely to be technically capable of helping resolve a transmission security constraint."

  NESCOE appreciates ISO-NE's efforts to produce MRA analysis that is useful to market participants and states, to whom alternative analysis is particularly helpful in the context of siting proceedings. The states continue to support ISO-NE's MRA analysis objective, as identified in its June 2012 *Aligning Planning and Markets Whitepaper*, which is "…to have information dissemination and the procurement of market resources timed in coordination with the regional transmission planning process". NESCOE hopes its perspectives are helpful in this regard.