

**Planning Advisory Committee
WebEx Teleconference
April 28, 2022**

Attendee	Organization
J. Truswell - Chair	ISO New England Inc.
M. Lyons - Secretary	ISO New England Inc.
J. Adadjo	Eversource Energy
S. Adams	ISO New England Inc.
Z. Ahmed	ISO New England Inc.
M. Ainspan	NRG
R. Albrecht	Raymond J. Albrecht LLC
S. Ali	PPL Energy Plus
M. Allen	VELCO
R. Andrew	Eversource Energy
E. Annes	Connecticut DPU
J. Ansah	Avangrid Renewables, LLC
A. Balaji	Daymark Energy Advisors
C. Benker	Eversource Energy
P. Bernard	ISO New England Inc.
M. Birchard	Acadia Center
P. Boughan	ISO New England Inc.
H. Braun	London Economics
J. Breard	ISO New England Inc.
J. Burlew	ISO New England Inc.
D. Burnham	Eversource Energy
D. Capra	NESCOE

D. Cavanaugh	Energy New England
J. Cebrik	Avangrid
L. Cecere	Vermont DPU
S. Chen	RLC Engineering
R. Collins	ISO New England Inc.
B. Cracola	Maine Public Utilities Commission
K. Csizmesia	New England Power Company
F. Dallorto	ISO New England Inc.
J. Dong	Eversource Energy
M. Drzewianowski	ISO New England Inc.
R. Ethier	ISO New England Inc.
J. Fenn	Versant Power
B. Forshaw	CMEEC
B. Fowler	Wheelabrator North Andover Inc.; Exelon Generating Company LLC; Nautilus Power; Dynegy Power Marketing, LLC; Entergy Nuclear Power Marketing LLC; Great River Hydro, LLC
G. Ghanavati	Eversource Energy
S. Glackin Coley	Avangrid
M. Gonzalez	ISO New England Inc.
L. Guilbault	HQ US
Z. Harris	FERC
L. Hua	ClearWay Energy
N. Hutchings	ISO New England Inc.

J. Iafrati	Customized Energy Solutions
G. Jesmer	ISO New England Inc.
S. Judd	ISO New England Inc.
S. Kaminski	New Hampshire Electric CoOp
S. Keane	NESCOE
A. Kniska	ISO New England Inc.
R. Kornitsky	ISO New England Inc.
M. Kotha	ISO New England Inc.
N. Krakoff	Conservation Law Foundation
A. Krich	Boreas Renewables
B. Kruse	Calpine
F. Kugell	Avangrid
R. Lafayette	Eversource Energy
S. Lamotte	ISO New England Inc.
W. Lu	ISO New England Inc.
J. Lucas	Eversource Energy
T. Lundin	LS Power
E. Mailhot	ISO New England Inc.
K. Mankouski	ISO New England Inc.
J. Martin	New England Power Company
T. Martin	New England Power Company
B. Marszalkowski	ISO New England Inc.
C. Marquis	Advanced Energy Economy
A. McBride	ISO New England Inc.
S. Mintz	RTO Insider
A. Nichols	ISO New England Inc.

S. Nikolov	ISO New England Inc.
B. Oberlin	ISO New England Inc.
L. Ortiz	Anbaric Development
H. Pathan	Eversource Energy
M. Perben	ISO New England Inc.
D. Phelan	New Hampshire Public Utilities Commission
H. Presume	VELCO
S. Rastegar	ISO New England Inc.
C. Richards	PPL Energy Plus
J. Rotger	Galt Power, Cross Sound Cable, BP Energy, Mercuria Energy and DTE Energy
C. Ruell	ISO New England Inc.
E. Runge	Day Pitney
M. Saravanan	ISO New England Inc.
K. Schlichting	ISO New England Inc.
D. Schwarting	ISO New England Inc.
M. Scott	New England Power Company
C. Sedlacek	Eversource Energy
P. Shattuck	Anbaric
B. Sheingold	New Energy Opps
P. Silva	ISO New England Inc.
A. Singh	ISO New England Inc.
J. Slocum	Massachusetts Public Utilities Commission
R. Snook	Connecticut DEEP
P. Sousa	Marble River

R. Stein	Generation Group Member, NRG Power Marketing, HQ Energy Services, PSEG Energy Resources & Trade, SunEdison
B. Swalwell	Tangent Energy
L. Szot	Strata Clean Energy
P. Tatro	En Engineering
B. Thomson	PPL
J. Vaile	Eversource Energy
R. Vega	ISO New England Inc.
Y. Venkobarao	MEPPI
P. Vijayan	ISO New England Inc.
F. Walsh	Avangrid
A. Weinstein	Dynegy Marketing and Trade
B. Wilson	ISO New England Inc.
P. Wong	ISO New England Inc.
A. Worsley	Transmission Analytics
F. Zeng	ISO New England Inc.
J. Zhang	ISO New England Inc.
C. Zhu	Eversource Energy

Item 1.0 – Chairs Remarks

Ms. Jody Truswell welcomed the committee and reviewed the day’s agenda.

The order of Agenda items 5 and 6 will be switched so that all of the CEII topics will be grouped together.

Item 2.0 – Follow-Up on Proposal to Change K Street 345 kV Breaker Status

Ms. Eva Mailhot (ISO-NE) provided an update on discussions with Eversource regarding the proposal to operate the 345 kV breaker (103S) at K Street as normally open. Eversource has

agreed to proceed with changing the breaker status to normally open. The project will be implemented shortly after approval of the PPA and is expected to be in service in September of 2022. The estimated cost is expected to be less than \$500k. For an N-1 condition, the Boston Import Transfer capability is not expected to change. For an N-1-1 condition, the constraint on the 3162 Line (Stoughton to K Street 345 kV) is no longer limiting resulting in a 300 MW increase (post-project will be 4850 MWs) to the Boston Import transfer capability. The updated SENE import transfer capability will also increase to 4850 MWs in an N-1-1 condition. These changes will be reflected in future FCM activities and System Impact Studies.

In response to stakeholder questions, ISO-NE provided the following statements:

- The in service date of the project is September 2022 and it will be included in the network topology for FCA 17.
- The driver for the breaker change is a relief in an N-1-1 condition on the Stoughton – K Street cables. Once the breaker status is changed to normally open, there will be an increase in the Boston Import transfer capability.

Item 3.0 – D-4 Line Protection System Needs Assessment

Mr. Pradip Vijayan (ISO-NE) provided an overview of the D-4 Line Protection System Needs Assessment. In November 2021, NGrid presented the needs and preferred solution for the Vernon #13 Substation Asset Replacement. As part of PPA study for the Vernon substation rebuild, an existing stability criteria violation was identified for a fault on the D-4 line. The D-4 line is a 16.6-mile transmission line between the Vernon 69 kV station in VT and the Deerfield 69 kV substation in western Massachusetts. A 3-phase fault on the D-4 line at Deerfield resulted in the tripping of all Vernon hydro units. A faster clearing time for faults on the D-4 line is required, and the addition of more Demand resources (DR) and Energy Efficiency (EE) and Solar Photovoltaic (PV) would not address the criteria violation. Moreover, the need is observed at light load levels, which are possible under current conditions. Therefore, the ISO has determined this need to be time sensitive. ISO will work with National Grid as a part of the D-4 Protection System Solutions Study. The D-4 Protection System Needs Assessment report and study files was posted on April 26, 2022 and comments are due back to ISO by May 13, 2022.

In response to stakeholder questions, ISO-NE provided the following statements:

- The project driver is the inadequacy of the protection system of the D-4 line that results in the Vernon hydro generation tripping due to stability issues.

Item 4.0 – Bridgewater #16 Substation Asset Replacement Project

Ms. Kelley Csizmesia (New England Power Company) provided an overview of the Bridgewater #16 Substation Asset Replacement Project. Due to age and deteriorating conditions, the

substation transformers, gas circuit breakers, oil circuit breakers, and relays will need to be replaced or refurbished. The project cost is estimated to be \$25.95M (+50%/-25%). In response to stakeholder questions, New England Power provided the following statements:

- There will be no need to construct a new Control House as part of this project.

An Eversource Energy representative stated that they are seeing similar issues on their system with the gas circuit breakers.

Item 5.0 - Second Cape Cod Resource Integration Study – Preliminary Results

Mr. Al McBride (ISO-NE) reviewed the second Cape Cod Resource Integration Study to review additional offshore wind interconnections in the Cape Cod area and to identify infrastructure for remaining area Interconnection Requests that did not proceed forward in the First Cape Cod Cluster System Impact Study. After the First Cape Cod cluster, there is an additional approximately 2,670 MW of offshore wind generation currently seeking to interconnect to Cape Cod and an additional 1,200 MW is seeking to interconnect near Pilgrim substation. The queue also contains Elective Transmission Upgrade (ETU) requests to connect from offshore directly to Mystic station in Boston and an ETU request to add a connection from Cape Cod to Boston. There are three potential upgrade alternatives. 1) An additional AC Circuit crossing Cape Cod canal in separate right-of-way. 2) A new submarine HVDC Circuit connection from Cape Cod to the Boston area. 3) A new submarine HVDC Circuit connecting directly from offshore wind location to the Boston area. Between the First Cape Cod Study and the Second Cape Cod Study, there would be a maximum of 4000 MWs of offshore injections into the Cape Cod area. The Second Cape Cod Resource Integration Study is expected to be finished by Q3 2022 with the identification of the preferred Cluster Enabling Transmission Upgrade.

In response to stakeholder questions, ISO-NE provided the following statements:

- There is a single project output limitation of 1200 MWs due to a single loss of source issue.
- There is expected to be little difference between the interconnection points of Bourne and Barnstable because the constraints are upstream from both locations.
- AC upgrades will be needed even with a HVDC connection into the Boston area.

There were a number of stakeholder comments and follow-up requests:

- A request was made to run a sensitivity where an additional 1200 MWs is interjected into the Boston area.
- A stakeholder commented that having independent generator leads versus a single collection point and one lead to onshore would allow greater flexibility to resolve system

contingencies. If this kind of modification is acceptable, we should look at other locations to inject the 1200 MWs.

- It was requested that ISO should look into increasing the loss of source limitation of 1200 MW to 1400 MWs or greater. ISO replied that the request would be a significant undertaking and is beyond the scope of this study.
- A request was made to have the Second Cape Cod Resource Integration Study Queue Position projects be included in future presentations.
- ISO agreed to look into a request to increase the lines to a higher rating due to the difficulty in siting and right of way.

Item 6.0 – New Generation Curtailment Analysis – Pilot Study and Preliminary Analysis

Mr. Al McBride (ISO-NE) reviewed the New Generation Curtailment Analysis Pilot Study results to analyze the potential curtailments that could be experienced by proposed new generation focused on offshore wind on Cape Cod and Brayton Point. There will be no changes to the interconnection standards at this time. The purpose of the study is to assess the impacts of the operating characteristics and availability criteria of proposed incremental resources. The capacity capability of intermittent resources is based on the median output over certain reliability hours. In summer, approximately 30-35% of the full nameplate capability for offshore wind. There may be many instances where the wind farms are producing more than 35% of their combined output. Curtailment analysis focused on new offshore wind competing with other new offshore wind and increasing levels of solar in SEMA and Cape Cod. However, if the first constraint is relieved through line upgrades, the results show that the upstream constraints will then become limiting. The analysis has to be re-run after each upgrade to examine remaining upstream constraints. It is expected that the Pilot Study will be completed by Q3 2022.

In response to stakeholder questions, ISO-NE provided the following statements:

- In response to a question a stakeholder, at this time there are no plans at this time to repeat this type of study for new renewable generation in other areas.
- The hourly profiles represent the unconstrained output of the offshore resources.

Item 7.0 – FCA 17 Transmission Transfer Capabilities and Capacity Zone Development

Mr. Alex Rost (ISO-NE) reviewed the Transmission Transfer Capabilities and Capacity Zone Development that will be used in FCA 17. There were changes from FCA 16 to FCA 17 to the Internal Interface Transfer Capabilities for the Boston and SENE. Specifically discussed was a change to the timing of an increase in transfer capability for these interfaces associated with the timing of a Greater Boston project upgrade (Wakefield – Woburn 345 kV Line), and an increase to the N-1-1 transfer capabilities of these interfaces based on the opening of the K Street breaker project. There were no External Interface Import Capability changes for FCA 17. The potential capacity zones for FCA 17 are NNE with Maine nested inside, Rest of Pool (WCMA, NY AC & Phase II), SENE (NEMA/Boston & SEMA/RI), and CT.

There were no questions from the committee on this topic.

Item 8.0 – 2022 Economic Study Process Update

Mr. Steven Judd (ISO-NE) reviewed background and criteria for proposals and submission of Economic Studies. ISO-NE did not receive any Economic Study requests for 2022 and ISO-NE is proposing not to perform any Economic Studies for 2022.

There were no questions from the committee on this topic.

Item 9.0 – Economic Planning for the Clean Energy Transition

Mr. Steven Judd (ISO-NE) reviewed the EPCET Pilot Study Scope. The study will start with three reference scenarios: Benchmark Scenario - Model previous year (2021) to test fidelity of models against historical performance, Attachment K Scenario - Model future year (i.e., 10-year planning horizon) based on our existing planning criteria (CELT forecasts [EE, PV, EV, HP], FCM new/retired resources, state contracted resources, etc.), and Policy Scenario - Model future year (i.e., year of last policy target, 2050) based on full effect of all New England state climate policies (i.e., electric sector and economy-wide de-carbonization). ISO-NE will ask for stakeholder feedback and model additional sensitivities if requested. The Study work is expected to take place over the next 18 – 24 months.

In response to stakeholder questions, ISO-NE provided the following statements:

- In response to a question regarding how the EPCET study timeline of 18-24 months would fit in with future economic studies, ISO replied that one of the current challenges with the process is starting new studies while we are still working on the previous one. The timing of Economic Studies has become more challenging due to their size and complexity. This issue will be addressed at the Transmission Committee as part of the Economic Study Process Improvements initiative expected to start at the May TC meeting.

Stakeholders provided the following comments:

- Several stakeholders expressed their support for the proposed pilot study and look forward to providing further input on assumptions and results as the pilot study progresses.
- A stakeholder commented that they do not believe that we will get actionable results from FGRS Phase I until we perform the FGRS Phase II study for revenue adequacy. ISO replied that there are plans to perform the revenue adequacy study from FGRS Phase II in the second half of this year. The only difference is it will not be performed under the

Tariff Economic Study process since that type of analysis is outside the scope of analyses for Economic Studies.

- Concern was expressed that in performing this study, how will it impact ISO resources for performing other studies that are have high NEPOOL interest from a Market Development perspective. ISO mentioned the pilot study will be performed with resources that aren't involved in Market Development initiatives but agreed to take the comment back for additional discussion.

Item 10.0 – Transmission Planning for the Clean Energy Transition (TPCET) – Follow-up and Roadmap for Future Needs Assessments

Mr. Dan Schwarting (ISO-NE) reviewed the plan to follow up on a few open items from the TPCET Pilot Study. This will include a PAC presentation in May on modeling DER, including modeling assumptions for protection for DER interconnected under the IEEE 1547-2003 standard, assumptions for replacement of IEEE 1547-2003 DER inverters with newer inverters that are more capable of riding through transmission faults, updated modeling for DER locations on a bus-by-bus basis, and adjustments to DER power factor assumptions. Other upcoming assumption changes will include generator ratings used in Needs Assessments, limits on the amount of DER allowed to trip due to design contingencies, and generator outages and interface flows in Needs Assessments. The presentation also included plans for other Needs Assessments initiated in 2022. These will include the Boston Area, where recent NERC and NPCC compliance studies have revealed a possible need due to updates in load distribution. The Vermont Area and WCMA Area will also be studied, due to high penetrations of solar in these areas that have led to a decrease in daytime net loads below 0 MW either currently or within the next 10 years. There are tentative plans for additional Needs Assessments in 2023 for CT (combining the previous SWCT, GHCC, and ECT study areas), Maine, and SEMA/RI.

Item 11.0 – NERC TPL-007-04 Benchmark and Supplemental Geomagnetic Disturbance Needs Assessment Scope of Work

Ms. Jinlin Zhang (ISO-NE) reviewed the scope of work for the NERC TPL-007-04 Benchmark and Supplemental Geomagnetic Disturbance Needs Assessment. The objective of the Needs Assessment is to determine whether the New England System meets the performance requirements for the steady state GMD event specified in Table 1 of the TPL-007-4 standard. The study area is the entire New England (NE) system, and the focus is on facilities connected to the transmission system at 200 kV and above. The study year is 2026 and focused on two load levels, a 90/10 peak load level (summer evening) utilizing the 2021 CELT Report* and an off-peak load level (nighttime minimum, low renewables) with the New England load fixed at approximately 7,477 MWs. Comments on the GMD 2026 Needs Assessment Scope of Work and Intermediate Study files will be due to ISO 15 days after the posting.

There were no questions from the committee on this topic.

Item 12.0 – Transmission Planning Process Guide Update – Order 1000 Lessons Learned

Mr. Fabio Dallorto (ISO-NE) provided an overview of the updates to the Transmission Planning Process Guide as part of the Order 1000 lessons learned. Changes to Phase One proposals include: proposals other than the backstop solution, might now be proposed jointly by multiple QTPS. An individual proposal may either be comprehensive in scope (solving all needs identified in the RFP) or solve just a subset of the identified needs. If feasible, the ISO will combine proposals that solve a subset of identified needs into a group that comprehensively addresses all identified needs. Changes to the Phase Two proposals include: the description of the financing being used. For the Failure to Proceed provisions, the failing QTPS will have 60 days from the ISO's notification to reassign a portion or all of the preferred Phase Two Solution to another Qualified Transmission Project Sponsor. Comments on these revisions are due to ISO by May 13, 2022.

There were no questions from the committee on this topic.

Item 13.0 – 2050 Transmission Study – Sensitivity Results and Solution Development Plans

Mr. Dan Schwarting and Mr. Abhinav Singh (ISO-NE) reviewed the results of the 2050 Transmission Study, as presented at the March PAC meeting. Approximately 4500 miles of 9000 total miles of PTF lines were overloaded. In addition, 90 of 150 PTF transformers were shown to be overloaded. The majority of the overloads (2705 miles) in 2050 occur during the winter peak and the summer daytime peak shows 1120 miles of overloads.

At the March PAC meeting, two sensitivities were proposed. The first looked at how a reduction in load would reduce the total of overloaded circuit miles during the winter peak. This was primarily addressed through a reduction of approximately 6000 MW of load, to a new load level of 51 GW. This load reduction was compensated for by reducing approximately 6800 MW of shortfall generation in northern New England. This sensitivity resulted in a reduction of approximately 1500 miles of overloaded transmission lines in the 2050 Winter Peak condition. The second sensitivity looked at whether a curtailment and redispatch of resources could reduce the total of overloaded circuit miles during the summer peak. This was primarily addressed through a curtailment of 1950 MWs of gas and solar resources. The results of this sensitivity showed that some overloads unique to the 2050 Summer Daytime Peak case could be eliminated, but others could not be addressed.

Solution development plans include transmission solution sets for 2035, 2040 and 2050 using the 51 GW winter load sensitivity (lower expected load growth). An additional solution set will be developed for the 57 GW winter load level (the original 2050 Winter Peak snapshot). The development of detailed cost estimates was proposed to be limited to major solution components, such as HVDC transmission, new overhead transmission on new rights of way, and new transmission with major underground components. For other solution components, such as rebuilds of existing lines, per-mile cost assumptions based on recent project costs would be used.

Development of these transmission solutions is expected to continue throughout 2022 and may extend into 2023. Feedback on the presentation is requested by May 13, 2022.

In response to stakeholder questions, ISO-NE provided the following statements:

- ISO is still in discussions with NESCOE regarding the replacement of offshore wind interconnection points in Northern New England and SEMA/RI with interconnection points in Connecticut, as suggested by a recent stakeholder comment.
- ISO is using winter transmission ratings for the Winter Peak snapshots in this study. However, FERC Order 881, on the use of ambient adjusted transmission ratings, is not being addressed as part of this study.
- ISO would be considering adding a HVDC line from Maine into a southern New England load center as a possible solution alternative.
- Dynamic performance issues could be looked at in future studies, but are beyond the scope of the 2050 Transmission Study.
- ISO is working with NESCOE in reviewing potential solutions. No firm timeline can be estimated regarding when cost estimates will be presented to NESCOE or to PAC.

Item 14.0 – 2021 Economic Study – Future Grid Reliability Study Phase I – Reliability Scenario Results

Mr. Patrick Boughan (ISO-NE) provided a review of the results of various reliability scenarios. Adding single resources is not an effective strategy for meeting reliability criteria P6 (ONSW & BESS added to S3 renewables mix) and P7 (Pathways Status Quo renewables mix scaled up) was able to achieve reliability criteria with the lowest total installed capacity of the clean mixes. P1 (resources retained for reliability and CTs) can achieve reliability with lower total installed capacity but doesn't meet state environmental goals. Dispatchable resources, with unconstrained fuel, substantially lower the amount of MWs needed to achieve reliability criteria. This ISO posted an additional P7 case with 3,000 MW of CTs added to explore how much dispatchable resources can reduce the quantity of other resources needed to meet criteria. Dispatchable emissions free resources could be a valuable part of future resource mixes. Production Cost and Ancillary Services analyses were previously run with a resource mix that did not meet LOLE. The updated resource mixes that meet LOLE criteria also produce more favorable results in these other analyses such as lower emissions (in S3_P6), less utilization of expensive fossil units, reduced reserve requirement violations, and decreased regulation needs. S3_P1 and S3_P6 have far smaller regulation needs and fewer reserve requirement violations and S3_P6 also has substantially reduced emissions. Future studies will benefit from ensuring resource mixes meet reliability criteria via PRAA before performing other types of analyses.

In response to stakeholder questions, ISO-NE provided the following statements:

- In regards to the battery cases, the battery capacity (4 hrs. vs 2 hrs.) is not a limiting factor because there is not enough energy available to charge them so duration has less of an effect.

- A stakeholder requested that ISO provide a single graph with all the cases so it's a single side-by-side snapshot of all the information. The ISO agreed to take it back and include it in the final report if it was achievable.

Item 15.0 – Notice of Initiation of the Third Maine Resource Integration Study

Mr. Al McBride (ISO-NE) provided a review of the eligible interconnection requests for the Third Maine Resource Integration Study. There are seven Queue position projects totaling approximately 1500 MWs that could be used to interconnect queued generation and ETUs in northern Maine. The base case will include all earlier Queued projects. The initial conceptual transmission upgrade would include a new 345 kV line from northern Maine to connect to the existing system. Feedback is requested to ISO-NE by May 28, 2022.

In response to stakeholder questions, ISO-NE provided the following statements:

- The ultimate objective of the study is to find a way to get these MWs down to the load pockets in the greater Boston area.

Item 16.0 – Closing Remarks

The next scheduled PAC meeting will be held virtually on Wednesday, May 18, 2022.

Meeting Adjourned at 4:40 PM

Respectively submitted,

Marc Lyons
Secretary, Planning Advisory Committee