ISO-NE Responses to Stakeholder Comments on the Eastern Connecticut (ECT) 2027 Needs Assessment Scope of Work Report

Comments from Eversource

Comment 1: Page 14: Please include the NNC interface level in Table 2-4.

Response 1: A sentence describing the flow on the Northport Norwalk Cable has been added after Table 2-4.

Comment 2: Page 19: Table 2-11: Dispatch 6B column, Newpage Bus is listed twice; Cherry Street 4, 8, & 12 should be 8, 10, & 12.

Response 2: One instance of Newpage Bus 3 has been removed from the Dispatch 6B column. The units OOS at Cherry Street have been updated to 8, 10, & 12 for Dispatch 6B.

Comment 3: Page 21: The New England East to West and West to East interface flows on page 21 don't match the peak load case summary. Please explain.

Response 3: A limitation with the Python script used to create Case Summaries was discovered when used with RAW files rather than SAV files. The Case Summaries have been updated and now match Table 2-12.

Comment 4: Page 26: Table 2-15 typo: "Wyman Hydro 2 (Weekly Hydro)" at the bottom row of the Table 2-15 should have been "Wyman Hydro 1 (Weekly Hydro)"

Response 4: The bottom row of Table 2-15 has been updated to Wyman Hydro 1.

Comment 5: Page 27: Please state the Aspen version that ISO-NE is using to perform the circuit breaker duty studies.

Response 5: ASPEN OneLiner v14.3 will be used to perform the circuit breaker duty studies as was described in Section 1.4 of the Draft 2027 ECT Needs Assessment Scope of Work.

Comment 6: Page 30: Table 3-2 on Page 29: Why are some voltages ranges rounded to two decimal places and other rounded to three decimal places?

Response 6: In Table 3-2 the only voltages that are rounded to three decimal places are the voltages associated with the nuclear units. In order to comply with the NUC-001 standards, the Nuclear Plant Interface Requirements (NPIRs) need to be met. The kV level thresholds specified in the NPIRs for the 345 kV at Millstone, 345 kV, Seabrook 345 kV and Pilgrim 345 kV are met by rounding the per unit voltage to three decimal places.

Comment 7: Page 31: Should the list of relevant BPS stations be included in the Scope of Work?

Response 7: The Final 2027 ECT Needs Assessment Intermediate files include a folder titled "List_of_BPS_Facilities". This folder contains two files:

- **ISO_BCDB_BPS_Bus_Listing_2017-11-15.csv** - A list of all BPS buses in New England for the 2027 System
- **ISO_BCDB_CTGElem-Xref_2017-11-15.csv** - Element classification table for all elements in the Basecase Database used for the 2027 SWCT Needs Assessment. This includes identification of BPS and Non-BPS facilities.

Comment 8: Please provide the TARA option file to be used for the study.

Response 8: A new Appendix C has been added that provides the TARA options that are used for the Needs Assessment.

Comment 9: Page 36:

- Why does ISO-NE select Loads, Transmission line G+jB, Shunts with +seq values, and Transformer line shunts in the "Ignore in Short Circuits" section of the Aspen Options?
- Why has ISO selected the "Iterate short circuit solutions" for MOV-Protected Series Capacitors?
- What is the basis of ISO-NE selection of typical X/R values for generators, transformers, reactors, and all others?

Response 9: The short circuit testing parameters were selected after a detailed review and testing of the parameters by Transmission Planning at the ISO. The short circuit testing parameters were presented to the Transmission Working Group and no objections were made to the selection of the parameters.

ISO-NE ignores loads in short circuit calculations because ignoring loads in short circuit calculations results in more conservative results. The inclusion of loads in short circuit calculations increases the Thevenin impedance at the bus being tested and thereby reduces the short circuit currents at the bus under test. Note that the short circuit model being used for the 2027 ECT Needs Assessment has only 3 loads, so the impacts of including loads in short-circuit calculations would be minimal.

The inclusion of shunts with positive sequence values has the following impact:

- Inclusion of reactors with positive sequence values modeled increases fault currents

- Inclusion of capacitors with positive sequence values modeled reduces fault currents

The short circuit model being used for the 2027 ECT Needs Assessment does not have models for several of the shunt devices across New England. In some instances where the models are present, positive sequence values are zero for the shunts. Therefore for the 2027 ECT Needs Assessments, shunts with positive sequence values will be ignored. As more up-to-date short circuit data is available for switched shunts, this assumption may be revisited for future Needs Assessments.

The inclusion of Transmission line G+jB with positive sequence values has the following impact:

- The G value for most lines is zero and has no impact on short circuit duties
- The B value for most lines is positive and the impact of line susceptance (B) is similar to the impact of capacitors with positive sequence values and tends to reduce the fault currents

Therefore ignoring Transmission line G+jB values provides conservative results.

The short circuit model being used for the 2027 ECT Needs Assessment does not have B values for several transmission lines. Therefore for the 2027 ECT Needs Assessments, Transmission line G+jB will be ignored. As more up-to-date short circuit data is available for line susceptance, this assumption may be revisited for future Needs Assessments.

Note that any change in assumptions regarding ignoring of shunts with positive sequence values and ignoring transmission line G+jB will need to be coordinated because at several locations shunt reactors are added to compensate for line charging. Modeling both components accurately would be necessary to reflect the impact on short circuit duty.

Finally, none of the transformers modeled at the PTF buses that are being evaluated in the Needs Assessments have transformer line shunts. Therefore for the 2027 ECT Needs Assessments, Transformer line shunts will be ignored. As more up-to-date short circuit data is available for transformer line shunts, this assumption may be revisited for future Needs Assessments.

There are two PTF series capacitors in New England which are located in Maine and the “Iterate short circuit solutions” options is selected to accurately capture fault currents in the vicinity of these series capacitors. The MOV characteristics are non-linear and an iterative solution is required to accurately capture the impact of the MOV protected series capacitors. For the 2027 ECT Needs Assessment, this option is not expected to have any impact, but in an effort to standardize options across all Needs Assessments, this option has been selected.

In the short circuit calculations typical X/R values are used to estimate resistance (R) values for facilities where the R value provided is zero. Note that a majority of the PTF transmission lines, transformers and large generators have actual values for R provided, in which case the choice of typical value of X/R ratio does not matter.

The typical X/R values for generators, transformers, reactors and all others is the IEEE Standard C37.010-1999. For generators and reactors, the standard provides typical values of 80.

For transformers, the value of 60 is based on the high end of the X/R range for power transformers at 60 Hertz.

The value of 10 that is used for all other facilities is higher than the typical X/R value for open wire lines (typical X/R of 5) and underground cables (typical X/R of 2).

Comment 10: Appendix B1: 2027_Peak_Load_Dispatches case summary 4B: Missing data in sections such as generation for sub-areas MA, RI, and CT, NE Phase Angle Regulators, Switches Shunts, Dynamic Reactive Devices, and Voltage profile.

Response 10: Appendix B1 has been updated to include the missing information for Case Summary 4B.

Comment 11: The following contingencies should be included in the Line-out contingency files:

LN_303	LN_332	LN_3361	LN_359
LN_315	LN_333	LN_341	LN_359
LN_327	LN_3348	LN_347	TF_KILLNG_2X
LN_328	LN_336	LN_3520	

Response 11: ISO-NE requested clarification on the duplicate LN_359 listed in the table above. Eversource confirmed that the second LN_359 should be LN_366.

The contingencies mentioned in Comment 11 have been added the Element Out Contingency files.

Comment 12: The following contingencies are duplicates across the N-1 contingency files:

LN_1070	BO_FTHILL_1T	BF_MONTV_22T	DC_1000_1070_NPCC_NERC
LN_1090	BF_FTHILL_1T	BF_MONTV_23T	DC_1000_1090_NPCC_NERC
	BF_MONTV_18X	BF_STCKHS_1T	DC_1070_1080_NPCC_NERC

Response 12: The methodology used by ISO-NE for performing the N-1-1 analysis screens out the duplicate element out contingencies. A bus was assigned to the wrong PSSE zone and this resolved he duplication issue for all the contingencies above has been except for BF_MONTV_18X. This contingency removes a line that is in two PSSE zones.

Comment 13: The Eastern Connecticut monitor file reads: “MONITOR TIES FROM AREA 101 TO AREA 102”. Please consider rephrasing to allow TARA to properly work and prevent TARA to skip multiple scenarios during testing. The file should read: “MONITOR ALL TIES FROM AREA 101 KVRANGE 60 999”.

Response 13: ISO-NE did not see the line “MONITOR TIES FROM AREA 101 TO 102” in the monitor file. The line “MONITOR TIES FROM AREA 101 KVRANGE 60 999” is in both files. TARA worked properly and didn’t skip any cases when ISO-NE ran the study. To be consistent with other studies the “MONITOR TIES FROM AREA 101 KVRANGE 60 999” will be left.

Comment 14: Eastern Connecticut ISO_Monitor_2027_ECT_Pre.mon and Eastern Connecticut ISO_Monitor_2027_ECT_Post.mon: The Eastern Connecticut zone #1630 is missing in the voltage section

of the monitor file. Please include the specified zone of #1630 to allow proper reporting of potential voltage violations in the Eastern Connecticut Study area.

Response 14: The issue with the 1630 zone not showing up was a naming discrepancy in the sub file. This discrepancy has been fixed in the Final 2027 ECT Needs Assessment Intermediate Study files.

Comment 15: There are several units in Connecticut that are dispatched with the reactive output in the lead. Please adjust the autotransformers local to these units in order to modify the reactive generator outputs closer to unity or slightly lagging. Leaving units in the lead could bias the post contingency pre-switching results.

Response 15: The dispatches were reviewed and adjustments were to address the reactive profile in the case. The updated dispatches are included in the Final 2027 ECT Needs Assessment Intermediate files and the updated case summaries are included in the appendices to the Final 2027 ECT Needs Assessment scope of work document.

Comments from Bruce McKinnon

Comment 1: Page 7 – Figure 1-1, This diagram nor its footnote indicate the 69kV PTF facilities which are to be included in the area analysis!

Response 1: Although the 69kV PTF facilities may be difficult to decipher on Figure 1-1, they are shown. In addition, it was stated at the September 28th PAC meeting that the 69 kV PTF system will be included as part of the analysis and the 69 kV PTF facilities are included in the study files.

Comment 2: Page 8 – Figure 1-2, This diagram nor its footnotes do not indicate the 69kV PTF facilities which are to be included in the area analysis.

Response 2: The footnote has been updated to state that the 69 kV facilities are not shown on the diagram. As stated at the September 28th PAC meeting, the 69 kV PTF system will be included as part of the analysis and the 69 kV PTF facilities are included in the study files.

Comment 3: Page 10 - Para 2.1.1, This ignoring of EE and DR works correctly only if the existence of these resources is in actuality in a similar ratio with the placement of the area's **net** load magnitudes already used as substation load inputs. This study assumption is problematical if the actual PV and DR in the smaller geographical study area's substations is either substation concentrated or higher/lower than the region-wide averages and could also result in double counting!

Response 3: The comment assumes that the load in the model is based on net loads, when the load in the model is based on gross loads. Therefore, there should not be double counting of these resources. The ISO understands the concern with using a distribution of EE and PV based on the gross load distribution, though it has been somewhat mitigated through the use of applying the EE distribution by load zone and the PV distribution by dispatch zone. In addition, PV that is greater than 1 MW is modeled at the applicable bus. As additional data and implementation tools become available, additional refinement of this methodology may occur in the future.

Comment 4: Page 11 – Para 2.1.1, How will the infrastructure projects for the installation of "dual high speed protection systems" (i.e. pilot schemes) of NGRID and Eversource and their associated relay setting upgrades be included in this analysis?

Response 4: The speed of a particular protection system cannot be reflected in a steady state assessment. Since the Needs Assessment does not include stability analysis, the infrastructure projects for the installation of "dual high speed protection systems" will have no bearing on the outcome of the Needs Assessment.

Comment 5: Page 12 - Para 2.1.3 and Table 2-2, Why is the focus on the WCMA zone, here, in this study of the ECT region?

Response 5: As explained in Section 2.1.3, it was discovered that the Photovoltaic (PV) forecast that is modeled as negative load in all the cases built from the 2017 Library Cases was understated by 20 MW. The 20 MW were located in the western Massachusetts dispatch zone and Table 2-2 shows the differences in PV modeling for the western Massachusetts load zone and the total New England PV modeled. The PV modeled as negative loads for the other load zones in New England is unchanged.

Comment 6: Page 14 - Table 2-4, I disagree with the footnote 18's inference that the Phase II capacity import capability is limited to only the amount of HQICC's that are normally calculated, there remains additional capacity available for contractual CSO eligible imports in addition to the HQICC allowance. The 950MW amount analyzed in this study may still be chosen and used, but for other reasons.

Response 6: Slide 19 of the "Creation of Needs Assessment Dispatches Revision 1"[1] presented at the September 6th, 2017 PAC meeting explains how the minimum value of 950 MW for Phase II was determined. HQICCs are compensated through the Forward Capacity Market and therefore the HQICC MW value was considered a reasonable minimum amount that can be relied upon in Needs Assessments, similar to other capacity resources.

Comment 7: Page 16 - Table 2-9, The use of the word "generator" may be inappropriate because there are two resource contingencies that are larger than this single generator in Eastern New England. Specifically the Mystic 8 & 9 contingency is a larger single contingency and the allowed capacity imports of the Phase II Interconnection of 1400MW is also larger than the Seabrook generator capacity listed here. Shouldn't these be the correct measure of major capacity contingency?

Response 7: The purpose of Table 2-9 (as well as Tables 2-7, 2-8, and 2-10) is to show the values for each generator group and the capacity of the largest individual generator in each group, not the capacity lost as the result of contingencies. ISO New England considers generator to be the correct word.

Comment 8: Page 19 – Table 2-9, Case 6B, - Newpage Bus 3 is listed twice in same case, and I thought the Eastport diesel was retired.

[1] https://www.iso-ne.com/static-assets/documents/2017/09/a6_creation_of_needs_assessment_dispatches.pdf

Response 8: This comment refers to Table 2-11. One Newpage Bus 3 has been removed. The Eastport diesel has not retired.

Comment 9: Page 22 - Table 2-13, why is only 1400MW of reserves being analyzed? The normal Morning Report listing would be of a magnitude of at least a nuclear unit times 1.25 or larger, unless you are assuming both large nuclear units being off-line at the same time in addition to your lower assumptions on Phase II imports!

Response 9: Slide 35 of the "Creation of Needs Assessment Dispatches Revision 1"[2] presented at the September 6th, 2017 PAC meeting explained that 1,200 MW of reserves would be modeled in Needs Assessments. This is consistent with Section 3.4.2 of the Transmission Planning Technical Guide where the total amount of resources that are turned online in New England following a first initiating event must not exceed 1,200 MW.

Comment 10: Page 30 - Table 3-2, There are Eversource 69kV PTF facilities within this study's scope, what are the applicable Bus-Voltage limits criterion that will be applied to them?

Response 10: The information in Table 3-2 has been updated to include 69 kV and above PTF facilities.

Comment 11: Page 32 - Look into PP-3 for special condition for analysis of Buddington manual response to a multi-voltage circuit contingency issue in this study scope.

Response 11: The manual system adjustments mentioned in regional reliability standards including Planning Procedure 3 (PP 3) allow fast-stat generation re-dispatch, phase-angle regulator adjustments or HVDC adjustments prior to the next design contingency event. These actions are to prepare for the occurrence of the next contingency and are not intended to allow for an operator to create system reliability concerns.

Comment 12: Page 32 - Para. 3.3.1, This paragraph states

> " The N-1-1 analyses will examine the summer peak load case. For these N-1-1 cases, regional reliability standards, including ISO Planning Procedure 3, allow specific manual system adjustments, such as fast-start generation re-dispatch, phase-angle regulator adjustment or HVDC adjustments prior to the next design contingency event."
>
> And it further states :
>
> • For N-1 testing and 2nd contingency in N-1-1 testing, contingencies on the following elements were evaluated
>
> o All elements 230 kV and above in Connecticut and Rhode Island
>
> o All elements 115 kV **and below** in ECT and Rhode Island
>
> o All elements 115 kV **and below** in rest of Connecticut excluding SWCT

[2] https://www.iso-ne.com/static-assets/documents/2017/09/a6_creation_of_needs_assessment_dispatches.pdf

o Three major loss of source contingencies in eastern New England (loss of Seabrook, loss of Mystic 8&9 and loss of Phase II)

• The list of initial elements out of service for N-1-1 analysis included:

o All elements at 345 kV in Connecticut

o All elements **at 115 kV** in ECT and Rhode Island"

Then why has the ISO refused to analyze, as part of this study, CMEEC's request to include a N-1-1 contingency involving the supply into Buddington Substation having a 69kV PTF manual back-up solution? A solution which has been utilized during past N-1-1 events servicing that substation and it's loads?

Response 12: As stated in Response 3 to Bruce McKinnon in the "ISO-NE Responses to Stakeholder Comments on the Eastern Connecticut (ECT) 2027 Needs Assessment Scope of Work Presentation" document[3] and Response 1 to CMEEC in the "ISO-NE Responses to Stakeholder Comments on the 2017 Transmission Planning Base case Library Review" document[4] the ISO will not be including a load throwover scheme from the 115 kV system to the 69 kV system at Buddington.

Today, there is no automatic throwover scheme at Buddington that transfers the 115 kV load to the 69 kV bus. Additionally, there are also no system modifications that are proposed which would allow such a scheme to be implemented. Therefore it would be inappropriate to include such a scheme in the model.

Comment 13: Page 33 - Section 3.3 System Testing, Why are there no 69kV PTF elements listed in the category of N-1-1 contingencies being tested?

Response 13: The language on page 33 has been updated to reflect what is in the Appendix. As shown on page 2 of Appendix A2-B, there are 69 kV PTF elements in the category of N-1-1 contingencies being tested.

Comment 14: Page 40 - Appendix A2, First Element Out List, Are there any 69kV PTF elements in the category of N-1-1 contingencies being tested?

Response 14: As shown on page 2 of Appendix A2-B, there are 69 kV PTF elements in the category of N-1-1 contingencies being tested.

Comment from CMEEC

[3] https://www.iso-ne.com/static-assets/documents/2017/11/a7_response_to_stakeholder_comments_on_the_ect_2027_sow_september_presentation.pdf

[4] https://www.iso-ne.com/static-assets/documents/2017/08/response_to_stakeholder_comments_on_the_2017_transmission_planning_base_case_library_review.pdf

Comment 1: CMEEC requests inclusion of a N-1-1 contingency for the known, previously executed Buddington Substation manual 115kV to 69kW throwover, which manual practice continues to be relied upon to back up loss of part or all of 115kV service to Buddington Substation. Failure to recognize this practice may understate ECT Needs and jeopardize regional reliability. We further note that we understand other RTOs do consider similar operating experience in conduct of their studies.

Response 1: As stated in Response 3 to Bruce McKinnon in the "ISO-NE Responses to Stakeholder Comments on the Eastern Connecticut (ECT) 2027 Needs Assessment Scope of Work Presentation" document[5] and Response 1 to CMEEC in the "ISO-NE Responses to Stakeholder Comments on the 2017 Transmission Planning Base case Library Review" document[6] the ISO will not be including a load throwover scheme from the 115 kV system to the 69 kV system at Buddington.

Today, there is no automatic throwover scheme at Buddington that transfers the 115 kV load to the 69 kV bus. Additionally, there are also no system modifications that are proposed which would allow such a scheme to be implemented. Therefore it would be inappropriate to include such a scheme in the model.

Additional Edits made to the Final 2027 Eastern Connecticut Needs Assessment Scope of Work Document

In addition to the edits made to reflect the comments from Eversource listed above, the following changes were made to the base cases:

1. West-East interface flow for Dispatch 2B in Table 2-12 was updated to match the case summary.

2. Table 3-2 was adjusted to change the minimum voltage monitored for Eversource CL&P to 69 kV and the voltage level of 69 kV was added to CMEEC.

3. Section 3.2.3 was updated to include the evaluation of fault interrupting duty and momentary duty of the PTF circuit breakers in the study area. The previous version of the Scope of Work document only referred to fault interrupting duty.

4. Eversource has recalculated the ratings for the proposed transformer replacement for the Card 11F-5X[7] and these will be included in the Needs Assessment.

5. Eversource has indicated to the ISO that they will be bringing the Montville 4J-16X replacement forward as an asset condition project at the March 2018 PAC meeting. The ratings and impedances for the proposed transformer will be included in the Needs Assessment.

[5] https://www.iso-ne.com/static-assets/documents/2017/11/a7_response_to_stakeholder_comments_on_the_ect_2027_sow_september_presentation.pdf
[6] https://www.iso-ne.com/static-assets/documents/2017/08/response_to_stakeholder_comments_on_the_2017_transmission_planning_base_case_library_review.pdf
[7] https://smd.iso-ne.com/operations-services/ceii/pac/2017/09/a2_eversource_autotransformer_replacement_plan.pdf

Additional Edits made to the Final 2027 Eastern Connecticut Needs Assessment Scope of Work Appendices

The appendices related to contingency summaries (Appendix A) in the draft scope of work document were updated to reflect the changes in PSS/E zone and RSP subarea assignments that are discussed in the following section titled "Additional Edits made to the Final 2027 Eastern Connecticut Needs Assessment Intermediate Study Files".

Additionally, all the case summaries in Appendix B were updated to reflect changes made to the base cases as discussed in Eversource Responses 3 and 15.

A new Appendix C has been created to provide TARA options that will be used for the N-1 and N-1-1 analysis.

Additional Edits made to the Final 2027 Eastern Connecticut Needs Assessment Intermediate Study Files

The Intermediate study files have been updated to include:

- Revised folder titled "BCDB_Used" to modify the PSS/E zone and RSP subarea information for the following buses in the BCDB that will be used for the ECT Needs Assessment:
    a. Bus 119949 (Fort Hill 1090 bus) – PSSE Zone modified to1630 (previously incorrectly assigned zone 1678).
    b. Buses 119038 (Killingly 345 kV), 119051 (Lake Road 345 kV), and 119514 (Killingly 115 kV) - RSP subarea were modified to 1911 (previously incorrectly assigned to RSP Subarea 1910).
- Revised peak load base cases and case summaries
- Revised "First_Element_Out" contingency files to reflect changes discussed in Eversource Response 11
- Revised N-1 contingency file and second contingency files for N-1-1 testing to reflect the zone number and RSP subarea changes discussed above
- Two Breaker Failure contingencies were updated to correctly model the elements lost
    a. BF_TRACY_2T2
    b. BF_TRACY_3T2
- Revised monitor and exclude files for N-1 and N-1-1 analysis
- Revised contingency files for N-1 and N-1-1 analysis
- Revised subsystem files for N-1 and N-1-1 analysis
- A new folder named "RAS_Files" with auxiliary files for N-1 and N-1-1 analysis
- A new folder named "Incremental_Change_Files" with the incremental change file to lock the taps on the autotransformers on SCADA control for contingency analysis. The details of this file are provided in Appendix C to the Scope of Work document
- A new folder titled "List_of_BPS_Facilities" with the details on BPS elements that was discussed in Eversource Response 7
- The two series capacitors in ME were incorrectly bypassed in the short circuit base case. The short circuit base case was modified to keep the series capacitors in-service