Appendix K - Submission of Short Circuit Data

ISO New England Transmission Equipment Rating, Characteristic, and Operational Data

Generation and Transmission Equipment Short Circuit Data

Effective Date: October 5, 2023

Review By Date: October 5, 2025

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I. DEFINED TERMS USED IN THIS OP

Bulk Electric System (BES) is defined in the North American Electric Reliability Corporation (NERC) Glossary of Terms Used in NERC Reliability Standards.

Generator is defined in ISO Operating Procedure OP-14 Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources

Interconnection Customer is defined in Section I of Schedule 22, Attachment 1 to Schedule 23, and Section I of Schedule 25 of the Open Access Transmission Tariff (OATT).

Lead Market Participant (Lead MP) is defined in Section I.2.2 of the ISO Tariff.

Near-Term Transmission Planning Horizon is defined in the NERC Glossary of Terms Used in NERC Reliability Standards.

1. **Point of Interconnection (POI) is** defined in Schedules 22, 23 and 25 of the OATT.

Regional System Plan (RSP) is defined in Section I.2.2 of the ISO Tariff and directed to Attachment K of the OATT for process.

Settlement Only Resources (SORs) – is defined in ISO Operating Procedure OP-14 Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources. (Formerly defined as Settlement Only Generators (SOGs))

Short Circuit Data Management System (SDMS) is the ISO system used to maintain Short Circuit characteristics and data for Generator equipment as further described with the short circuit data request.

Short Circuit Working Group (SCWG) is an ISO-New England Transmission Planner (TP) group that reviews short circuit case development and short circuit issues.

Transmission Owners (TOs) are entities that are registered with NERC as Transmission Owners **but** that are not registered with NERC as Transmission Planners.

Transmission Planners (TPs) are entities that are registered with NERC as Transmission Planners.

Year N Case is the monthly short circuit case reflecting the current system updates up to the beginning of the current month updated with “as-built” facilities up to the beginning of current month. These cases are typically used for protection studies and operational analyses.

Year N+5 Case is the Year 5 case that reflects the existing system and planned changes with proposed facilities and retirements through the next five years including (i) projects with Proposed Plan Applications (PPAs) approved as described in Section I.3.9 of the Tariff; and (ii) planned facilities from the RSP project list and the asset condition list that do not require PPA approval and (iii) resource retirements. Year N+5 cases are typically used for planning studies.

Any other capitalized terms used but not defined in this OP-16K shall have the meanings ascribed to them in the ISO Tariff.

II. PURPOSE

This Appendix K (OP-16K) to ISO New England Operating Procedure No. 16 - Transmission System Data (OP-16) describes how Lead MPs for applicable Generators, TOs, and TPs provide information for, and how ISO New England (ISO) maintains, two short circuit base cases for New England on a continuing basis in ASPEN OneLiner (OLR) format for:

i. the Year N Case: this case reflects the current system configuration
ii. the Year N+5 Case: this case reflects proposed facilities and retirements five through the next five years

Figure 1 shows the short circuit process flow established by NERC Reliability Standard MOD-032 Data for Power System Modeling and Analysis and this OP-16K. Refer to the ISO's "Compliance Bulletin - MOD-032 and ISO New England's Model Data Requirements and Reporting Procedures" for further details.

III. APPLICABILITY

Each Lead MP shall provide and certify to ISO short circuit characteristics for each Generator that meets the BES definition and each existing and future[1] Generator that registers pursuant to OP-14 Sections II.A.2 or II.A.3 or II.A.4, or as required by ISO to study the reliability of the power system.

Each TO that owns transmission equipment connected within the New England service territory shall provide ISO with short circuit characteristics for;

i. all transmission equipment that is designated as part of the BES and
ii. transmission equipment that is connected to a voltage of 69 kV or above.

The data submittal requirements for entities that are registered with NERC as TOs but not TPs are contained in Section V of this OP-16K.

The data submittal requirements for Transmission Planners (TP) are contained in Section VI of this OP-16K.

ISO assembles the New England short circuit case as described in Section V of this OP-16 K.

[1] For purposes of this OP-16K, future Generators are Generators that have PPA approval but are not yet commercial.

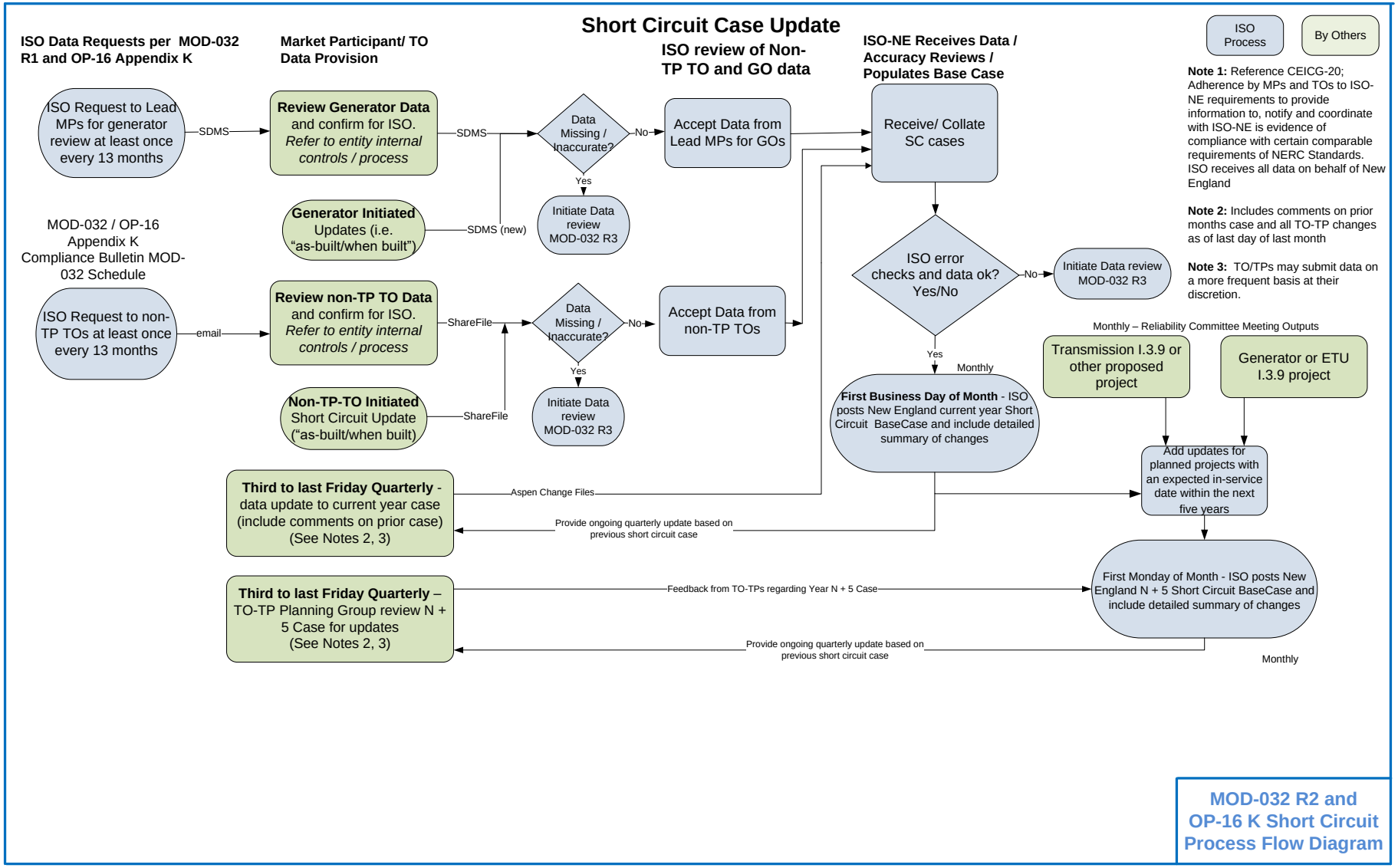

Figure 1 - New England Short Circuit Case Process Flow Diagram

IV. GENERATOR REQUIREMENTS

A. Data Requirements

Lead MPs or Interconnection Customers for future Generators shall provide short circuit modeling characteristics for Generators, Generator step-up transformation equipment and generator breaker data including dynamic reactive devices as appropriate. This data shall include the following for existing and planned Generator:

i. Short circuit data required per MOD-032-1 Attachment 1

ii. Updates to generator breaker characteristics and characteristics of any other higher voltage breakers installed between the generator breaker and the POI to the transmission system when owned by the Generator.

iii. Other updates to characteristics and impedances associated with Generator step-up transformation equipment when owned by the Generator.

iv. Dynamic reactive device characteristics when such equipment is owned by the Generator

ISO shall make data review requests using the SDMS whether the Generator is inverter based or non-inverter based (e.g. synchronous or rotor based) with an associated spreadsheet data form previously completed with Generator modeling data. Data forms for inverter based and non-inverter based Generators differ to more accurately represent the different technologies. The Lead MP for the Generator shall review, make any changes required and provide any data identified by ISO as requiring an update in the SDMS included form. The Lead MP shall recertify the data as representing the Generator and associated equipment as currently configured.

Each Lead MP shall periodically review and certify the short circuit characteristics. If the short circuit characteristics of Generator and associated equipment change, revised data shall be provided. Entities shall maintain their own records of data submittal and review for audit purposes as necessary. The short circuit data submitted by a Lead MP pursuant to this Section IV shall be consistent with the other data required by OP-16 (i.e. NX-9 data).

When updating short circuit characteristics for ISO, each Lead MP shall:

i. If based on an ISO request, notify ISO that the short circuit Generator data, breaker data for breakers owned by the Generator and Generator step-up transformation equipment has not changed. In this case, the Lead MP shall provide or review and certify a copy of the existing characteristics. The ISO request shall include instructions for data review; or

ii. If not initiated by ISO, e.g. for planned projects or replaced equipment, provide updates for the data in the spreadsheet data form, that is requested by ISO.

B. Data Submittal Method

Lead MPs shall submit the required data as described in ISO's data requests using the SDMS.

For any non-ISO initiated data submittal, including but not limited to submittals associated with PPAs or facility modifications, Lead MPs shall submit the short circuit characteristics as described in the most recent ISO request for data.

For a future or modified facility with an associated System Impact Study (SIS), the models used for the SIS shall be considered the data submittal for short circuit modeling. Lead MPs or Interconnection Customers for future Generators shall provide subsequent recertifications using SDMS.

C. Data Submittal and Certification Schedule

ISO shall initiate the short circuit data submittal and certification process at least once every 13 calendar months by issuing a data request.

If modifications are made to short circuit characteristics for planned Generators, Lead MPs or the Interconnection Customer shall provide updates to short circuit characteristics as they become available.

Note that submittals of changes to short circuit characteristics via OP-16K do not supersede the material modification process conducted pursuant to Section I.3.9 of the ISO Tariff and ISO New England Planning Procedure PP5-1 Procedure for Review of Market Participant's or Transmission Owner's Proposed Plans (Section I.3.9 Applications: Requirements, Procedures, and Forms).

NOTE: If a Lead MP becomes aware that short circuit characteristics provided to ISO may be inaccurate, then the Lead MP shall notify ISO as soon as possible that the short circuit characteristics provided are subject to change. This will provide ISO operations and planning staff an opportunity to consider the impact of any inaccurate data until the Lead MP can provide accurate short circuit characteristics to ISO. The Lead MP shall provide updated data as soon as possible.

D. Short Circuit Data Certification

Through the submittal of the annual short circuit data or "as-built" updates, the Lead MP certifies that the short circuit model provided to ISO accurately represents the equipment as installed at the time of certification. Additionally, for planned Generators, the Lead MP certifies the accuracy of the planned facility characteristics.

V. TRANSMISSION OWNERS THAT ARE NOT TRANSMISSION PLANNERS

A. Data Requirement

Each entity that is registered with NERC as a TO but not as a TP shall submit short circuit data for equipment it owns as requested by ISO for:

i. existing and future equipment designated as part of the BES; and

ii. existing and future facilities that are connected to 69 kV and above.

The short circuit data shall include but not be limited to:

i. Short circuit data required per MOD-032-1 Attachment 1
ii. Updates to 69 kV and higher breaker characteristics.
iii. Updates to equipment associated with Generator step-up transformation equipment when owned by the TO.
iv. Interconnecting equipment impedance for Generators for equipment owned by the TO or modeled at buses owned by the TO which are not covered in Section IV of this OP-16K.
v. Necessary supporting data for Generator and step-up transformation equipment characteristics for equipment owned by the TO.

TOs shall confirm or provide updated short circuit data based on the spreadsheet data form provided by ISO with the data request.

The short circuit data submitted by a TO shall be consistent with the other data required by OP-16 (i.e. NX-9 data).

If a TO owns dynamic devices (excluding Generators) capable of supplying or absorbing reactive power, then the TO shall provide the short circuit characteristics for those devices using the spreadsheet data form provided by ISO with the data request.

Data for equipment connected to voltages below 69 kV may be required when ISO determines that such data is necessary for the reliable planning and operation of the New England Transmission System. Such data shall be provided to ISO based on the spreadsheet data form provided by ISO with any ISO request.

When updating short circuit characteristics for ISO, each TO shall either:

i. Notify ISO that the short circuit information owned by the TO has not changed. In this case, the TO shall provide or review and certify a copy of the existing characteristics as described in the request; or
ii. In the case of planned projects, provide updates for the data that is requested by ISO.

B. Data Submittal Method

TOs shall submit data as described in the ISO's data requests.

For a future or modified facility with an associated approved System Impact Study (SIS) or approved Proposed Plan Application, the associated models used shall be considered the data submittal. TOs shall make subsequent recertifications as described by ISO.

C. Data Submittal and Certification Schedule

ISO shall initiate the short circuit data submittal and certification process for the existing system at least once every 13 calendar months by issuing a data request.

If modifications are made to short circuit characteristics of a TO's planned transmission projects, the TO shall provide updates to the short circuit characteristics as they become available.

Note that submittals of changes to transmission short circuit characteristics via OP-16K do not supersede the material modification process conducted pursuant to Section I.3.9 of the ISO Tariff and ISO New England Planning Procedure PP5-1.

NOTE: If a TO becomes aware that short circuit characteristics provided to ISO may be inaccurate, then the TO shall notify ISO as soon as possible that the short circuit-characteristics provided are subject to change. This will provide ISO operations and planning staff an opportunity to consider the impact of any inaccurate data until the TO can provide accurate short circuit characteristics to ISO. The TO shall provide updated data as soon as possible.

D. Short Circuit Data Certification

Through the submittal of the annual short circuit data, the TO certifies that the short circuit model provided to ISO accurately represents the equipment as installed at the time of certification. Additionally, when submitting updates for a planned transmission project, the TO certifies the accuracy of the planned transmission project's characteristics.

VI. TRANSMISSION OWNER-TRANSMISSION PLANNERS

A. Data Requirement

Year (N) Case Reviews

Each entity that is registered with NERC as a TP for the New England region shall provide to ISO a short circuit model for all existing transmission equipment connected to 69 kV and above that is owned by the TP and SORs within the TP service area. The short circuit data shall include but not be limited to:

i. Short circuit data required per MOD-032-1 Attachment 1
ii. Updates to 69 kV and higher breaker characteristics.
iii. Updates to equipment associated with Generator step-up transformation equipment when owned by the TP.
iv. Generator interconnecting equipment owned by the TP that is not covered in Section IV of OP-16K.
v. Updates to dynamic devices dedicated to supplying or absorbing reactive power that are owned by the TP.
vi. Effective March 1, 2023, the TP shall provide aggregate models for each distribution substation with SORs comprising generation that totals over 1 MW. In the Year N case, the aggregate models shall include existing SORs. The aggregate inverter models can be interconnected to a radial distribution bus, where the distribution bus is connected to the associated transmission bus with a delta (system side) - wye (inverter side) distribution transformer (e.g. 115/13.kV). If no existing transformer is available, the aggregate model shall include an interconnecting transformer with parameters provided by the Short Circuit Working Group. ISO shall provide a list of SORs and TOs shall review and ensure that double counting of SOR assets does not occur in the ASPEN case with other models.

NOTE: When a distribution substation is supplied from more than one transmission substation, the SOR aggregate model will be connected to the distribution substation in a manner that reflects the splitting of short circuit current from the distribution system to the transmission system while minimizing the extent of the distribution system that needs to be represented in the model. This modeling approach is meant to capture splitting of short circuit current from the aggregate model through the distribution system to the transmission system and not require additional modeling of the distribution system.

If there is no distribution substation in the ASPEN case then the aggregate SOR model will be connected to the closest transmission substation.

TPs shall provide the data in the format as described in Section VI.B of OP-16K.

The short circuit data submitted by a TP shall be consistent with the other data required by OP-16 (i.e. NX-9 data).

TPs shall provide periodic updates per ISO's request for the current system according to the schedule in Table 1. The changes provided shall include facilities that were placed in-service since the last update and any modeling revisions that are required to be made to the most recent Year N Case.

When revising the New England case that is provided by ISO, each TP shall submit an ASPEN OneLiner (OLR) file representing the short circuit model for the current system, ASPEN change files (CHF), comma-separated values (CSV) files when appropriate to modify existing modeling information within the data browser, and modified versions of the CAMs data which reflects SOR aggregates, the Aspen bus name, number and KV they are connected to. In the data that the TP provides in the OLR and CHF, each TP shall:

i. Include change files that compare the revised case to the original case. The original case shall be the most recent Year N Case that is posted on the SCWG ShareFile.
    a. If multiple incremental change files are provided and order of implementation is important, then the TP shall number the change files to indicate the order of implementation.
ii. Verify that all of the changes are made to equipment owned by the TP only and that no changes are made to the facilities of another TP, TO or GO.
iii. Include branch impedance for interconnecting Generator equipment if it is owned by the TP. However, the TP shall not modify equipment data for Generator equipment as described in Section IV of this OP-16 K if the equipment is not owned by the TP
iv. Use border buses to reflect TP ownership changes in line sections.
v. Make any hidden buses visible
vi. To the extent possible, avoid changing the graphical coordinates of facilities.

If the TP does not utilize the ASPEN OneLiner software, data shall be provided to ISO in a manner approved by ISO such that it can be easily translated and integrated into an OLR short circuit case.

With each submittal of short circuit data, each TP shall provide documentation that lists the changes submitted. The document shall include RSP Project List and asset condition list project identification numbers[2] where applicable.

[2] The RSP Listing and asset condition list are available at http://www.iso-ne.com/system-planning/system-plans-studies/rsp

Year N+5 Case Reviews

TPs shall perform periodic reviews of the Year N+5 Case provided by ISO according to the schedule in Table 1. The review shall include future facilities that ISO has included in the case since the last update and any modeling revisions that are needed in the most recent Year N+5 Case.

If, after its review, a TP determines that it is necessary to revise the Year N+5 Case that is provided by ISO, that TP shall submit an OLR file representing the revised Year N+5 Case short circuit case and associated CHF. The files shall meet the requirements for current year (N) as described above. With each submittal of short circuit data revisions, the TP shall provide documentation that lists the revisions submitted.

i. Modeling of SORs in the Year N+5 case shall follow the method outlined in Section VI.A.vi where the the Transmission Planner shall provide the aggregated models with existing SORs as updated to reflect any Proposed Plan Application generation changes or retirements.

B. Data Submittal Method

The following shall be submitted electronically via the TP subdirectory on the SCWG ShareFile site, when changes are submitted as a part of an update:

i. Update the change log to document changes and revisions
ii. ASPEN OLR file with changes/revisions included
iii. ASPEN CHF based on the most recent short circuit case(s) on the SCWG ShareFile
iv. Comma-separated value (CSV) file when appropriate
v. Modified version of the CAMs data reflecting SOR aggregates

In addition to the above requirements TPs shall include ASPEN modelling information as an Appendix to the associated Proposed Plan Application or System Impact Study report.

If a TP does not have any changes or revisions to report, the TP shall upload a document to the SCWG sharefile that states that no updates are being submitted.

C. Data Submittal and Certification Schedule

Table 1 provides the reporting schedule for TPs related to the Year N Case update and the Year N+5 Case review.

Table 1 - Ongoing Short Circuit Update Schedule		
	Transmission Planners	**ISO-NE**
Monthly Update (as necessary)	Provide update by second to last Friday of the month	Posts updated cases on first of the month following submittals on second to last Friday of month
Quarterly Updates (required)	Provide update by third to last Friday of January, April, July, and October	Posts updated cases on first of February, May, August, and November

NOTE: If a TP becomes aware that short circuit characteristics provided to ISO for the Year N Case or the Year N + 5 Case may be inaccurate, then the TP shall notify ISO as soon as possible that the short circuit characteristics provided are subject to change. This will provide ISO operations and planning staff an opportunity to consider the impact of any inaccurate data until the TP can provide accurate short circuit characteristics to ISO. The TP shall provide updated data as soon as possible.

D. Short Circuit Data Certification

Through the submittal of the quarterly short circuit data, the TP certifies that the short circuit model provided to ISO accurately represents the equipment as installed at the time of certification[3] and that the TP has reviewed the Year N+5 case for accuracy.

VII. ISO AS THE PLANNING COORDINATOR

ISO shall prepare a monthly New England area Year N Case and a Year N + 5 Case that shall include available updates for:

i. Generator short circuit data
ii. TO short circuit data
iii. TP short circuit data

ISO shall add future projects based on PPA approval for the Near-Term Transmission Planning Horizon.

[3] A TP is only responsible for the accuracy of information reported for equipment that it owns or for which it is the Lead MP.

A. Cases and Format

ISO shall maintain two short circuit base cases on a continued basis in OLR format for:

- Year N Case
- Year N+5 Case

ISO shall determine the version of the Aspen OneLiner software used to build cases.

ISO shall post the two cases on the SCWG ShareFile.

The cases posted by ISO shall:

- Include all previously submitted changes from TPs
    a. Any changes provided in the TP Year N case shall be incorporated in the New England Year N Case and the New England Year N+5 Case
- Include all data that has been submitted by Lead MPs and TOs per Section IV and V of OP-16K.
- Be accompanied by a standard transmittal letter provided by ISO that includes facilities for which ISO has modified Generator and TO transmission short circuit data in the ASPEN case (data changes per Sections IV and V of OP-16K)
- Include all PPA approved projects in the Year N+5 Case
- Not modify data for Generators as provided in the cases by other TPs. If such data is included in TP Short Circuit cases, ISO shall not remove the model data.
- Include ISO assigned bus numbers, areas and zones according to Table 2 for new buses in the short circuit case. Note that the inclusion of zone numbers for each bus is operational, and its inclusion is at the discretion of the associated TO.
- ISO shall post a list of SOR assets for TP inclusion in the ASPEN cases.

Table 2 – Area, Zone, and Bus Numbering				
Area	**TP/Area**	**Zones**	**Bus Numbers in PSS/E**	**Bus Numbers Not in PSS/E**
99	Border buses	99	See PSS/E	----
	Versant Power			
	Versant Power Area Generators			
100	Versant Power Area non-TP/TOs	100-199	103000 - 103699	10000-19999
	AVANGRID CMP			
	AVANGRID CMP Area Generators			
200	AVANGRID CMP Area non-TP/TOs	200-299	100000- 102999	20000-29999
	Eversource NH			
	NH Area Generators			
300	NH Area non-TP/TOs	300-399	104000-105999	30000-39999
	Eversource East MA			
	Eversource East MA Generators			
400	Eversource East MA non-TP/TOs	400-499	110000-112999	40000-49999
	Eversource Connecticut/ Western Ma			
	Eversource Connecticut/ Western Ma Area Generators			
500	Eversource Connecticut/ Western Ma Area non-TP/TOs	500-599	116000-116999, 119000-122999	50000-59999
	National Grid		106000-106999, 109500-109699, 113000-115999, 117000-118999	
	National Grid Area Generators			
600	National Grid Area non-TP/TOs	600-699		60000-69999
	VELCO			
	VELCO Area Generators			
700	VELCO Area non-TP/TOs	700-799	107000-109999	70000-79999
	AVANGRID United Illuminating			
	AVANGRID UI Area Generators			
800	AVANGRID UI Area non-TP/TOs	800-899	123000-124999	80000-89999
	Rhode Island Energy			
	Rhode Island Energy Area Generators			
900	Rhode Island Energy Area non-TP/TOs	900-999	117000-118999	90000-99999
1	New Brunswick Power	1	190000-194999	1000-1999
2	Hydro Quebec	2	176000-189999	2000-2999
3	NYISO	3	125000-149999	3000-3999
4	*ISO-NE (Used for Queue Projects during SIS process)	4	200000-300000	4000-5999

*TOs will be consulted for bus numbers once the associated PPA is approved by ISO-NE

B. Year N Case Preparation

On a monthly basis, ISO shall include information provided in Sections IV, V, and VI of OP-16K to produce a Year N Case. ISO shall also reflect Generator retirements in short circuit cases. ISO shall not otherwise make any changes to data provided by equipment owners.

C. Year N+5 Case Preparation

For the Year N+5 Case, ISO shall also add or remove projects from the case each month based on the most recent list of approved PPAs. ISO shall add or remove projects based on the data provided in the latest system study available on ISO's website.

Certain future projects do not require PPA approval. Such projects shall be included in the cases. Those projects are tracked in the RSP Project List, Local System Plan (LSP) and asset condition lists kept in the Excel files found here:

https://www.iso-ne.com/system-planning/system-plans-studies/rsp/

ISO shall also reflect Generator retirements in short circuit cases.

D. ISO Coordination with Neighboring Areas

The quarterly ISO-compiled cases include updates to neighboring Balancing Authorities, with NYISO and NBP-SO equivalents.

E. ISO Case Releases

ISO shall publish cases as shown in Table 2.

VIII. OP-16 APPENDIX K REVISION HISTORY

Document History

Rev. No.	Date	Reason
Rev 0	11/06/15	Initial document
Rev 1	08/05/16	Globally all footers, added the required corporate document identity; Updated equipment requirements to include BES equipment, added detail to the Table 1 TO data submittals , Corrected typo in Section I para.3 "Equivalent" and added Section VII;
Rev 2	11/03/17	Biennial review completed by procedure owner; Added "...Generation and..." to the document title; Globally replaced "TO" with "TP" where applicable and minor editorial clarifications concerning TPs; Table 1, replaced "...Owners (interconnecting to TOs..." in the title with "...Planners...", deleted footnote [2], and modified list of applicable TPs; Table 2, deleted;
Rev 3	08/02/19	Biennial review completed by procedure owner; Extensive rewrite of document. Updated to reflect ISO monthly updates with quarterly Transmission Planner updates and handling of future cases
Rev 3.1	06/02/21	Biennial review completed by procedure owner with no changes
Rev 4	01/13/22	Added terms Generator, Settlement Only Resources and clarified references for other terms in Section I; Globally capitalized Generator; Specified applicability and updated Figure 1 in Section III; Updated data requirements and submittal in Section IV; Updated data requirements in Section VI; Updated TP/Area information in Table 2; Deleted Attachment 1
Rev 4.1	05/08/23	Biennial review completed by procedure owner with no changes required.
Rev 5	10/05/23	Periodic review completed by procedure owner; Revised Table 1 - Ongoing Short Circuit Update Schedule; Revised Table 2 – Area, Zone, and Bus Numbering; Added Attachment 1 – ASPEN OneLiner Bus Naming Convention; Various revisions.

ATTACHMENT 1: ASPEN ONELINER BUS NAMING STANDARD

A. PURPOSE

To ensure that bus names in ASPEN OneLiner are easily identifiable and provide a consistent means to search for specific buses.

B. DEFINITIONS

- **Battery Energy Storage System**: A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed.
- **Bus**: An electrical node or point of interconnection to the electric power system where power is available for transmission. Also, an electrical conductor that serves as a common connection for two or more electrical circuits.
- **Border Bus**: A bus that is used to model the transition of ownership of a line between two Transmission Owners.
- **Bus ID**: An alphanumeric set of characters used to identify a specific bus inside of a station.
- **Bus Name**: The identifier of the bus used for modeling purposes other than a station
- **Bus Type**: Identified as one of the following:
    - Tap Bus – Connecting two line sections
    - Tap bus of three terminal line – Connecting three line sections
    - Transformer midpoint
- **Collector Bus**: The bus modeled on the system side of the aggregate of the collector system of a distributed energy resource (DER) facility
- **Company**: The name of the Transmission Provider (TP)
- **Generator/Resource Bus**: A generator or resource is connected to this type of bus.
- **GSU/GSU Aggregate Bus**: The system side bus of the transformer used to connect the generator bus to the network
- **Interconnection**: The connection between two bulk electric power systems or balancing authority areas. Also, the connection between a new or uprated generating facility, elective transmission upgrade, or other transmission service and the bulk electric power system.
- **Interconnection Transformer Bus**: The bus on the system side of the transformer used to connect the generator/resource low voltage system to a higher voltage system
- **Line Number**: The alphanumeric name assigned to a circuit either by the Transmission Owner or ISO-NE
- **Mutual Bus**: A bus used to model zero sequence data of two lines resulting from the magnetic field between the two lines
- **Point-of-Interconnection (POI) Bus**: The bus that defines the change in ownership of equipment between a Developer and the Transmission Owner
- **Solar Photovoltaic (PV)**: Solar photovoltaic resource.
- **Station ID**: A unique set of alphanumeric characters used by some New England Transmission Owners to identify a particular station

- **Station Name**: The identifier of the bus used to identify the physical station where equipment is terminated
- **Step Up Transformer**: A transformer, usually located at a generator site, that converts electricity from a lower to a higher voltage.
- **Tap Bus**: A bus connecting two line sections or line sections of a 3 terminal line or a line section to a radial load bus.
- **Transformer Tertiary Bus**: A fictitious bus used to model a three winding transformer.

C. ASPEN Basic Rules of Bus Naming

- ASPEN V15 and later has increased the number of characters that can comprise a bus name from 12 to 16.
- Any alphanumeric characters can be used, except '#', '$' and the string delimiter (single or double quotation mark).
- The first 12 characters of the name must be unique among all the buses in the network.

D. Abbreviations, Punctuation, and Symbols

1.0 Cardinal Directions

1.1 Cardinal directions will be placed in front of the name and shall use one capital letter N, S, E, or W, followed by a space. Names that start with the four letters of the Cardinal directions should not be abbreviated with these letters in order to avoid confusion with the abbreviation of the directions.

2.0 Separators

2.1 Underscores shall be used to break up different portions of the name when the type of information changes

2.2 Spaces shall be used to separate names or words if they are part of the same information

2.2.1 A space should always be used between a cardinal direction and the name

2.2.2 There should be no spaces within a station ID

3.0 Bus Voltage

3.1 Do not include the nominal bus voltage since it has its own field when adding the bus

E. Bus Naming Conventions

1.0 Standard Bus

1.1 Standard Bus: StationName_StationID; where the StationName is up to twelve (12) characters and the StationID is up to three (3) characters. If a TP does not use a Station ID in the name, they can use more than 12 characters for the StationName.

- Use of StationID is optional. If not using StationID, StationName may be up to 15 characters
- If necessary, the TP may abbreviate the station name in order to increase StationID from 3 to more characters.
- Stations that have a cardinal direction in them, e.g. SOUTH EXAMPLE, the name shall be “S EXAMPLE” with a space.

- Not including cardinal direction, first four letters of StationName must be spelled out, i.e. not abbreviated.
- Station_Names should use all capital letters.

1.2 Multiple Buses at the same Station: StationName_StationID_BusID; where the StationName is up to nine (9) characters, the StationID is up to three (3) characters, and the BusID is up to two (2) characters, e.g. EXAMPLE_99X_A5, while ensuring that the StationName and StationID of the multiple buses are the same. The StationName or StationID can be less in order to have a third character for the BusID.

1.3 Duplicate Bus Names, Different Companies: If there are Identical StationNames belonging to different companies, the StationID shall follow the StationName. If a TP does not have Station IDs, then the state postal abbreviation shall be used to differentiate between companies.

2.0 Non-Standard Bus

2.1 Mutual Bus: M_LineNumber_BusName; where the “M” indicates the bus exists only to model zero sequence mutuals, the LineNumber is up to five (5) characters, and the BusName is up to eight (8) characters, e.g. M_X123Y_MUTBUS. Mutual Buses should be designated as a “Tap bus” buses to facilitate relay modeling.

2.2 Border Bus: B_LineNumber_Company1-Company2; where the “B” indicates the bus exists only to model a change in ownership, LineNumber is up to five (5) characters and Company1/Company2 are three (3) characters each, e.g. B_123_XYZ-COM. The order of companies listed should be alphabetical. Border Buses should be designated as a “Tap bus” buses to facilitate relay modeling.

Company Abbreviations:

- Avangrid – Central Maine Power: CMP
- Avangrid – United Illuminating: UI
- Eversource – Connecticut/Western Massachusetts: ECW
- Eversource – Eastern Massachusetts: EMA
- Eversource – New Hampshire: ENH
- Maine Electric Power Company: MEP
- Massachusetts Municipal Wholesale Electric Company: MWC
- National Grid: NGR
- New Brunswick: NB
- New Hampshire Transmission: NHT
- NYISO: NY
- Rhode Island Energy: RIE
- Vermont Electric Power Company: VEL
- Versant Power: VP

2.3 Transformer Tertiary Bus: X_StationName_StationID; where the “X” indicates the bus exists only to model a fictitious bus, e.g. a buried tertiary winding, or “Phantom” Tertiary, the StationName is up to ten (10) characters and the StationID is three (3) characters. Shall be identified as a “Transformer Midpoint” in the Bus Info.

2.4 Tap bus for terminal line: T_LineNumber_Tap#_BusName, where “T” indicates the physical bus that is the tee point of a multi-terminal line, LineNumber is up to nine (9) characters, Tap# and BusName are optional and used if there are multiple taps on a line.

3.0 Generator/Resource Bus

The table below provides the naming conventions to be used for the Year N+5 and Year N cases.

Bus Type	Planned Project (Year N+5 case)	In-Service Project (Year N AND Year N+5 cases)
Generator	QP####_SYNC	ProjectName_SYNC
PV or PV with Battery Energy Storage System	QP####_PV	ProjectName_PV
Battery Energy Storage System	QP####_BESS	ProjectName_BESS
HVDC Converter	QP####_HVDC	ProjectName_HVDC
STATCOM	QP####_STAT	ProjectName_STAT
Synchronous Condenser	QP####_SC	ProjectName_SC
Wind Generator/Resource	QP####_WIND	ProjectName_WIND
Collector Aggregate	QP####_COLL	ProjectName_COLL
GSU/GSU Aggregate	QP####_GSU	ProjectName_GSU
Interconnection Transformer High-Side	QP####_XFMR	ProjectName_XFMR
Interconnection Transformer Tertiary	QP####_TERT	ProjectName_TERT
Project Point-of-Interconnection (POI)	QP####_POI	StationName or ProjectName_POI

Table 3 – Generator/Resource Bus Naming Convention

3.1 The ProjectName consists of up to twelve (12) characters.
3.2 The name change by the ISO-NE is required by next quarterly update after the project receives PPA approval.
3.3 The ProjectName shall change from the QP# to the Project Name by ISO-NE.
3.4 The ProjectName shall be unique within the ASPEN model.

4.0 Clustered DER and Settlement Only Resource Bus

The table below provides the naming conventions for a Settlement Only Resources (SOR), to be used for the Year N+5 and Year N cases.

Bus Type	Planned Project (Year N+5 case)	In-Service Project (Year N case)
DER Aggregate Bus	StationName_DER	StationName_DER

Table 4: Clustered DER and Settlement Only Resource Bus Naming Convention

4.1 The StationName consists of up to twelve (12) characters.
4.2 The “Memo” section of the aggregated DER/SOR model shall have a list of the DER projects that are clustered and the MW total of aggregated SORs.