

ISO New England Operating Procedure No.16 Transmission System Data

Effective Date: January 25, 2021

Review By Date: January 25, 2023

References:

ISO New England Operating Procedure No. 3 - Transmission Outage Scheduling (OP-3)

ISO New England Planning Procedure No. 7 - Procedures for Determining and Implementing Transmission Facility Ratings in New England (PP7)

NERC Reliability Standard FAC-008 Facility Ratings

NERC Reliability Standard MOD-032 Data for Power System Modeling and Analysis

NERC Glossary of Terms Used in NERC Reliability Standards

ISO New England Compliance Bulletin - MOD-032 Model Data Requirements and Reporting Procedures

ISO New England Inc. Transmission, Markets, and Services Tariff, Section I.2.2 Definitions

ISO New England Transmission, Markets, and Services Tariff, Section I.3.9 Review of Market Participant's Proposed Plans

Local Control Center Instructions:

CONVEX	NONE
Maine	NONE
New Hampshire	NONE
NSTAR	NONE
REMVEC/NGRID	NONE
VELCO	NONE

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I. OVERVIEW AND PURPOSE

Data, that defines and represents the physical characteristics, ratings, and operational data of all New England Transmission System¹ equipment, is required to develop accurate system models and maintain the day-to-day reliable operation of the New England bulk power generation and transmission system. The timely submission of accurate and complete data is critical to the creation of the models used in real-time reliability operations, market operations, operations planning and to the applications that operate on those models.

It is the responsibility of Transmission Owners (TOs) and Market Participants, *i.e.*, Market Participants who own the equipment or Lead Market Participants for Generator Assets (collectively MPs) to determine and submit the required data for new, reconducted, and reconfigured facilities for all their transmission equipment in accordance with the submission schedules in Sections II and IV of this ISO New England Operating Procedure No. 16 - Transmission System Data (OP-16).

NOTE

The requirement for distribution transformers with a high side winding that connects at voltages of 69 kV or greater became effective on 5/4/12. Those that are not currently on file with ISO New England (ISO) will continue to be added in collaboration between ISO and the MPs and TOs.

ISO will maintain an application housing NX-9 data for all existing transmission equipment, as provided by the MPs and TOs on the appropriate NX-9 form (see Section V). ISO is also responsible for acquiring the data for that portion of any transmission facility that is beyond the ISO border.

MPs and TOs shall collaborate with ISO in developing or revising rating procedures, establishing ratings for new transmission facilities and modifying ratings of existing transmission facilities consistent with Planning Procedure No. 7 (PP7). A facility rating shall equal the rating of the most limiting individual equipment that comprises the facility.

ISO will internally implement data that is submitted by the MP or TO after such data has been reviewed and approved in accordance with OP-16 and its appendices and ISO has been notified that it is effective. Notification of data approval or implementation will be sent via email to ISO staff and external stakeholders who have requested such notification in the ISO Customer and Asset Management System (CAMS).

Questions regarding NX-9 data requirements or use of the NX-9 application should be directed to the ISO Customer Support Department.

Questions regarding Dynamic data, Dynamic Demand data or short circuit data requirements covered by OP-16 and its appendices should be directed to the ISO

¹ New England Transmission System is defined in the ISO Transmission, Markets, and Services Tariff, Section I.2.2.

Customer Support Department and should reference the NERC Reliability Standard MOD-032 Data for Power System Modeling and Analysis (MOD-032).

II. NX-9 DATA SUBMISSION SCHEDULE

MPs and TOs shall submit equipment data for new facilities, planned modifications, planned re-evaluation of existing facilities, correction of detected data errors, unplanned equipment changes, temporary ratings and impedance changes, and re-submission of rejected NX-9s, consistent with the schedules defined in this section. In-Service Date shall mean the date upon which the MP or TO reasonably expects the equipment will be ready to be energized or carry power.

New facilities:

For the purposes of OP-16 and its appendices, new facilities shall include new substations, new lines, new transformers, transformer replacements and additions of equipment to existing substations.

MPs and TOs shall submit data for new facilities, including planned transformer replacements, that require NX-9 data to ISO at least one hundred twenty (120) calendar days in advance of the expected In-Service Date of the new facilities. Advanced notice data can be based on preliminary, planned or MP/TO specification data and shall be the most accurate data available at the time of submission.

NX-9 data for transformer replacements due to failure shall be submitted by MPs and TOs no later than five (5) Business Days² after determining the replacement equipment or one hundred twenty (120) calendar days prior to the expected In-Service Date of the replacement, whichever is later. This advanced notice data can be based on preliminary, planned or MP/TO specification data and shall be the most accurate data available at the time of submission. Replacement equipment shall be determined by MPs and TOs in accordance with good utility operating practice.

MPs and TOs shall update advanced notice NX-9 data at least fifteen (15) Business Days prior to the In-Service Date. Transformer data shall be derived from the transformer test report. Data for all other equipment shall either be based on as-built or derived from the specification for construction and shall be the most accurate data available at the time of submission.

Submission of NX-9 data for a project with an accelerated In-Service Date shall be coordinated with the ISO NX-9 Administrator (nx9admin@iso-ne.com).

Planned modifications to existing facilities:

Data associated with substation equipment modifications or retirements and changes to existing lines shall be submitted at least fifteen (15) Business Days prior to the expected In-Service Date and shall either be based on as-built or

² Business Day is defined in the ISO Transmission, Markets, and Services Tariff, Section I.2.2.

derived from the specification for construction and shall be the most accurate data available at the time of submission.

ISO permits an exception to the requirement that planned modifications to existing facilities be submitted at least fifteen (15) Business Days prior to the expected In-Service Date when an unanticipated system condition can be utilized as an opportunity to accelerate the schedule of a planned modification to existing equipment providing:

- A. the modification does not decrease the ratings of the equipment
- B. the work is approved via an ISO New England Operating Procedure No. 3 - Transmission Outage Scheduling (OP-3) Opportunity Outage that has the expected new ratings as an attachment
- C. the modification does not extend the length of the outage
- D. ratings changes associated with these modifications are reported to ISO through the established process for reporting abnormal ratings

NX-9 data for equipment changes associated with this exception shall be submitted as soon as possible and no later than five (5) Business Days after the change.

As-built data for new and modified facilities:

As-built data shall be confirmed or submitted no later than three (3) months after the equipment In-Service Date. If as-built data is not available within this timeframe, the MP or TO shall notify the ISO NX-9 Administrator (nx9admin@iso-ne.com).

Planned re-evaluation of existing facilities:

A planned re-evaluation, such as due to a methodology change or a change to impedance or rating calculation formula, shall be coordinated with the ISO NX-9 Administrator (nx9admin@iso-ne.com).

Correction of detected data error:

Upon discovery of a data error, MPs and TOs shall determine the correct data in accordance with good utility operating practice. Corrected NX-9 data shall be submitted no later than ten (10) Business Days after establishing corrected data for a detected error. Corrected data shall be provided to the LCC.

Unplanned equipment change:

NX-9 data pertaining to an unplanned equipment repair or replacement that result in a change to equipment rating or impedance shall be submitted as soon as possible and no later than ten (10) Business Days after the repair. Updated data shall be provided to the LCC.

Temporary ratings and characteristics changes:

Unplanned temporary adjustments to ratings and characteristics such as impedance data, including those due to localized emergency situations shall

be provided to the ISO-NE Control Center without delay. Planned temporary adjustments shall be reported during the outage application process.

Temporary changes expected to be in place forty-five (45) calendar days or longer require an NX-9 submission to be made by the MP or TO in accordance with normal submission schedules. Temporary changes that are expected to be in place less than forty-five (45) calendar days do not require an NX-9 submission.

Re-submission of rejected NX-9s:

NX-9 forms submitted by MPs or TOs that are rejected by the ISO NX-9 Administrator will be returned to the MP or TO for correction. For equipment with a scheduled In-Service Date within fifteen (15) Business Days, corrections shall be submitted no later than five (5) Business Days after ISO notification to the MP or TO. For equipment with a scheduled In-Service Date later than fifteen (15) Business Days, corrections shall be submitted no later than ten (10) Business Days after ISO notification to the MP or TO.

Widespread outage and major system restoration:

ISO recognizes that during times of widespread outage and major system restoration, it may not be possible to adhere to the above timelines in all situations. However, all affected NX-9 data shall be updated no later than six (6) months after system restoration.

The table below is a quick reference guide to the submission schedule above:

Change Type:	NX-9 Submission Required:
All data shall be the most accurate data available at the time of submission	
New facilities including planned transformer replacements - initial submission of preliminary data	At least one hundred twenty (120) calendar days in advance of the expected In-Service Date
Transformer replacements due to failure - initial submission of preliminary data	No later than five (5) Business Days after determining the replacement equipment or one hundred twenty (120) calendar days in advance of the expected In-Service Date, whichever is later
New facilities including all transformer replacements - update to preliminary data (as tested, as-built or based upon specification)	At least fifteen (15) Business Days prior to the In-Service Date
Retirements of existing facilities	At least fifteen (15) Business Days prior to the expected retirement date
Planned modifications to existing facilities - data is as-built or based upon specification	At least fifteen (15) Business Days prior to the expected In-Service Date

Change Type:	NX-9 Submission Required:
Planned modifications to existing facilities with OP-3 exception	As soon as possible and no later than five (5) Business Days after the change
As-built data for new and modified facilities	No later than three (3) months after equipment In-Service Date
Planned re-evaluation of existing facilities	Coordinated with the ISO NX-9 Administrator
Correction of detected data error	No later than ten (10) Business Days after establishing correct data
Unplanned equipment change	No later than ten (10) Business Days after the repair
Temporary ratings and characteristics changes of less than forty-five (45) calendar days	NX-9 submission not required
Temporary ratings and characteristics changes of forty-five (45) calendar days or longer	In accordance with normal submission schedules
Re-submission of rejected NX-9s with In-Service Date less than or equal to fifteen (15) Business Days of rejection date	No later than five (5) Business Days after rejection notification
Re-submission of rejected NX-9s with In-Service Date later than fifteen (15) Business Days of rejection date	No later than ten (10) Business Days after notification

III. ENTRY AND MAINTENANCE OF NX-9 FORM EFFECTIVE DATE FIELDS

MPs and TOs are required to provide and maintain the Requested and Actual Effective Date fields as defined below for all NX-9 data. As changes to project dates arise, the Requested Effective Date field on NX-9 forms shall be updated by the MP or TO in the ISO NX Application.

Requested Effective Date:

When submitting changes to NX-9 data for existing equipment, the Requested Effective Date field shall reflect the date the MP or TO reasonably expects the data to be effective.

When submitting NX-9 data for new equipment, the Requested Effective Date field shall reflect the date the MP or TO reasonably expects the equipment will be In-Service.

When submitting corrections to NX-9 equipment data that are effective immediately, the Requested Effective Date field shall be the date submitted plus one day.

Actual Effective Date:

The Actual Effective Date field shall be populated with the date the NX-9 data went into effect in the field. Entry of the actual effective date will trigger a notice to the ISO NX-9 Administrator that the data can be implemented in ISO applications.

For both modifications to existing equipment and for new equipment, the MP or TO shall populate the NX-9 form's Actual Effective Date field as soon as possible upon completion of work.

For corrections to NX-9 equipment data that are effective immediately, the actual effective date shall be the date that the correct data was determined and shall be entered by the MP or TO at the time of form submittal.

IV. ONE-LINE SCHEMATIC DIAGRAM REQUIREMENTS

ISO will maintain an application housing all one-line schematic diagrams (one-lines) provided by the MPs and TOs. These one-lines are required to be on file for use by ISO and the Local Control Centers (LCCs). ISO will use these one-lines to define the substation model. MPs and TOs shall provide their one-lines using the one-line form in the ISO web-based application.

MPs and TOs shall provide documentation that identifies equipment changes,³ additions or removals and/or nomenclature changes on revised one-lines by providing a description of the changes in the one-line form revision comments field.

When uploading a revised one-line, the one-line being replaced shall be terminated.

Required facility one-lines:

MPs and TOs shall provide new or revised individual station one-lines of all substations containing equipment designated as part of the Bulk Electric System⁴ (BES) or with equipment operating at voltages of 69 kV or greater.

Lead Market Participants for Generator Assets shall provide new or revised individual station one-lines of all substations that include generators participating in the Real-Time Energy Market regardless of voltage level. One-lines shall depict all equipment up to the point of interconnection.

One-lines for stations or areas operating at voltages that are less than 69 kV may be required when ISO determines that the one-lines are necessary for

³ All changes shall have completed any applicable planning approval requirements, such as Tariff Section I.3.9 approval.

⁴ Bulk Electric System (BES) is defined in the NERC Glossary of Terms Used in NERC Reliability Standards.

reliable operation of the New England Transmission System. When required by ISO, the TO or MP shall submit the one-line no later than thirty (30) calendar days after ISO's notification.

Required facility one-lines shall include all equipment that affects the flow of system real or reactive power of equipment at voltages of 69 kV or greater or between a generator and its point of interconnection. This includes switching devices, transformers, phase shifters and reactive devices (shunt, variable or dynamic) and the nomenclature for all such devices.

When it is necessary to provide a system overview one-line for the purpose of satisfying the criteria for individual station one-lines, the system overview one-line shall be considered a required facility one-line and shall adhere to the rules and submission schedule for required facility one-lines.

Optional facility one-lines:

Optionally, MPs and TOs may provide one-lines of substations with equipment operating at voltages that are less than 69 kV and/or overview one-lines of any kV level.

MPs and TOs are not expected to provide preliminary versions of optional facility one-lines.

MPs and TOs are not expected to provide relay or metering specific diagrams or topological diagrams.

Submission schedule for required facility one-lines:

Preliminary one-lines for required facilities and equipment: MPs and TOs shall submit preliminary individual substation one-lines to ISO at least one hundred eighty (180) calendar days in advance of the expected In-Service Date of a change when the change meets one or more of the following criteria:

- New substation with equipment designated as part of the BES or with equipment operating at voltages of 69 kV or greater.
- New generator participating in the Real-Time Energy Market regardless of voltage level.
- New line, transformer, phase shifter or reactive device (shunt, variable or dynamic) connecting at voltages of 69 kV or greater.
- Addition or removal of a switching device that affects connectivity and system real or reactive power flow of equipment at voltages of 69 kV or greater or that affects connectivity between a generator and its point of interconnection.
- Device type or nomenclature change for a switching device operating at voltages of 69 kV or greater when the device affects connectivity and system real or reactive power flow.
 - ISO groups devices into four main types: breaker, circuit switcher, motor-operated switch and manual switch. Changes such as a

breaker type change from gas to oil do not affect the ISO device type and are not required in advance of the change.

It is acceptable to provide a document with multiple diagrams outlining the various project phases rather than multiple separate documents with various effective dates as long as the diagrams in the document:

- include all required devices and nomenclature; and
- provide an estimated effective date for each diagram.

When such a document is used, the user shall enter the expected effective date of the final configuration as the expected effective date of the entire document. When exercising this option, the diagram is required to be submitted at least one hundred eighty (180) calendar days in advance of the expected In-Service Date of the first phase included in the document.

Preliminary one-lines are not required for the following changes to required facility one-lines unless specifically requested by ISO:

- A device type change that does not affect the ISO device type.
 - ISO groups devices into four main types: breaker, circuit switcher, motor-operated switch and manual switch. Changes such as a breaker type change from gas to oil do not affect the ISO device type.
- Changes (including additions or removals) to devices or equipment operating at any kV level that do not affect the connectivity and system real or reactive power flow at voltages of 69 kV or greater or between a generator and its point of interconnection. This includes changes to grounding devices, relay equipment, metering equipment, wave traps, VTs, CTs, etc.

Preliminary one-lines can be based on preliminary, planned or MP or TO specification data but shall include device nomenclature. This device nomenclature shall be consistent with the nomenclature that will be used by all station and system operators to identify equipment.

- When uploading a preliminary one-line, the user shall enter the expected effective date of the changes depicted on the preliminary one-line.
- Users are not expected to update or maintain the expected effective date of preliminary one-lines.

MPs and TOs shall provide any updated issued for construction one-line schematic diagrams prior to the In-Service Date of the facility. One-lines shall either be based on as-built or derived from the specification for construction.

As-built one-lines shall be submitted no later than thirty (30) calendar days after the In-Service Date if not provided prior to the In-Service date.

Revisions to required facility one-lines not requiring submission of a preliminary one-line shall be submitted within fifteen (15) Business Days of being revised and re-issued by the participant.

Submission schedule for optional facility one-lines:

System overview one-lines, area one-lines and non-requested one-lines for facilities connected at voltages that are less than 69 kV are not required to be submitted but can be helpful for ISO System Planning engineers and LCC System Operators.⁵ To this end, submission of these one-lines to ISO is desired.

Once initially provided, MPs and TOs shall submit revisions to one-lines for optional facilities no later than thirty (30) calendar days after being revised and re-issued by the MP or TO.

V. DETERMINATION AND SUBMISSION OF NX-9 DATA REPRESENTING THE PHYSICAL CHARACTERISTICS, RATINGS, AND OPERATIONAL DATA OF TRANSMISSION SYSTEM EQUIPMENT (NX-9 FORMS)

Revised or new transmission facility data is to be submitted electronically to the ISO NX-9 Administrator in the NX Application. The data required and the appropriate NX-9 forms are identified in the following appendices, which also provide explanations of terms and instructions for data preparation:

- OP-16 Appendix A - Explanation of Terms and Instructions for Data Preparation of NX-9A - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transmission Line
- OP-16 Appendix B - Explanation of Terms and Instructions for Data Preparation of NX-9B - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transformer - FIXED/GSU/TCUL
- OP-16 Appendix C - Explanation of Terms and Instructions for Data Preparation of NX-9C - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transformer - Phase Shifting
- OP-16 Appendix D - Explanation of Terms and Instructions for Data Preparation of NX-9D - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Static Capacitor/Reactor
- OP-16 Appendix G - Explanation of Terms and Instructions for Data Preparation of NX-9G - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Variable Reactor
- OP-16 Appendix H - Explanation of Terms and Instructions for Data Preparation of NX-9H - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Series Device

⁵ System Operator is defined in the NERC Glossary of Terms Used in NERC Reliability Standards.

- OP-16 Appendix I - Explanation of Terms and Instructions for Data Preparation of NX-9 - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Other Equipment

ISO will review all submitted data to verify that it is complete, reasonable and consistent with the related data and with the reason for the revision and to ensure that it conforms to the explanation of terms. ISO will notify the MP or TO of any discrepancies found. The MP or TO will provide corrections to the NX-9 form consistent with the schedule identified in Section II, Re-submission of Rejected NX-9s.

Ratings data may be subjected to a more rigorous review as the need is determined by ISO. During the period of such a review, the new rating data will be granted provisional approval and data resolution and implementation will proceed as described in Section 3 of PP7. ISO will notify the MLCC Heads that a provisional rating has been implemented.

If any other submitted data is in dispute, the ISO Reliability & Operations Compliance Department and ISO Legal Department will send a formal written notification to the MP or TO seeking resolution. The MP or TO will review the data and provide substantiation of data they find accurate. If the data submittal is then determined to be reasonable by ISO, it will be approved by ISO. If the data is determined to be inaccurate by the MP or TO, it will be modified and re-submitted by the MP or TO after which ISO approval will proceed.

VI. ANNUAL NX-9 DATA CERTIFICATION

In January of each year, unless otherwise communicated to the MP and TO NX-9 Contacts as identified in ISO CAMS, ISO will initiate an NX-9 certification process. MPs and TOs shall respond as outlined in OP-16 Appendix E - Annual Data Certification of ISO New England Transmission Equipment Rating Characteristic, and Operational Data by the date specified by ISO which will be at least thirty (30) calendar days from the certification initiation. This process requires that the MP or TO certify that all transmission facilities identified in OP-16 and its appendices are accurately represented in the ISO NX Application.

MPs and TOs should not include Planned Re-evaluations of Existing Facilities, or unreported changes due to widespread outage and major system restoration that are within the six month time allowance, when responding to the annual certification.

VII. DYNAMICS AND SHORT CIRCUIT DATA FOR TRANSMISSION SYSTEM EQUIPMENT

It is the responsibility of Transmission Planners (TPs), TOs and MPs to determine and submit the required dynamics and short circuit data for new and reconfigured facilities for all its transmission equipment in accordance with the requirements in the appendices listed below.

- OP-16 Appendix J - Instructions for Submission of Dynamics Data - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transmission Equipment Dynamics Data
- OP-16 Appendix K - Instructions for Submission of Short Circuit Data - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Generator and Transmission Equipment Short Circuit Data

ISO will review all submitted data to verify that it is complete, reasonable and consistent with the related data and with the reason for the revision and to ensure that it conforms to the explanation of terms. ISO will notify the TP, MP or TO of any discrepancies found. The TP, MP or TO will provide corrections to the dynamics or short circuit data as identified in requirement R3 of MOD-032.

VIII. OP-16 REVISION HISTORY

Document History (This Document History documents action taken on the equivalent NEPOOL Procedure prior to the RTO Operations Date as well as revisions made to the ISO New England Procedure subsequent to the RTO Operations Date.)

Rev. No.	Date	Reason
--	11/03/17	For previous revision history, refer to Rev 10 available through Ask ISO;
Rev 11	11/03/17	Biennial review by procedure owner; Add detail to one-line schematic diagram section specifying required versus optional one-lines and the submission schedule for all one-lines; Specify calendar versus Business Days where not already specified; Made editorial changes to be consistent with current practices and management expectations (e.g., grammar changes from "must" to "shall" and "which" to "that" as appropriate; and remove capitalization from non-defined terms; Truncated the Revision History per SOP-RTMKTS.0210.0010 Section 5.6;
Rev 11.1	06/06/19	Biennial review by procedure owner requiring no changes; Made administrative changes required to publish the Minor Revision
Rev 11.2	01/25/21	Biennial review by procedure owner requiring no changes; Made administrative changes required to publish the Minor Revision

IX. APPENDICES

- Appendix A - Explanation of Terms and Instructions for Data Preparation of NX-9A - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transmission Line
- Appendix B - Explanation of Terms and Instructions for Data Preparation of NX-9B - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transformer - FIXED/GSU/TCUL
- Appendix C - Explanation of Terms and Instructions for Data Preparation of NX-9C - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transformer - Phase Shifting
- Appendix D - Explanation of Terms and Instructions for Data Preparation of NX-9D - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Static Capacitor/Reactor
- Appendix E - Annual Data Certification of ISO New England Transmission Equipment Rating Characteristic, and Operational Data
- Appendix F - Retired 05/04/2012
- Appendix G - Explanation of Terms and Instructions for Data Preparation of NX-9 - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Variable Reactor
- Appendix H - Explanation of Terms and Instructions for Data Preparation of NX-9 - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Series Device
- Appendix I - Explanation of Terms and Instructions for Data Preparation of NX-9 - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Other Equipment
- Appendix J - Instructions for Submission of Dynamics Data - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Transmission Equipment Dynamics Data
- Appendix K - Instructions for Submission of Short Circuit Data - ISO New England Transmission Equipment Rating, Characteristic, and Operational Data - Generation and Transmission Equipment Short Circuit Data