

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

Effective Date: October 26, 2023

Review By Date: October 26, 2025

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I. EQUIPMENT REQUIREMENTS

Data for all series reactive devices, including Smartvalve devices, designated as part of the Bulk Electric System¹ (BES) or connecting to the New England Transmission System² at a voltage of 69 kV or greater shall be provided by the Transmission Owners and Market Participants who own the equipment.³

If a series reactive device cannot be switched in or out independently of the associated line, the impedance and rating information for the series reactive device may be combined with the line data and the combined total may be submitted on a single NX-9A form. On all new and revised NX-9A forms, if a series reactive device is combined with a line and reported on a single combined NX-9A form, the MP or TO shall update the Participant Equipment Notes field to indicate that the NX-9A form includes the series reactive device information.

Data for series reactive devices connected at voltages that are less than 69 kV may be required when ISO determines that the data is necessary for reliable operation of the New England Transmission System. When required by ISO, the TO or MP shall submit the data within thirty (30) calendar days of ISO's notification.

For Smartvalve devices, a document (.pdf format) defining the various impedance settings shall be included as a file attachment to the NX-9H form.

II. GENERAL DATA INSTRUCTIONS

The NX-9H form provides for entry of both ISO and MP/TO data. ISO fields cannot be modified by the MP or TO. The MP or TO is responsible for providing data for all non-ISO fields via the NX Application.

The circuit number shall initially be entered by the MP or TO for new equipment and thereafter maintained by ISO.

Select the terminals that reflect the connection points of the equipment. Terminals are created and maintained by ISO. The user should contact the ISO NX-9 Administrator (nx9admin@iso-ne.com) if terminal additions or changes are needed.

To remove equipment from service, select the Remove Equipment From Service checkbox. Equipment is removed from service either when the equipment is retiring from service or if new forms are being submitted as a replacement due to a change in configuration.

¹ Bulk Electric System (BES) is defined in the Glossary of Terms Used in NERC Reliability Standards.

² New England Transmission System is defined in the ISO Transmission, Markets, and Services Tariff, Section I.2.2.

³ Generally, under Section I of Operating Procedure No. 16, data shall be provided by Transmission Owners (TOs) and Market Participants, *i.e.* Market Participants who own the equipment or Lead Market Participants for Generator Assets (collectively MPs).

To assist in completing the NX-9H form, completed sample NX-9H forms are attached (Examples 1, 2 and 3).

III. RATING DATA INSTRUCTIONS

Facility rating data shall be provided in MVA (rounded down to the nearest whole number) and determined in accordance with Planning Procedure 7, "Procedures for Determining and Implementing Transmission Facility Ratings in New England" (PP7). The definition of Thermal Ratings is described in PP7 Section 2.0 Collaborative Development of Rating Procedures. A facility rating shall equal the rating of the most limiting individual equipment, shall reflect relay loadability limits⁴, and shall account for auxiliary support equipment such as wave traps and any other equipment that Good Utility Practice suggests is necessary. This requirement does not remove the TO's obligation to adhere to PRC-023-4, and its successor standards, nor does it suggest a TO be allowed to change a relay setting to create a more limiting thermal rating for a facility.

The NX-9H form provides for entry of both summer (April 1 through October 31) and winter (November 1 through March 31) thermal ratings. The ambient temperature (reported in Fahrenheit) and wind speed (reported in feet per second) used to establish the normal ratings shall be entered for each rating set. If ratings for special conditions or configurations are added to the NX-9H form, comments that describe the associated circumstances for use of the special ratings are required. The MP or TO is also responsible for providing a statement as to the authority of ISO and the Local Control Center (LCC) for use and distribution of these special ratings.

IV. CHARACTERISTIC AND OPERATIONAL DATA INSTRUCTIONS

Indicate the device type by selecting capacitor, inductor or reactor in the Device Type field.

Provide positive sequence impedance data in percent on a 100 MVA base. Impedance data provided shall represent the incremental impedance that is realized when the series device is in service. Impedance for the associated line will account for total impedance when the series device is out of service. Impedance on NX-9H forms shall be calculated and provided out to at least the 3rd decimal place.

R = resistance

X = reactance

For Smartvalve devices, provide the impedance values expected to be in use the majority of the time.

V. EXPLANATION OF DATA CHANGES

⁴ The term "relay loadability limits", as used in this Appendix, represents the minimum flow at which the relay acts.

Any time an NX-9H form is modified or created, a brief description of the reason(s) for the entry shall be provided in the Revision Comments field. It will provide a written record of the change and clearly identify the equipment changes made in the field and/or other reasons that necessitated the update of the NX-9H form. For example: Rating changes due to replacement of switch XYZ.

This data is utilized by ISO in the NX-9H form review and approval process.

VI. EQUIPMENT NOTES

The Equipment Notes field is used to provide explanations of data or other pertinent or operational information. For example: In the normal configuration, equipment is bypassed and out of service.

Fields are provided for both ISO and MP/TO notes. An additional private field is available to the MP or TO for internal notes that can be edited and viewed only by the MP or TO owning the record.

Equipment notes are carried forward when an NX-9H form is updated. MPs and TOs should review and modify or delete any MP or TO note that is no longer pertinent. ISO is responsible for maintaining ISO notes.

EXAMPLE 1, NX-9H SERIES DEVICE-REACTOR

**ISO New England Equipment Rating, Characteristic,
and Operational Data Implementation Form
Series Device (NX-9H)**

Reference 1502100001	Participant ID L123 Reactor
Participant Test Company	ISO ID L123_Reac
Form State Preliminary	Ckt 1
Device Type Reactor	ISO EMS ID L123_Reac
Terminal A Station1 115kV	Bus # 456789 EMS STATION1
Terminal B Station1 Series Reactor 115kV	Bus # 345678 EMS STATION1
Nominal System Voltage (kV) 115	

Default Summer 100 F

	<u>MVA</u>	<u>Limiting Device / Description</u>	<u>Location</u>
Normal	189	Conductor -	Substation1
LTE	217	Conductor -	Substation1
STE	283	Reactor -	Substation1
DAL	283	Reactor -	Substation1

Default Winter 50 F

	<u>MVA</u>	<u>Limiting Device / Description</u>	<u>Location</u>
Normal	202	Conductor -	Substation1
LTE	233	Conductor -	Substation1
STE	283	Reactor -	Substation1
DAL	283	Reactor -	Substation1

Impedance Data (%) (100 MVA Base)

R 0.024 X 2.956

Revision Comments Series Reactor Example - new equipment.

Equipment Notes Impedance reflects incremental impedance added when device is in service.
Ratings include only the additional equipment in the path when the device is in service.

Data Revision Number 1	Date Created 02/10/2015	Prepared By Participant Username
Requested Effective Date 02/11/2015	Date Received	Approved By
Actual Effective Date	ISO EMS Implementation Date	

EXAMPLE 2, NX-9H SERIES DEVICE-CAPACITOR

**ISO New England Equipment Rating, Characteristic,
and Operational Data Implementation Form
Series Device (NX-9H)**

Reference 1502120001	Participant ID L123 Series Capacitor
Participant Test Company	ISO ID L123_SC
Form State Preliminary	Ckt 1
Device Type Capacitor	ISO EMS ID L123_SC
Terminal A Station1 115kV	Bus # 456789 EMS STATION1
Terminal B Station1 Series Cap 115kV	Bus # 345678 EMS STATION1
Nominal System Voltage (kV) 115	

Default Summer 100 F

	<u>MVA</u>	<u>Limiting Device / Description</u>	<u>Location</u>
Normal	217	Series Capacitor-	Substation1
LTE	217	Series Capacitor-	Substation1
STE	217	Series Capacitor-	Substation1
DAL	217	Series Capacitor-	Substation1

Default Winter 50 F

	<u>MVA</u>	<u>Limiting Device / Description</u>	<u>Location</u>
Normal	217	Series Capacitor-	Substation1
LTE	217	Series Capacitor-	Substation1
STE	217	Series Capacitor-	Substation1
DAL	217	Series Capacitor-	Substation1

Impedance Data (%) (100 MVA Base)

R 0 **X** -2.4

Revision Comments Install new series capacitor on line L123

Equipment Notes Impedance reflects incremental impedance added when device is in service.
Ratings include only the additional equipment in the path when the device is in service.

Data Revision Number 2	Date Created 02/12/2015	Prepared By ParticipantUsername
Requested Effective Date 02/13/2015	Date Received	Approved By
Actual Effective Date	ISO EMS Implementation Date	

EXAMPLE 3, NX-9H SERIES DEVICE-INDUCTOR

**ISO New England Equipment Rating, Characteristic,
and Operational Data Implementation Form
Series Device (NX-9H)**

Reference 1502120002	ParticipantID L123 IND
Participant Test Company	ISO ID L123-1W
Form State Preliminary	Ckt 1
Device Type Inductor	ISO EMS ID L123-1W
Terminal A Station1 115kV	Bus # 456789 EMS STATION1
Terminal B Station1 Reactor 115kV	Bus # 654321 EMS STATION1
Nominal System Voltage (kV) 115	

Default Summer 100 F

<u>MVA</u>	<u>Limiting Device / Description</u>	<u>Location</u>
Normal 525	Reactor-	Substation1
LTE 525	Reactor-	Substation1
STE 525	Reactor-	Substation1
DAL 525	Reactor-	Substation1

Default Winter 50 F

<u>MVA</u>	<u>Limiting Device / Description</u>	<u>Location</u>
Normal 553	Reactor-	Substation1
LTE 553	Reactor-	Substation1
STE 553	Reactor-	Substation1
DAL 553	Reactor-	Substation1

Impedance Data (%) (100 MVA Base)

R 0.0115 **X** 2.05

Revision Comments New equipment installation

Equipment Notes Impedance reflects incremental impedance added when device is in service.
Ratings include only the additional equipment in the path when the device is in service.

Data Revision Number 3	Date Created 02/12/2015	PreparedBy ParticipantUsername
Requested Effective Date 02/13/2015	Date Received	Approved By
Actual Effective Date	ISO EMS Implementation Date	

VII. OP-16 APPENDIX H REVISION HISTORY

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

Rev. No.	Date	Reason
Rev 0	11/06/15	Initial version
Rev 1	08/05/16	Globally all footers, added the required corporate document identity; Update equipment requirements to include BES equipment;
Rev 2	11/03/17	Biennial review by procedure owner; Globally, 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; Add language allowing data for series reactive devices that cannot be operated independently to be combined with the associated line and reported on a single NX-9A form; Clarify circumstance for ISO to require reporting of equipment connected at voltages that are less than 69 kV is because it is needed for reliable operation of the New England Transmission System;
Rev 2.1	06/06/19	Annual review by procedure owner requiring no changes; Made administrative changes required to publish the Minor Revision;
Rev 2.2	01/25/21	Annual review by procedure owner requiring no changes; Made administrative changes required to publish the Minor Revision;
Rev 3	08/22/22	Biennial review by procedure owner; Clarify ratings requirements to include relay loadability limits and other equipment deemed necessary by Good Utility Practice.
Rev 4	10/26/23	Periodic review by procedure owner; Add footnote to define "relay loadability limits" as used in this Appendix; Add instructions for Smartvalve device impedance reporting.