

ISO New England Operating Procedure No. 19 - Transmission Operations

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REFERENCES:

1. NERC Reliability Standard EOP-011, Emergency Operations
2. NERC Reliability Standard FAC-010, System Operating Limits Methodology for the Planning Horizon
3. NERC Reliability Standard FAC-011, System Operating Limits Methodology for the Operation Horizon
4. NERC Reliability Standard IRO-001, Reliability Coordination - Responsibilities
5. NERC Reliability Standard IRO-002, Reliability Coordination - Monitoring and Analysis
6. NERC Reliability Standard IRO-008, Reliability Coordinator Operational Analyses and Real-time Assessments
7. NERC Reliability Standard IRO-009, Reliability Coordinator Actions to Operate Within IROLs
8. NERC Reliability Standard IRO-010, Reliability Coordinator Data Specification and Collection
9. NERC Reliability Standard IRO-014, Coordination Among Reliability Coordinators
10. NERC Reliability Standard IRO-017, Outage Coordination
11. NERC Reliability Standard IRO-018, Reliability Coordinator Real-time Reliability Monitoring and Analysis Capabilities
12. NERC Reliability Standard TOP-001, Transmission Operations
13. NERC Reliability Standard TOP-002, Operations Planning
14. NERC Reliability Standard TOP-010, Real-time Reliability Monitoring and Analysis Capabilities
15. NERC Reliability Standard VAR-001 Voltage and Reactive Control

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16. NPCC Regional Reliability Reference Directory #1, Design and Operation of the Bulk Power System (Directory 1)
17. NPCC Regional Reliability Reference Directory #1, Design and Operation of the Bulk Power System (Directory 1) Appendix F: Procedure for Operational Planning Coordination, NPCC Facilities Notification List - Attachment D
18. NPCC Regional Reliability Reference Directory #2, Emergency Operations
19. Capacity Rating Procedures - System Design Task Force
20. ISO New England Operating Procedure No. 3 - Transmission Outage Scheduling (OP-3)
21. ISO New England Operating Procedure No. 4 - Action During a Capacity Deficiency (OP-4)
22. ISO New England Operating Procedure No. 7 - Action In an Emergency (OP-7)
23. ISO New England Operating Procedure No. 8 - Operating Reserve and Regulation (OP-8)
24. ISO New England Operating Procedure No. 18 - Metering and Telemetry Criteria (OP-18)
25. ISO New England Operating Procedure No. 24 - Protection Outages, Settings and Coordination (OP-24)
26. ISO Planning Procedure No. 7, Procedures for Determining and Implementing Transmission Facility Ratings in New England (PP7)
27. ISO New England Transmission Operating Guides

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I. INTRODUCTION

This Operating Procedure (OP) describes reliability criteria for the analysis and operation of the New England Transmission System. Prescribed operator actions are further detailed in several ISO New England (ISO) Transmission Operating Guides.

The provisions of this OP are used to determine data, methods, and limits for operation of the New England Transmission System. ISO, as the System Operator, is responsible for, among other things, matters pertaining to the central dispatch of each transmission facility over which it has operational control pursuant to the Transmission Operating Agreement (TOA). ISO is responsible for operating all transmission facilities rated 115 kV and above. Local Control Centers (LCCs) are responsible for operating all transmission facilities rated 69 kV and below. LCCs have exclusive operating responsibility for all 69 kV facilities with the exception of certain facilities listed in Master / Local Control Center Procedure No.15 - System Operating Limit Methodology, Attachment F (M/LCC 15F), List of 69kV Facilities Currently Under ISO-NE Operational Control. The New England Transmission System is defined in the ISO New England Transmission, Markets, and Services Tariff (ISO Tariff) and includes the Reliability Coordinator Area/Balancing Authority Area (RCA/BAA),¹ Bulk Electric System,² and bulk power system elements found within New England on the transmission network.

This OP describes how ISO and each LCC plan to operate within all System Operating Limits (SOLs) and Interconnection Reliability Operating Limits (IROLs).

A. Purpose

The purpose of this OP is to describe how each Transmission Owner (TO), the ISO, and each LCC [as Transmission Operators (TOP-)]³:

- Monitor the New England Transmission System and determine ratings, criteria and limits for their operation under NORMAL and EMERGENCY system conditions.
- Analyze and operate the New England Transmission System under those two categories of system conditions.

This OP provides for the reliability of the New England Transmission System and addresses the execution and coordination of activities that impact inter- and intra-regional reliability, including:

- Monitoring and controlling voltage levels and real / reactive power flows
- Switching transmission elements
- Planned outages, including outages of protection systems

¹ RCA/BAA are defined in the Glossary of Terms Used in NERC Reliability Standards.

² Bulk Electric System is defined in the Glossary of Terms Used in NERC Reliability Standards.

³ Transmission Operator is defined in the Glossary of Terms Used in NERC Reliability Standards.

- Responding to IROL and SOL exceedances

II. RELIABILITY RATINGS, CRITERIA AND LIMITS FOR TRANSMISSION OPERATIONS

A. Background

ISO operates the New England Transmission System to account for contingencies. A contingency is the unexpected failure or outage of a system component such as a generator, transmission line, circuit breaker, switch or other electrical element. The New England Transmission System is operated reliably to avoid adverse impacts, pre-contingency, and after single-element and certain multiple-element contingencies. Adverse impacts may include, but are not limited to:

- Equipment damage due to thermal overload
- Cascading thermal overloads
- Excessively high or low voltage or voltage collapse
- Unit or area instability
- Unacceptable post-transient voltage sag
- Uncontrolled system separation
- Unacceptable damping

A single contingency may result in the loss of one or more elements. Single contingencies within the New England RCA/BAA shall not result in a violation of the operating reliability criteria of another RCA/BAA. Loss of small portions of the New England Transmission System (such as radial portions) may be tolerated provided they do not jeopardize the reliability of the remaining New England Transmission System and the Interconnection.⁴

This OP includes specific definitions, ratings, limits, and criteria for two categories of system conditions (NORMAL and EMERGENCY), as well as two associated levels of transmission transfer capabilities for the New England Transmission System. During NORMAL system conditions, a higher level of prescribed reliability is maintained. During EMERGENCY system conditions, a lower level of reliability is permitted to allow for increased operating flexibility.

For the purposes of this OP, “facility ratings” are the maximum or minimum voltage, current, frequency, or real or reactive power flow through a facility that does not violate the applicable equipment rating of any equipment comprising the facility. “Facility ratings” and “ratings” are used interchangeably throughout this OP. Facility ratings are provided by each TO.

For the purposes of this OP, “facility limits” or “limits” are the ratings used for facilities in system operations. For example, a TO may offer a facility thermal

⁴ Interconnection is defined in the Glossary of Terms Used in NERC Reliability Standards.

rating for a transmission line, but once the thermal rating is put into use by the TOP, that facility rating becomes a facility limit. TOs provide ratings, while TOPs provide limits. A TOP may directly provide a facility limit to ISO.

For the purposes of this OP, “criteria” are applicable guidelines or rules used when establishing limits. Examples of criteria are the rules applied to establish stability limits (i.e., no loss of synchronism, acceptable damping and post-fault voltage performance). Criteria are not ratings or limits.

This OP utilizes the following thermal capacity ratings for transmission facilities, as described in ISO Planning Procedure No. 7, Procedures for Determining and Implementing Transmission Facility Ratings in New England (PP7):

- Normal Rating (Normal)
 - Normal is a continuous 24-hour rating
- Long Time Emergency Rating (LTE)
 - LTE is a 12-hour summer rating and 4-hour winter rating
- Short Time Emergency Rating (STE)
 - STE is a 15-minute rating
- Drastic Action Limit (DAL)
 - DAL is a 5-minute rating

The use of these ratings requires the pre-contingent facility loading to be at or below the Normal rating and that the facility loading be returned to or below the Normal rating after the daily load cycle. For the New England Transmission System, a load cycle is defined as:

- A continuous 12-hour period during the summer
- A continuous 4-hour period during the winter

Both summer (April 1 to October 31) and winter (November 1 to March 31) facility ratings are established for each of these categories of ratings. These categories of ratings are as prescribed in PP7, which contains the facility ratings methodology that is used by all TOs in the New England RCA/BAA.

For any facility that has two or more sets of thermal limits applicable (due to multiple TOs, for example), the most conservative thermal limits shall be used.

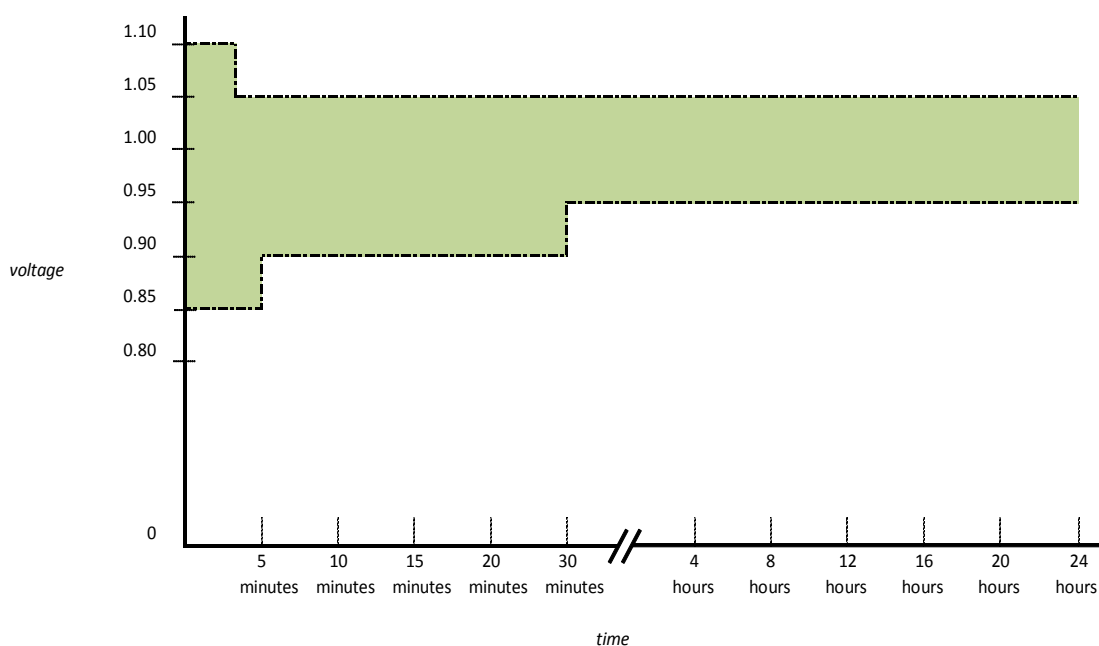
This OP utilizes the following high and low voltage limits for transmission substations, as supplied to ISO and the LCCs by the TOs:

- Normal Voltage Limit (NORMVL)
 - NORMVL is a continuous 24-hour voltage limit
- Long Time Emergency Voltage Limit (LTEVL)

- LTEVL is a voltage limit for a **minimum** of 30 minutes (duration provided by TO)
- Short Time Emergency Voltage Limit (STEVL)
 - STEVL is a 15-minute voltage limit
- Drastic Action Voltage Limit (DAVL)
 - DAVL is a 5 (five) minute voltage limit

Figure 1 below shows an example set of voltage limits, with both the allowed voltage level and acceptable time duration indicated in the figure. Operation at voltage levels and time durations within the shaded area, including the boundaries, is within the limits and reliable, and therefore does not result in an SOL exceedance. Operation at voltages and time durations outside of the shaded area may result in an SOL exceedance. For any facility that has two or more sets of voltage limits applicable (due to multiple TOs, for example), the most conservative limits shall be used by ISO and the LCCs. Appendix K to this OP, Operating Voltage Limits by LCC (OP-19K) and Master / Local Control Center Procedure No.15 - System Operating Limit Methodology, Attachment H (M/LCC 15H), Voltage SOL Identification Procedure, provides these limits

Figure 1
Voltage limit example



The set of voltage limits, NORMVL, LTEVL, STEVL, and DAVL, may include both “high” and “low” limits, but only the NORMVL set is required to include both “high” and “low” limits. Each set of NORMVL limits has a high and low limit, which together describe the voltage operating bandwidth using the NORMVL. The example, shown in Figure 1 above, shows a “high” NORMVL of 1.05 per unit and a “low” NORMVL of 0.95 per unit; it also shows an apparent LTEVL “low” limit of

0.90 per unit with no corresponding LTEVL “high” limit.

ISO and each LCC shall take actions to establish and maintain NORMAL system conditions. ISO and the LCCs shall avoid regular cycling between NORMAL and EMERGENCY system conditions and shall not intentionally position daily operations into EMERGENCY system conditions for first contingency coverage.

1. IROls and SOLs

ISO establishes limits for the most critical system operating parameters of the New England Transmission System which preclude, on a pre- and post-contingency basis, adverse impacts, as described above.

a. SOLs

An SOL is a value (such as MW, MVA_r, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating limits for a specified system configuration to operate within acceptable reliability criteria and ratings. ISO SOLs are based upon the following operating limits:

- Facility limits (applicable pre- and post-contingency equipment or facility limits)
- Transient stability limits (applicable pre- and post-contingency stability limits)
- System voltage limits (applicable pre- and post-contingency voltage limits, i.e. steady-state voltage limits)

In ISO determination of SOLs, the New England Transmission System conditions shall reflect:

(1) current or expected system conditions; and

(2) shall reflect changes to system topology such as facility outages, including outages of protection systems, and de-ratings.

ISO SOL methodology requires that SOLs provide New England Transmission System performance consistent with the following:

- In the pre-contingency state:
 - The New England Transmission System shall demonstrate acceptable transient, dynamic, stability, and voltage performance;
 - All facilities shall be within their facility limits (i.e., thermal, voltage, and stability limits).
- Following the single contingencies identified in Table 1 of Appendix J to this OP - Contingency List and Criteria/Limits (OP-19J):
 - The New England Transmission System shall demonstrate acceptable transient, dynamic, stability, and voltage performance;

- All facilities shall be operating within their facility limits and within their thermal, voltage, and stability limits; and
 - Cascading or uncontrolled separation shall not occur.
 - In determining the New England Transmission System response to a single contingency, the following are acceptable:
 - Planned or controlled interruption of electric supply to radial customers or some local network customers connected to, or supplied by, the faulted facility or by the affected area.
 - Interruption of other network customers, if the Real-Time operating conditions are more adverse than anticipated in the corresponding studies.
 - System reconfiguration through manual or automatic control or protection actions.
 - To prepare for the next contingency, ISO may take or direct one or more of the following actions to adjust the New England Transmission System: re-dispatch of generation, demand, and external transactions, and reconfiguration of the transmission system topology.
- b. IROLs

ISO and each LCC operate the New England Transmission System so that, in the pre- and post-contingent state, the system shall demonstrate thermal, voltage, and stability performance within accepted limits. Any SOL that has been identified by ISO to have an adverse impact beyond the New England Transmission System is considered to be an IROL. These IROLs require studies or post-event analysis for identification. Examples of unacceptable system performance that may result in an IROL include:

- System instability.
- An oscillatory or negatively damped system response.
- An inability to determine if a discrete bounded sub-area of the system is susceptible to voltage collapse or uncontrolled separation from the rest of the system.
- Analysis results that indicate the isolation of a sub-area supplying more than 1,200 MW to the rest of the system, or absorbing more than 1,200 MW of power from the rest of the system.
- Uncontrolled islanding is considered an IROL. Controlled islanding as a result of proper operation of a Remedial Action Scheme (RAS)⁵ or Special Protection System (SPS)⁶ to a contingency for which it was

⁵ Remedial Action Scheme is defined in the Glossary of Terms Used in NERC Reliability Standards

⁶ Special Protection System is defined in the Glossary of Terms Used in NERC Reliability Standards.

designed is not considered an IROL (e.g., islanding of Bangor, ME area and/or Maritimes transmission systems).

- An identified sub-area of the system, that includes portions of the New England Transmission System and/or another RCA/BAA, that is susceptible to an exceedance of voltage limits or voltage collapse. This determination shall be coordinated with the applicable Reliability Coordinator (RC)⁷ to determine if the event remains classified as an IROL.
- Facilities of another RCA that exceed their applicable facility limits for a contingency within the New England Transmission System. This determination shall be coordinated with the applicable RC to determine if the event remains classified as an IROL.

Changes in network load, topology, and generation dispatch may alter the system response to an event and make what is normally an SOL into an IROL, or make what is normally an IROL into an SOL. ISO methodologies for determining which SOLs are IROLs shall rely upon predictive analysis techniques and may utilize Day-Ahead/Real-Time information to assess the system.

2. Transmission System Analysis

Analysis and modeling of the New England Transmission System is required for reliable operation. ISO conducts next-day reliability analyses for the New England Transmission System for reliable operation in anticipation of NORMAL and EMERGENCY system conditions as well as contingency event conditions. ISO conducts contingency analysis studies to identify potential interface and other SOL/IROL exceedances.

Under NORMAL system conditions, the New England Transmission System is operated to a level of reliability such that the loss of a major portion of the system, or unintentional separation of a major portion of the system, would not result from any contingencies referred to in Table 1 of OP-19J. Under EMERGENCY system conditions, the New England Transmission System is operated to a level of reliability such that the loss of a major portion of the system, or unintentional separation of a major portion of the system, will not result from any contingencies referred to in Table 2 of OP-19J.

B. Normal System

1. NORMAL System Conditions

The highest level of transmission reliability is achieved during NORMAL system conditions on the New England Transmission System. In general, this level of reliability is accomplished by satisfying NORMAL ratings, criteria and limits for a wide range of contingencies (NORMAL System Contingencies, as described in Section II.B.3 of this OP and defined in Table 1 of OP-19J) using a limited set of operator actions (NORMAL System

⁷ Reliability Coordinator is defined in the Glossary of Terms Used in NERC Reliability Standards.

Actions, as defined in Section II.B.4 of this OP). Information about simulating the contingencies is located in Table 3 of OP-19J.

2. NORMAL System Ratings, Criteria and Limits

NORMAL transfer capabilities are to be observed unless EMERGENCY system conditions are declared.

2.1. NORMAL System Thermal Limits

- a. For pre-contingency system conditions, including planned outages, transmission line and equipment loadings shall not exceed the Normal limit.
- b. NORMAL System Contingencies shall not cause, or result in, loadings beyond the STE limits. Flows between the LTE and STE limits must be reduced to or below the LTE limit as soon as possible but in a time not to exceed 15 minutes from the event. If studies show that operators would not be able to reduce flows to or below the LTE limit within 15 minutes, pre-contingent actions shall be taken such that following any NORMAL System Contingency flows can be reduced to or below the LTE limits within 15 minutes. Actions that may be taken pre or post-contingency to reduce flow are listed under NORMAL System Actions.

Previously established/provided DAL limits may be used only if authorized by the TOP whose transmission facilities would be affected and flows between the STE and DAL limits may be reduced to or below the LTE limit immediately and in a time not to exceed 5 minutes from the event.

After a contingency and all appropriate NORMAL System Actions are taken, the following shall occur:

- i. Flows shall return to or below the Normal limit within the appropriate SOL or IROL timer, if the next contingency results in flow exceeding the LTE limit but below the STE limit; or
- ii. Flows may remain between the Normal and LTE limits provided the next contingency does not result in flow exceeding the LTE limit; and
- iii. Loadings shall be returned to or below the Normal limit after the daily load cycle

If the TOP does not know if the next contingency would result in an IROL or SOL, then the IROL timer shall be used.

If ISO Operations staff determines that neither of the above flow requirements (i. or ii.) can be achieved after all appropriate NORMAL System Actions are taken, ISO shall consider implementation of EMERGENCY system conditions

- c. System condition allowances for switching activities that are typically

completed within 15 minutes are as follows:

- i. Pre-contingent system conditions during switching:
 - During the time period when switches are open, a transmission facility may not exceed the LTE limit
 - ii. Contingency protection during switching:
 - During brief switching activities (typically 15 minutes or less, but not to exceed 30 minutes), ISO shall only provide first-contingency coverage as long as restoring the outage is not the corrective action.
- d. Without prior approval to operate to the STE limits, NORMAL System Contingencies shall not cause, or result in, loadings on New York ISO (NYISO) transmission facilities, including NYISO - ISO-NE RCA/BAA tie lines, beyond the LTE limits.

2.2. NORMAL System Stability Criteria

- a. NORMAL System Contingencies shall not cause instability of any single unit, the system, or unacceptable system oscillations. When determining acceptable system response, applicable criteria shall be applied, including, but not limited to, post-transient voltage sag and damping.
- b. Following a NORMAL System Contingency, unless specific instructions describing alternate actions are in effect, system flows shall be adjusted such that manual reclosing or automatic reclosing of a faulted element may be carried out without affecting the stability of the New England Transmission System.
- c. Without prior approval to operate otherwise, NORMAL System Contingencies shall not cause, or result in, any neighboring RCA/BAA to exceed its stability criteria

2.3. NORMAL System Voltage Limits

- a. NORMAL System Contingencies shall not cause unacceptably high or low voltage in violation of limits or voltage collapse. The applicable voltage limits are described in OP-19K and Master / Local Control Center Procedure No.15 - System Operating Limit Methodology, Attachment E (MLCC 15E) Transmission System Voltage Criteria Exceptions.
- b. Without prior approval to operate otherwise, NORMAL System Contingencies shall not cause, or result in, any interconnected RCA/BAA to exceed its voltage limits

2.4. NORMAL System Miscellaneous Criteria

- a. Generation and transmission service is scheduled to provide the New England RCA/BAA load and operating reserve as prescribed in ISO New England Operating Procedure No. 8 - Operating Reserve and Regulation (OP-8) while covering NORMAL System Contingencies.

- b. An LCC may request more stringent operating limits. If such a request is made, ISO shall evaluate the request and honor it if there is no adverse system reliability consequence.

3. NORMAL System Contingencies

Table 1 of OP-19J identifies each type of contingency respected under NORMAL system conditions, if it is respected for SOLs or IROLs, and the appropriate thermal limits, voltage limits and stability criteria are applied. ISO shall respect these limits and criteria in Real-Time and in off-line system analyses. OP-19K describes the voltage limits that each LCC applies to its system by voltage class.

The following M/LCC 15 Attachments address specific identified contingencies, study methodologies and criteria, or their determination:

- a. Attachment A 345 Stuck Breaker Contingencies That Can Have Unacceptable Inter-Area Impacts (Confidential)
- b. Attachment B 345 kV Double Circuit Tower Contingencies (Confidential)
- c. Attachment C Contingency Impact Evaluation
- d. Attachment D Bus Fault Contingencies (Confidential)
- e. Attachment E Transmission System Voltage Criteria Exceptions
- f. Attachment H Voltage SOL Identification Procedure
- g. Attachment I Primary and Secondary Voltage ICCP IDs
- h. Attachment K Voltage Task Force Work Scope

4. NORMAL System Actions

ISO and each LCC shall continuously assess system conditions and implement the NORMAL System Actions described below to maintain or restore transmission reliability to NORMAL system conditions. Actions for SOL and IROL contingencies within the New England RCA/BAA shall use the following NORMAL System Actions as required:

- a. Adjusting Phase Shifting Transformers (PSTs)

PSTs may be adjusted, pre or post-contingent, to achieve a desired post-contingent flow result.

- b. Adjusting Reactive Flows

Reactive flow may be adjusted through changes to shunt reactive devices (capacitors or reactors), adjustments to load tap changing transformers using manual operator action, or changes to generator/reactive device voltage schedule setpoints or bandwidths to achieve a desired post-contingent voltage result.

c. Weather-Sensitive Transmission Facility Ratings

There are times when actual ambient conditions (temperature and wind speed) are significantly different from those used to establish standard seasonal facility ratings. During those times, the use of temporary ratings based on actual ambient conditions may be warranted. Depending on the ambient conditions, the temporary ratings may be higher or lower than the standard seasonal facility ratings. When such weather conditions exist and a transmission facility is limiting, ISO, the appropriate LCC or appropriate TO shall identify the need for a temporary transmission facility limit based on actual weather conditions. In cases where the TO has supplied pre-defined weather sensitive ratings, ISO and the appropriate LCC shall use such ratings after the LCC and/or TO has gathered/established the actual weather conditions. If pre-defined weather sensitive ratings are not available, the appropriate LCC shall inform the involved TO of the circumstances. The TO may elect to provide the appropriate LCC with temporary ratings along with any pertinent qualifications for their use. The appropriate LCC shall forward and document all temporary rating information to ISO. Such temporary ratings shall then be used in operations as limits for the time period specified by the TO or until rescinded by the TO.

d. Deviation from Economic Dispatch

If the local area cannot be protected by economic dispatch, ISO and each LCC shall use a non-economic dispatch if it would provide improved system security. ISO shall deviate from economic dispatch and schedule resources to maintain NORMAL system transmission reliability.

e. Use of an RAS/SPS or the Preplanned Opening of a Circuit Breaker

Where possible, with ISO approval, the LCC shall arm each RAS/SPS that would relieve transmission limitations. When adequate facilities are not available, an RAS/SPS may be employed to maintain system security. When operating as designed, it is acceptable for an RAS/SPS to interrupt flows on a system element if loading is in excess of an element DAL limit.

f. Manually set up the tripping of a generator or a Dispatchable Asset Related Demand (DARD)

This preplanned option of opening a circuit breaker is limited to a situation where previously documented studies have demonstrated that the breaker opening reliably mitigates the specific existing operating condition and does not result in the loss of single-contingency protection for another contingency/facility.

g. Switch Transmission Elements

This action (open or close an element to relieve transmission constraints) may only be implemented when documented studies have demonstrated that the element opening or closing reliably relieves the specific existing condition and does not result in the loss of protection for another

contingency/facility and are agreed to by all applicable TOPs.

h. OP-4 Actions

Implement selected actions from OP-4 (Normal Actions of OP-4 include Actions 1 through 5). These actions use generator maximum capabilities, voluntary load curtailment of Market Participant's facilities, capacity/energy purchases, contracted customer generation and depletion of 30-minute reserves.

i. Use of Enhanced Facility Ratings or Limits

With the exception of all IROLs, if an SOL cannot be protected after utilizing the applicable NORMAL System Actions (a through h above), a TO or TOP may elect to modify the limiting thermal or voltage limit with an enhanced rating or limit to mitigate a Real-Time or post-contingent exceedance. When such a limit is provided for a post-contingent exceedance, the LCC shall provide a post-contingent action plan for contingency protection. All coordination required with the impacted TO/s to provide contingency protection with enhanced ratings or limits and a post-contingent action plan for the SOL is the responsibility of the LCC. All enhanced ratings or limits and post-contingent action plans used under this provision shall be communicated to ISO electronically prior to implementation. Use of a recorded line is acceptable for these purposes. Written documentation of the enhanced ratings or limits and action plans shall be provided to ISO in a timely manner, not to exceed 24 hours. If this option is not taken or is insufficient, pre-contingent load shedding (OP-7) shall be required.

C. Emergency System

1. EMERGENCY System Conditions

The system is in an EMERGENCY system condition if any of the NORMAL system ratings criteria or limits, as defined in Section II.C.2 of this OP, are exceeded. Recognizing the limited exposure to EMERGENCY system conditions, a revised set of contingencies is respected provided that ISO has initiated all appropriate NORMAL System Actions to restore NORMAL system ratings criteria or limits. This level of protection meets EMERGENCY System Criteria for a less stringent set of contingencies (EMERGENCY System Contingencies, as described in Section II.C.3 of this OP and as defined in Table 2 of OP-19J) using EMERGENCY System Actions (as defined in Section II.C.4 of this OP). Exposure to EMERGENCY system conditions that do not meet EMERGENCY system ratings, criteria or limits shall not exist for more than 30 minutes for an IROL. The set of contingencies respected under EMERGENCY system conditions is described in Table 2 of OP-19J. Information about simulating the contingencies is located in Table 4 of OP-19J.

2. EMERGENCY System Ratings, Criteria and Limits

2.1. EMERGENCY System Thermal Limits

- a. After a contingency ,and after TOPs take all appropriate EMERGENCY System Actions, the TOPs shall take actions so that:
 - i. Flows shall return to the Normal limit or below within the appropriate SOL or IROL timer if the next contingency results in flow exceeding the LTE limit but below the STE limit or
 - ii. Flows may remain between the Normal and LTE limits provided the next contingency does not result in flow exceeding the LTE limit
 - iii. Loadings shall be returned to the Normal limit or below after the daily load cycle
- b. If the TOP does not know if the next contingency would result in an IROL or SOL, then the TOP shall use the IROL timer.

2.2. EMERGENCY System Stability Criteria

- a. EMERGENCY System Contingencies shall not cause instability of any single generator or the system, or unacceptable system oscillations. When determining acceptable system response, the Operations engineer or TOP shall apply appropriate criteria, such as post-transient voltage sag and damping.
- b. Following an EMERGENCY System Contingency, unless specific instructions describing alternate actions are in effect, the TOP shall adjust system flows such that manual reclosing or automatic reclosing of a faulted element may be carried out without affecting the stability of the New England Transmission System.
- c. Without prior approval to operate otherwise, EMERGENCY System Contingencies shall not cause, or result in, a neighboring RCA/BAA exceeding its stability criteria.

2.3. EMERGENCY System Voltage Limits

- a. EMERGENCY System Contingencies shall not cause unacceptably high or low voltage in violation of Limits or voltage collapse. The applicable voltage limits are described in OP-19K and M/LCC 15E.
- b. Without prior TOP approval to operate otherwise, EMERGENCY System Contingencies should not cause, or result in, a neighboring RCA/BAA exceeding its voltage limits.

2.4. EMERGENCY System Miscellaneous Criteria

- a. In EMERGENCY system conditions, ISO shall maintain generation and transmission facilities adequate to supply the New England RCA/BAA customer electricity demand and energy requirements and at least minimum reserve requirements (10-minute requirements) as prescribed in OP-8 while covering only EMERGENCY System Contingencies.
- b. An LCC may request more stringent system operating limits. If such a request is made, ISO shall evaluate the request and honor it if there is no

adverse system reliability consequence.

3. EMERGENCY System Contingencies

Table 2 of OP-19J identifies each type of contingency respected under EMERGENCY system conditions, if it is respected for SOLs or IROLs, and the appropriate thermal limits, voltage limits and stability criteria are applied. ISO respects these limits and criteria in Real-Time and in off-line system analyses. OP-19K describes the pre and post-contingency voltage limits that each LCC applies to its system by voltage class. M/LCC15E documents the exceptions to the voltage limits noted in OP-19K.

4. EMERGENCY System Actions

TOPs shall take EMERGENCY System Actions to maintain or restore system conditions to at least those prescribed for operations under EMERGENCY system conditions. In general, all appropriate and timely NORMAL System Actions shall be exhausted before taking EMERGENCY System Actions. TOPs shall take EMERGENCY System Actions before NORMAL System Actions if the NORMAL System Actions cannot be completed in time to relieve a thermal overload above the LTE limit, prevent voltage collapse, or restore protection for EMERGENCY System Contingencies within 30 minutes for an IROL. TOPs shall take any unused long-term NORMAL System Actions to allow for the cancellation of EMERGENCY System Actions.

EMERGENCY System Actions may be needed to meet EMERGENCY system ratings, criteria or limits even though a contingency has not occurred. TOPs shall take such pre-contingency EMERGENCY System Actions when NORMAL System Actions are exhausted or cannot be completed in a timely manner and there would be insufficient time after an EMERGENCY System Contingency to contain the impact as an SOL.

TOPs shall also initiate pre-contingency EMERGENCY System Actions when a potential EMERGENCY System Contingency threatens to cause an IROL violation. TOPs shall also take pre-contingency EMERGENCY System Actions when a potential EMERGENCY System Contingency poses the same threats to any RCA/BAA outside of New England or jeopardizes the reliability of the Eastern Interconnection.

Operations department management at ISO and at each appropriate LCC, to the extent that time permits, shall consult with affected TOs when developing pre-contingency strategies.

The following is a list of EMERGENCY System Actions:

a. Transmission Element Switching Actions

Where it is clear that opening a transmission facility would alleviate a problem that exists for a specific emergency situation, TOs shall give consideration to opening such facility. TOPs shall initiate this action, without pre-determined studies, documentation, and authority only to prevent more severe EMERGENCY System Actions and shall immediately report such action to the TO.

b. OP-4 and OP-7 Actions

- i. ISO shall implement selected actions from OP-4 (i.e., Emergency Actions of OP-4 include Actions 6 through 11). These actions use voltage reductions, additional use of generator maximum capabilities, appeals for customer generation not contractually available to Market Participants, voluntary load curtailment (large industrial and commercial customers, radio and television appeals) and notices to state Governors to reinforce Power Warning appeals (as defined in OP- 4).
- ii. OP-7 Action - Load shedding

c. Planned Immediate Post-Contingency EMERGENCY System Actions

If an EMERGENCY System Contingency does not risk system stability but would result in low or gradually declining voltages or thermal loadings between STE and DAL, ISO shall establish specific voltage reduction or load shedding plans before the contingency for implementation immediately after the contingency. ISO shall establish and coordinate post-contingency EMERGENCY System Actions with each appropriate LCC before the need for implementation arises. If automatic devices are being used, each appropriate LCC shall confirm to the ISO the automatic device actions to be completed in a matter of cycles or seconds after the contingency. ISO shall complete manual actions as soon as possible after the contingency. ISO shall reduce post-contingent loadings between STE and DAL below LTE as soon as possible and in a time not to exceed 5 minutes from the event.

d. Use of Enhanced Facility Ratings or Limits

With the exception of all IROLs, if an SOL cannot be protected after using the applicable EMERGENCY System Actions (a through c), a TO may elect to modify the limiting thermal or voltage limit with an enhanced rating or limit to mitigate a Real-Time or post-contingent exceedance. When such a limit is provided for a post-contingent exceedance, the LCC shall provide a post-contingent action plan for contingency protection. All coordination required with the impacted TO/s to provide contingency protection for the SOL is the responsibility of the LCC. The LCC shall electronically communicate all enhanced ratings or limits and post-contingent action plans used under this provision to ISO prior to implementation. The use of a recorded line is acceptable for these purposes. The LCC shall provide written documentation of the enhanced ratings or limits and action plans to ISO in a timely manner, not to exceed 24 hours. If enhanced facility ratings or limits are not used or are insufficient, ISO shall implement pre-contingent load shedding pursuant to OP-7.

D. Post-Contingency Operation

If a contingency involves the loss of a transmission element(s), LCC operators should attempt to reclose the element(s) within 5 minutes unless otherwise

specified in specific policies and/or procedures. If reclosure is unsuccessful, or the contingency involved the loss of generation or load, ISO operators shall assess system conditions and perform appropriate NORMAL and EMERGENCY System Actions to restore NORMAL and EMERGENCY system conditions. When possible, ISO shall restore coverage for NORMAL System Contingencies using NORMAL System Actions.

ISO and LCC post-contingency actions shall meet the following time requirements:

- Rapidly declining critical transmission voltages shall be stabilized as quickly as possible (within one or two minutes) and returned to operation within system voltage limits using pre-determined NORMAL and/or EMERGENCY System Actions.
- Post-contingent transmission facility thermal loadings between the STE and DAL limits shall be reduced below the LTE limit immediately and in a time not to exceed 5 minutes from the event using pre-defined NORMAL and/or EMERGENCY System Actions.
- Post-contingent transmission facility thermal loadings between the LTE and STE limits shall be reduced below the LTE limit as soon as possible and in a time not to exceed 15 minutes from the event using appropriate NORMAL and/or EMERGENCY System Actions.
- Post-contingent transmission facility thermal loadings between the Normal and LTE limits shall be reduced below the Normal limit as soon as possible and in a time not to exceed a load cycle using appropriate NORMAL and/or EMERGENCY System Actions.
- Coverage for EMERGENCY System Contingencies shall be restored within the appropriate time for an SOL/IROL using appropriate NORMAL System Actions and/or EMERGENCY System Actions.

III. OP-19 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
--	02/01/19	For previous revision history, refer to Rev 10 available through Ask ISO;
Rev 11	02/01/19	Annual review completed by procedure owner; References section, added new OP-24; Step II.B.3.f, deleted (due to MLCC 15 Att G being retired); Truncated the Revision History per SOP-RTMKTS.0210.0010 Section 5.6;
Rev 12	11/01/19	Globally made editorial changes consistent with current conditions, practices and management expectations; Section II.B.4.f and Section II.C.4.f, modified to clarify utilization of enhanced facility ratings or limits; Section II.B.4, Normal Actions, added adjusting of phase shifter transformers and adjusting reactive flow;
Rev 13	10/12/21	Annual review completed by procedure owner; Updated Reference section; Restated requirement for both High and Low NORMML Added Remedial Action Scheme (RAS) term Globally, processed formatting, attributions, grammar and composition changes to improve flow and conceptual continuity

IV. APPENDICES

- A. Retired (09/02/12)
- B. Retired (09/02/12)
- C. Retired (09/02/12)
- D. Retired (09/02/12)
- E. Extreme Contingencies
- F. Retired (09/02/12)
- G. Retired (09/02/12)
- H. Retired (09/02/12)
- I. Retired (09/02/12)
- J. Contingency List and Criteria/Limits
- K. Operating Voltage Limits by LCC