

ISO New England Operating Procedure No. 8 Operating Reserve and Regulation

Effective Date: December 10, 2018

REFERENCES:

North American Electric Reliability Corporation (NERC) Reliability Standard BAL-001 - Real Power Balancing Control Performance

North American Electric Reliability Corporation (NERC) Reliability Standard BAL-002 - Disturbance Control Standard - Contingency Reserve for Recovery from a Balancing Contingency Event

Northeast Power Coordinating Council Inc. (NPCC), Regional Reliability Reference Directory #5, Reserve

ISO New England Operating Procedure No. 4 - Action During a Capacity Deficiency (OP-4)

ISO New England Operating Procedure No. 7 - Action in an Emergency (OP-7)

ISO New England Operating Procedure No. 14 - Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources (OP-14)

ISO New England Operating Procedure No. 23 - Resource Auditing (OP-23)

ISO New England Inc. Transmission, Markets and Services Tariff, Section I, General Terms and Conditions (Tariff, Section I)

ISO New England Inc. Transmission, Markets and Services Tariff Section III, Market Rule 1 - Standard Market Design (Market Rule 1)

ISO New England Manual for the Regulation Market Manual M-REG (M-REG)

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PART I - INTRODUCTION

In addition to the resources required to meet the New England Reliability Coordinator Area/Balancing Authority Area (RCA/BAA) load, Operating Reserve is required to reliably operate the New England RCA/BAA. Operating Reserve requirements, address:

1. Loss of generating equipment within the New England RCA/BAA or within any other Northeast Power Coordinating Council Inc. (NPCC) RCA/BAA.
2. Loss of transmission equipment within or between NPCC RCA/BAAs that may result in a reduction of energy transfer capability within the New England RCA/BAA or between the New England RCA/BAA and any other RCA/BAA.
3. Regulation in the New England RCA/BAA.
4. Errors in forecasting New England RCA/BAA loads.

This Operating Procedure (OP) sets forth criteria for the establishment and administration of Operating Reserve and Regulation in the New England RCA/BAA.

The objective is to ensure that the New England RCA/BAA Bulk Electric System (BES) is operated at the level of reliability prescribed in North American Electric Reliability Corporation (NERC), NPCC and ISO New England (ISO) criteria.

PART II - DEFINITIONS

Some of the following terms are defined in Section I of the ISO New England Inc. Transmission, Markets and Services Tariff and have been included here for convenience. If there are any discrepancies between the definitions of those terms included below and the definitions in the Tariff, the Tariff controls.

First Contingency Loss - is the largest capability outage (MW) that would result from the loss of a single element.

Operating Reserve - means Ten-Minute Spinning Reserve (TMSR), Ten-Minute Non-Spinning Reserve (TMNSR) and Thirty-Minute Operating Reserve (TMOR)

Reliability Coordinator Area/Balancing Authority Area (RCA/BAA) - is an electric power system or combination of electric power systems to which a common automatic generation control scheme is applied in order to:

- (i) Match, at all times, the power output of the generators within the electric power system(s) and capacity and energy purchased from entities outside the electric power system(s) with the load within the electric power system(s);
- (ii) Maintain scheduled interchange with other RCAs/BAA's within the limits of Good Utility Practice;
- (iii) Maintain the frequency of the electric power system(s) within reasonable limits in accordance with Good Utility Practice and the criteria of the applicable regional reliability council or the North American Electric Reliability Corporation (NERC); and
- (iv) Provide sufficient generating capacity to maintain Operating Reserves in accordance with Good Utility Practice.

Regulation - is the capability of a specific Resource with appropriate telecommunications, control and response capability to respond to an AGC SetPoint. [Tariff, Section I]

Replacement Reserve - is described in Part III, Section VII of this OP

Reportable Events - are system disturbances involving losses of generation or transmission facilities, which equal or exceed the following criteria, are reportable events:

- Actual net (interchange) tie-line flow deviations equal to or greater than 500 MW
- Loss of generation equal to or greater than 500 MW
- System frequency deviations equal to or greater than ± 0.03 Hz within a period of five (5) seconds or less

Second Contingency Loss - is the largest capability outage (MW) that would result from the loss of a single element, after allowing for the First Contingency Loss.

Ten-Minute Reserve - is the sum of TMSR and TMNSR that is fully available within ten minutes from the time first requested.

Ten-Minute Non-Spinning Reserve (TMNSR) - is the reserve capability of:

- (1) a generating Resource that can be converted fully into energy within ten minutes from the request of the ISO;
- (2) a Dispatchable Asset Related Demand that can be fully utilized within ten minutes from the request of ISO to reduce consumption; or
- (3) a Demand Response Resource that can provide demand reduction within ten minutes from the request of the ISO.

Ten-Minute Spinning Reserve (TMSR) - is the reserve capability of:

- (1) a generating Resource that is electrically synchronized to the New England Transmission System that can be converted fully into energy within ten minutes from the request of the ISO;
- (2) a Dispatchable Asset Related Demand pump that is electrically synchronized to the New England Transmission System that can reduce energy consumption to provide reserve capability within ten minutes from the request of the ISO; or
- (3) a Demand Response Resource that has been dispatched that can provide demand reduction within ten minutes from the request of the ISO for which none of the associated Demand Response Assets have a generator whose output can be controlled located behind the Retail Delivery Point other than emergency generators that cannot operate electrically synchronized to the New England Transmission System.

Thirty-Minute Operating Reserve (TMOR) - means the reserve capability of:

- (1) a generating Resource that can be converted fully into energy within thirty minutes from the request of the ISO;
- (2) a Dispatchable Asset Related Demand that can be fully utilized within thirty minutes from the request of the ISO to reduce consumption; or
- (3) a Demand Response Resource that can provide demand reduction within thirty minutes from the request of the ISO.

PART III - PROCEDURE

I. REAL-TIME OPERATING RESERVE REQUIREMENTS

A. Ten-Minute Reserve Requirement

During normal conditions, ISO shall maintain a quantity of Ten-Minute Reserve at least equal to the amount required to replace the First Contingency Loss in the New England RCA/BAA multiplied by the Contingency Reserve Adjustment (CRA) Factor for the most recently completed quarter. ISO will increase its Ten-Minute Reserve requirement by the CRA Factor for the calendar quarter (offset by a month) if the Disturbance Control Standard (DCS)¹ is not met during a given quarter (e.g., for the first calendar quarter of the year, the penalty is applied for May, June and July). The CRA Factor is calculated as follows:

$$\text{CRA}_{\text{quarter}} = 2 - \{\text{the average percentage DCS (expressed as a decimal) for the quarter of measurement}\}$$

The energy associated with Regulation reserves (Section VI) that is available within ten (10) minutes may be utilized to satisfy the Ten-Minute Reserve Requirement. Every available Resource of generating capability, including select Regulation Resources, DARD pumps, and capability made available by other qualifying load management techniques shall be considered for activation in an effort to maintain the required ten-minute reserve at all times.

1. TMSR Requirement

One hundred percent (100%) of the New England RCA/BAA Ten-Minute Reserve Requirement shall be synchronized reserve except as described below.

To the extent that, in the judgment of the ISO's Chief Operating Officer or an authorized designee, the New England RCA/BAA BES can be operated within NERC, NPCC, and ISO-established reliability criteria and without unduly imposing more severe operating conditions (emergency starts, short-time running, etc.) on non-synchronized capability. The TMSR Requirement may be decreased to a minimum of twenty-five percent (25%) of the Ten-Minute Reserve Requirement based upon ISO past performance in returning tie-lines to pre-contingency values within fifteen (15) minutes following loss of generation, in accordance with the following relationship:

The TMSR Requirement may decrease by ten percent (10%) of the Ten-Minute Reserve Requirement for every time ISO successfully returns the New England RCA/BAA Area Control Error (ACE)² to pre-contingency values, or to zero, following a reportable event where the Resource loss is equal to or less than the magnitude of the First Contingency Loss. Successful recoveries that occur in the same

¹ Disturbance Control Standard is defined in the Glossary of Terms Used in NERC Reliability Standards

² Area Control Error ("ACE") is defined in the Glossary of Terms Used in NERC Reliability Standards.

month as a failure shall not be counted that month towards a reduced TMSR Requirement. However, successful recoveries subsequent to a failure can be counted in the next month provided there are no failures in that month.

The TMSR Requirement shall increase by twenty percent (20%) for every time ISO fails to return the New England RCA/BAA ACE to pre-contingency values or to zero (0) within fifteen (15) minutes following a reportable event, where the Resource loss is equal to or less than the magnitude of the First Contingency Loss. The maximum TMSR Requirement shall be one hundred percent (100%) of the New England RCA/BAA Ten-Minute Reserve Requirement.

Changes in the TMSR Requirement caused by ISO performance in returning the New England RCA/BAA ACE to pre-contingency values or to zero (0) within fifteen (15) minutes following a reportable event, where the Resource loss is equal to or less than the magnitude of the First Contingency Loss, shall be calculated at the end of each month and shall be applied at the beginning of the next month. The ISO's Chief Operating Officer or an authorized designee may increase the Ten-Minute Synchronized Reserve Requirement above the amounts specified by the above provisions. If warranted to ensure recovery from a contingency, and to comply with established criteria, ISO shall, to the extent possible, activate Operating Reserve based on economic priority. Should reliable operation of the power system require it, ISO shall, as it deems necessary, activate Operating Reserve.

During periods when system conditions threaten to reduce actual Ten-Minute Reserve and/or TMSR quantity below the current prescribed levels, the actual Ten-Minute Reserve and/or TMSR Requirement may be increased by System Operators to a value greater than 100% of the current requirement in order to maintain system reliability.

B. TMOR Requirement

In addition to the Ten-Minute Reserve Requirement, ISO shall maintain a quantity of TMOR at least equal to fifty percent (50%) of the Second Contingency Loss. Any excess Ten-Minute Reserve can be counted as Thirty-Minute Reserve.

During periods when system conditions threaten to reduce Ten-Minute Reserve below prescribed levels, TMOR shall be re-dispatched to maintain ten-minute reserve.

During periods when system conditions threaten to reduce actual TMOR quantity below the current prescribed levels, the actual TMOR Requirement may be increased by System Operators to a value greater than 100% of the current requirement in order to maintain system reliability.

C. Zonal Forward Reserve Requirements

Zonal Forward Reserve requirements are established for Reserve Zones and are further explained in Section III.9.2.2 of the Tariff. Zonal Forward Reserve requirements reflect the need for 30-minute contingency response to provide 2nd contingency protection for each import constrained Reserve Zone. Zonal Forward Reserve requirements can be satisfied only by resources that are located within a Reserve Zone and that are capable of providing 30-minute or higher quality reserve products.

II. OPERATING RESERVE DISTRIBUTION

Operating Reserve shall be distributed so that it can be fully utilized by ISO, for any probable contingency without exceeding transmission system limitations. This distribution shall also allow operation in accordance with NERC, NPCC, and ISO Manuals, operating policies and procedures.

III. OPERATING RESERVE RESTRICTIONS

ISO shall be responsible for designating the First Contingency Loss and the Second Contingency Loss in the New England RCA/BAA. Frequent review of system configurations shall be conducted so that all probable capability losses, that could be caused by a First Contingency Loss and resulting relay actions, are considered.

When a generating unit is the largest First Contingency Loss in the New England RCA/BAA, and therefore, used to calculate the Ten-Minute Reserve Requirement, the capability of the unit, in excess of its output, cannot be considered as Operating Reserve. However, when a generating unit is the largest Second Contingency Loss in the New England RCA/BAA, the net capability of the unit, in excess of its output, may be considered as Operating Reserve.

When allocating Operating Reserve to the various resources throughout the New England RCA/BAA, ISO shall pay particular attention to temporary limitations and de-ratings. Only that capability that can actually supply MW in the applicable period shall be classified as Operating Reserve.

Operating Reserve, if activated, shall be sustainable for at least one (1) hour from the time of activation or the published NERC/NPCC criteria. It is recognized that resources called upon to activate Operating Reserve will operate without relief until ISO determines that they are no longer needed.

IV. SHORTAGE OF OPERATING RESERVE

Normally, Operating Reserve shall be provided to prescribed levels of synchronized and non-synchronized reserve from within the New England RCA/BAA. If available capability is insufficient to provide adequate Operating Reserve, ISO shall implement the various Actions of ISO New England Operating Procedure No. 4 - Action During a Capacity Deficiency (OP-4), as appropriate to maintain Operating Reserve requirements. During shortages of Operating Reserve, TMOR shall be re-dispatched to maintain ten-minute reserve at the prescribed value.

If ISO is arranging to purchase available emergency capacity and energy, or energy only, in accordance with OP-4, and a shortage of Ten-Minute Reserve is forecast, ISO will recognize that voltage reduction load relief available in ten minutes (10) provides non-synchronized Operating Reserve.

TMNSR will be synchronized to the system and brought to TMSR status whenever ten-minute reserve falls below the full Ten-Minute Reserve Requirement.

V. OPERATING RESERVE - CAPABILITY UNDER TEST CONDITIONS

Frequently, some capability is used to supply energy needs while it is in a test condition. This test energy normally is not released for ISO dispatch and shall be added, megawatt-for-megawatt, to the Operating Reserve requirement. However, based on the assumed degree of risk for the sudden loss of the total energy, ISO may recognize the test energy risk as being similar to other non-test capability and count the test energy as firm. In such cases, Operating Reserve requirements need not be increased due to the test energy.

VI. REGULATION RESERVE REQUIREMENT

ISO shall maintain a portion of its synchronized capability on Regulation sufficient to satisfy the NERC Control Performance Standard.³ The specific Regulation requirements are identified in the Markets and Operations/ISO Express/Operations Reports/Generation section of the ISO New England website.

VII. REAL-TIME REPLACEMENT RESERVE REQUIREMENT

In addition to the Operating Reserve requirements, ISO shall maintain a quantity of Replacement Reserve in the form of additional TMOR for the purposes of meeting the NERC requirement to restore its ten-minute reserve.

ISO will not activate emergency procedures, such as OP-4 or ISO New England Operating Procedures No. 7 - Action in an Emergency (OP-7), in order to maintain the Replacement Reserve Requirement.

To the extent that, in the judgment of the ISO's Chief Operating Officer or an authorized designee, the New England RCA/BAA may be operated within NERC, NPCC, and ISO established criteria, the Replacement Reserve requirement may be decreased to zero based upon the ISO's capability to restore ten-minute reserve to be within the NERC requirements.

VIII. TESTING OF RESPONSE RATES

As outlined in ISO New England Operating Procedure No. 23 - Resource Auditing (OP-23), ISO has the responsibility to conduct tests of response rates of both synchronized and non-synchronized Resources.

The ability of resources to demonstrate Operating Reserve capability shall be tested at regular intervals. ISO shall attempt to coordinate these tests within system conditions and Market Participants' normal testing practices.

³ Control Performance Standard is defined in the Glossary of Terms Used in NERC Reliability Standards

IX. RESPONSIBILITY

ISO is responsible for operating the New England RCA/BAA in accordance with established NERC, NPCC, and ISO criteria. This includes the responsibility for determining when Operating Reserve above minimum levels prescribed shall be retained. Further, ISO is responsible for determining how best to meet Regulation criteria and to manage tie-line flows, including flow deviations resulting from contingencies.

ISO is also responsible for identifying the First Contingency Loss and the Second Contingency Loss; for determining the required amount of Operating Reserve; for specifying the type, location, and quantity to be maintained; for selecting the number of resources as well as the location of resources to be assigned to Regulation; for determining the required amount of Replacement Reserve, and for communicating to the resources for activating Operating Reserve in response to contingencies in the New England RCA/BAA and/or external NPCC RCAs/BAAs.

LOCAL CONTROL CENTERS (LCCs)/MARKET PARTICIPANTS (MPs) are responsible for communicating to ISO current system conditions affecting Operating Reserve. The LCCs/MPs are also responsible for activating Operating Reserve for localized problems within a local area when time does not permit communication with ISO. When Operating Reserve is used by any LCC, ISO is to be notified as soon as practicable, and ISO shall take action to restore Operating Reserve as soon as possible.

OP-8 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
--	01/17/17	For previous revision history, refer to Rev 10 available through Ask ISO;
Rev 10.1	05/29/15	Part III.Section I, corrected typo (removed duplication of the TMOR definition language contained in Part II that was inadvertently made during formatting changes made in a previous version);
Rev 10.2	01/17/17	Periodic review performed requiring no changes; Made administrative changes required to publish a Minor Revision (including adding required corporate document identity to all page footers and Truncated the Revision History per SOP-RTMKTS.0210.0010 Section 5.6;
Rev 11	09/21/17	References Section, corrected NPCC Directory 5 title, added Tariff Section I; Part II, Added disclaimer for definitions, Updated Reserve Definitions to incorporate the new definitions for "Regulation", "TMNSR", "TMSR", and "TMOR" from Tariff Section I.
Rev 12	12/10/18	Periodic review performed by procedure owner: Change this OP Next Review Date to reflect an annual review as opposed to a biennial review (based on audit for BAL-002-2(i) and the auditors strongly suggesting that OP-8 periodic review be updated to annual); Corrected Reference titles; Globally editorial changes to be consistent with current conditions, practices and management expectations;