NPCC, Inc.

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May 10, 2012

Subject: Posting for Open Process Review-NPCC Regional Reliability Reference Directory 5, "Reserve"

Sir/Madam,

The NPCC Task Force on Coordination of Operation (TFCO) has approved a subsequent posting for public comment of a draft revision to NPCC Regional Reliability Reference Directory 5, "Reserve." The intent of this draft is to address the remaining issue surrounding the Simultaneous Activation of Reserve (SAR), the implementation of SAR when the initiating event is a radial source contingency. The TFCO has previously addressed the comments received during the first posting of the document, which concluded on January 30, 2012. All comments for this second posting must be submitted electronically through the NPCC Web site, and comments will be received for forty-five days through **Monday, June 25, 2012**. All comments will be addressed by the Task Force on Coordination of Operation.

The NPCC Open Process Review may be accessed through the following link:

**https://www.npcc.org/Standards/SitePages/DevStandardDetail.aspx?DevDocumentId=110**

The posted document is a marked draft with revisions noted in red text. All comments received will be addressed by the NPCC Task Force on Coordination of Operation.

Thank you for your assistance.

Very truly yours,

*J. G. Mosier, Jr.*

John G. Mosier, Jr.
Assistant Vice President-System Operations

JGM:cd

cc: Ms. Jennifer Budd Mattiello
Mr. Edward A. Schwerdt
Members, NPCC Task Force on Coordination of Operation

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**Marked Draft for Open Process Review**
**May 10. 2012**

# NPCC
# Regional Reliability Reference Directory # 5
# Reserve

| Task Force on Coordination of Operations Revision Review Record: |
|---|
| **December 2nd, 2010** |
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Adopted by the Members of the Northeast Power Coordinating Council, Inc. this December 02, 2010, based on recommendation by the Reliability Coordinating Committee, in accordance with Section VIII of the NPCC Amended and Restated Bylaws dated July 24, 2007 as amended to date.

## Revision History

| Version | Date | Action | Change Tracking (New, Errata or Revisions) |
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## Table of Contents

# 1.0 Title **Reserve**

## 1.1 Directory Number 5

## 1.2 Objective

The purpose of this Directory is to present the requirements with which the applicable entity must plan for and deploy adequate **reserve**. This Directory provides minimum requirements governing the amount, availability, distribution, and activation of **reserve** in addition to those specified in applicable NERC standards.

## 1.3 Effective Date **MM DD, YYYY**

## 1.4 Background

This Directory was developed from the NPCC A-6 Operating Reserve Criteria document. Guidelines and procedures for consideration in the implementation of this Directory are provided in the Appendices. Content from various NPCC B and C documents was used in both the body of this Directory and in the Appendices.

## 1.5 Applicability

### 1.5.1 Functional Entities

Balancing Authorities
Reliability Coordinators
Load Serving Entities
Generator Owners

## 2.0 Terms Defined in this Directory

NPCC-defined terms found in this Directory appear in bold typeface and can be found in the NPCC Glossary.

## 3.0 NERC ERO Reliability Standard Requirements

The NERC ERO Reliability Standards containing requirements that are associated with this Directory include, but may not be limited to:

BAL-001
BAL-002
BAL-003
BAL-005
EOP-002

## 4.0 NPCC Regional Reliability Standard Requirements

None.

## 5.0 NPCC Full Member, More Stringent Criteria

In the continuous operation of electric power systems, **operating capacity** is required to meet forecast demand, including an allowance for error, to provide protection against equipment failure which has a reasonably high probability of occurrence, and to provide adequate regulation of frequency and **tie line** power flow. The **operating capacity** in excess of that required for actual load is commonly referred to as **reserve.**

### 5.1 **Ten-Minute Reserve** Requirements

NPCC **ten-minute reserve** meets the requirement for the contingency reserve within the NERC standards. Each Balancing Authority shall have **ten-minute reserve** available to it that is at least equal to its **first contingency loss. Ten-minute reserve** shall be sustainable as specified in section 5.13.

### 5.2 Restoration of **Ten-Minute Reserve**

If a Balancing Authority becomes deficient in **ten-minute reserve** or forecasts a deficiency without counting the contribution of either curtailment of interruptible loads that is not part of normal operations, and/or public appeals:

5.2.1 It shall restore its ten-minute reserve as soon as possible and within the duration specified by the appropriate NERC standard.

5.2.2 If 5.2.1 cannot be achieved, minimize the magnitude and duration of **ten-minute reserve** deficiency.

Refer to Appendix 3, Section 3.1 for guidance on the restoration of ten-minute reserve.

If the actions identified in Appendix 3 do not fully restore **ten-minute reserve** within the specified duration, see Directory 2, "Emergency Operations," to determine additional actions required.

## 5.3 **Thirty-Minute Reserve** Requirements

Each Balancing Authority shall have **thirty-minute reserve** available to it that is at least equal to one-half its **second contingency loss**. **Thirty-minute reserve** shall be sustainable as specified in section 5.13.

## 5.4 Restoration of **Thirty-Minute Reserve**

If a Balancing Authority is deficient in **thirty-minute reserve** for four hours, or if it forecasts a deficiency of any duration beyond a four hour horizon, refer to Appendix 3, Sections 3.6 and 3.7 for guidance on the restoration of **thirty-minute reserve**.

No further corrective actions are required if the actions in Appendix 3, Sections 3.6 and 3.7, do not restore **thirty-minute reserve**.

## 5.5 Requirement for **Synchronized Reserve** Available Within Ten Minutes

Requirements for **synchronized reserve** available within ten minutes for NPCC Balancing Authorities shall be based on demonstrated performance. The requirements shall not be more than 100% or less than 25% of the **ten-minute reserve** requirement.

### 5.5.1 Computing Adjustments to the Requirement of **Synchronized Reserve** Available Within Ten Minutes

The requirement for **synchronized reserve** available within ten minutes shall be adjusted based upon the Balancing Authority's past performance in returning its Area Control Error (ACE) to pre-contingency values, or to zero, within fifteen minutes following loss of resource, in accordance with the following relationship:

- The requirement for **synchronized reserve** available within ten minutes shall be reduced to a minimum of 25 percent of the **ten-minute reserve** requirement in steps of 10 percent of the **ten-minute reserve** requirement for every time a Balancing Authority successfully returns its ACE to pre-contingency values, or to zero, following successful recoveries for events meeting or exceeding the NPCC reportable event threshold. Successful recoveries that occur in the same month as a failure shall not be counted in that month towards a reduced synchronized reserve requirement. However, successful recoveries subsequent to a failure can be counted in the next month provided there are no failures in that month.

- The requirement for **synchronized reserve** available within ten minutes shall increase by 20 percent of the **ten-minute reserve** requirement for every time a Balancing Authority fails to return its ACE to pre-contingency values or to zero within fifteen minutes when a contingent Balancing Authority experiences a contingency whose size is greater than or equal to the NPCC Reportable Event Threshold but less than the NERC Disturbance Control Standard default reporting threshold of 80% of the **first contingency loss**. The maximum requirement for **synchronized reserve** available within ten minutes shall be 100 percent of the Balancing Authority's **ten-minute reserve** requirement.

- Changes in the requirement for **synchronized reserve** available within ten minutes shall be calculated within twenty days after the end of each month. The new requirement for **synchronized reserve** available within ten minutes is applied on the first calendar day of the new month following the calculation of the new requirement and shall remain in effect for the full month.

5.5.2 Restoration of **Synchronized Reserve** Available Within Ten Minutes

If a Balancing Authority becomes deficient in the NPCC requirement for **synchronized reserve** available within ten minutes, it shall be restored according to the time constraints specified for **ten minute reserve**. If a Balancing Authority becomes deficient in meeting its requirement for **synchronized reserve** available within ten minutes, Appendix 3 provides guidance for eliminating the deficiency.

5.6 Distribution of **Reserve**

**Reserve** available to a Balancing Authority shall be distributed so as to ensure that it can be utilized without exceeding individual element ratings or transfer limitations.

## 5.7 Activation of Inter-Balancing Area **Reserve**

When a Balancing Authority acquires **reserve**, through direct procurement, bilateral or multi-lateral operating agreements, or through reserve sharing agreements from another Balancing Authority, the provider of the **reserve** shall deliver an increase in energy equal to the amount of **reserve** acquired when the acquiring Balancing Authority requests its activation. Unless the provider experiences its own contingency, it shall not initiate the curtailment of an existing or planned energy sale to any Balancing Authority to support the activation of the **reserve** that was acquired until the contingent Balancing Authority has recovered from the contingency. **Reserve** acquired from another Balancing Authority shall be sustainable as specified in section 5.13.

Inter-Balancing Area **reserve** may be acquired by NPCC Balancing Authorities beyond that specified in section 5.8. All activations of inter-Balancing Area **reserve** are subject to the following constraints:

- Decision-making related to the specific resources to be activated to provide inter-Balancing Area **reserve** is restricted to the affected Balancing Authorities.

- Due to the potential difficulties in managing interchange schedules in a timely and consistent manner and in monitoring the deliverability of inter-Balancing Area **reserve** with intermediary Balancing Authorities and Reliability Coordinators, the provision of inter-Balancing Area **reserve** shall be limited to adjacent Balancing Authorities only, unless specifically facilitated by an approved NPCC procedure or multilateral Balancing Authority/Reliability Coordinator procedure.

- The activation of inter-Balancing Area **reserve** shall be implemented by either step changes to interchange schedules, by normal ramping of interchange schedules or by dynamic transfers. Where dynamic transfers are used to activate inter-Balancing Area **reserve**, it must be agreed to by the affected Balancing Authorities, and approved by the TFCO. Host and acquiring Balancing Authorities and Reliability Coordinators may establish and document further restrictions for these activation techniques.

- If inter-Balancing Area **reserve** is utilized for a Disturbance Control Standard recovery or an NPCC **reportable event**, it shall be activated within 5 minutes of the disturbance.

- The Balancing Authority acquiring **reserve** from a host Balancing Authority shall continually update the host Balancing Authority and affected Reliability

Coordinators with any changes to the scheduling of inter-Balancing Area **reserve**.

- When inter-Balancing Area **reserve** is activated, the acquiring Balancing Authority notifies the host Balancing Authority to agree on interchange schedule modifications, and the host Balancing Authority activates the **reserve**. **Reserve** activation is subject to the concurrence of the affected Reliability Coordinators.

- When an energy transaction associated with Inter-Balancing Area **reserve** terminates at the end of a scheduling period (i.e., the **reserve** is not scheduled in the subsequent scheduling period), the Balancing Authorities participating in the transaction shall agree on the terms of the schedule change in advance. As a minimum, these terms shall address the start time, ramp rate, and duration of the curtailment of the **reserve** being delivered.

## 5.8 Simultaneous Activation of **Ten-Minute Reserve**

Simultaneous activation of **ten-minute reserve** (SAR) is a program in which two or more Balancing Authorities agree to individually maintain but jointly activate **ten-minute reserve** to facilitate a more rapid recovery from an NPCC Reportable Contingency (500 MW or greater; 300 MW or greater for New Brunswick) or for stressed system conditions. Balancing Authority participation in SAR is contingent on submission of the form located in Appendix 7 and approval by Task Force on Coordination of Operation. This form will also be used to indicate if a Balancing Authority wishes to act as the SAR Coordinator for the SAR program, contingent upon the approval of TFCO. All participating Balancing Authorities in the SAR program shall form an electrically contiguous area. Adjacent and directly connected non NPCC Balancing Authorities may participate in the Simultaneous Activation of Ten- Minute Reserve program described in this Directory.

Given that **reserve** is not shared under this arrangement, the SAR program is not a Reserve Sharing Group as defined by NERC.

Recovery from a large loss of resource(s) can be achieved faster by simultaneously activating **ten-minute reserve** in several Balancing Areas. Assisting Balancing Authorities provide SAR energy by implementing schedule changes with a zero ramp time, assuring that the reserve being activated responds as quickly as possible. Simultaneous activation of **ten minute reserve** is implemented in order to:

- more quickly relieve the initial stress placed on the interconnected transmission system following a large loss of **generation** or energy purchase

- effect an improvement in **reliability** achieved by the faster recovery
- assist in achieving compliance with the NERC Disturbance Control Standard (DCS)
- provide relief for transmission overloads, low voltage, or other abnormal conditions which evolve over time without an actual contingency, but might not otherwise be relieved by normal **reserve** pickup response**.**

When the resource loss is a generator, the contingent Balancing Authority's loss equals the total output of the generator irrespective of any energy or capacity sales from that generator to any other Balancing Authority. See Appendix 4 for guidance related to resource losses that occur at a specific point of delivery, and the source Balancing Authority cannot deliver energy on another path.

Balancing Authorities that participate in the Simultaneous Activation of Reserve program shall do so in accordance with the requirements in sections 5.8.1 through 5.8.6 below. Contingent Balancing Authorities are solely responsible for their DCS recovery.

5.8.1 Preliminary **Reserve** Assessment

On a continuing basis, participating Balancing Authorities shall keep the SAR Coordinator(s) informed of the largest, single **generation** or import energy transaction **contingency** in their respective Balancing Areas.

Information pertaining to a Balancing Authority's inability to participate in SAR shall be reported to the SAR Coordinator by the participating Balancing Authorities.

5.8.2 Notification of Contingency

A participating Balancing Authority may choose to implement the SAR program if it experiences a loss of **generation** or imported energy transactions equal to or greater than an NPCC **reportable event**, or for stressed system conditions.

A participating Balancing Authority that suffers a contingency meeting the activation threshold and wishes to receive SAR assistance shall report the following information to the SAR Coordinator via the direct telephone lines:

- Time T+0 (see below)
- If applicable, name of generating resource and megawatts lost

- If applicable, name of energy purchase and megawatts lost
- Megawatts of assistance requested including that provided by the Contingent Balancing Authority
- Cause of SAR request.

For a loss of resource, T+0 is estimated to be consistent with the time specified in section 5.17 below, rounded to the nearest minute. This estimate is for event identification purposes only, and the T+0 used for compliance determination will be performed after-the-fact, consistent with section 5.17 below. For system conditions not directly associated with a contingency, it is the time of the request for SAR assistance.

The contingent Balancing Authority shall request SAR assistance, providing sufficient time for the SAR Coordinator to distribute the shares, and for the assisting Balancing Authorities s to implement the schedule changes within five minutes of the contingency, allowing for a full 10 minutes to provide the reserve assistance assigned prior to the expiration of the 15 minute NERC Disturbance Recovery Period. This time constraint also applies for NPCC **reportable events** that are less than the Disturbance Control Standard reporting threshold.

5.8.3 Allocation of SAR

The SAR Coordinator shall assign 100% of the contingency to the Contingent and Assisting Balancing Authorities collectively. The SAR Coordinator shall assign allocations to the Assisting Balancing Authorities that are within their respective response capability.

After receiving a request for the activation of SAR, the SAR Coordinator shall:

a. Determine each Balancing Authority's SAR allocation in accordance with the following:
   - At least fifty percent (50%) of a loss is allocated to the Contingent Balancing Authority.
   - The remainder of a loss is normally allocated among the Assisting Balancing Authorities.
   - A Balancing Authority shall not be requested to provide more assistance during a **reserve** pickup than is required to meet its own largest **contingency**.

b. Immediately inform each Balancing Authority of its SAR allocation, the time that the schedule change is effective, and the time that the **contingency** occurred.

c. SAR participants may activate additional **reserve** beyond the SAR allocations to assure that the needed **ten minute reserve** is provided successfully. The Balancing Authority receiving SAR assistance may activate additional reserve to prepare for the eventual withdrawal of SAR assistance.

5.8.4 Provision of SAR Assistance

Assisting Balancing Authorities shall initiate immediate action to provide their allocated SAR assistance**.**

The Contingent Balancing Authority shall initiate immediate action to provide its share assigned by the SAR Coordinator to recover from the resource loss, and the Contingent Balancing Authority shall prepare for the replacement of the SAR assistance energy assigned to assisting Balancing Authorities.

Assisting Balancing Authorities shall activate **ten-minute reserve** and provide assistance by **interchange schedules** that are:

a. Implemented at a zero time ramp rate immediately following allocation notification.

b. Maintained until the Contingent Balancing Authority requests a return to normal up to a maximum of thirty minutes.

c. Sustained, from the time of implementation, for a minimum of ten minutes unless reliability is affected adversely.

5.8.5 Termination of SAR

The Contingent Balancing Authority shall notify the SAR Coordinator when it wishes to terminate the delivery of SAR assistance.

- The SAR Coordinator shall notify all participating Balancing Authorities and confirm the time that the activation is terminated. Revised **interchange schedules** are mutually established as required so that the Assisting Balancing Authorities properly recall assistance.
- The Contingent Balancing Authority shall replace the **reserve** assistance assigned to assisting Balancing Authorities in a manner consistent with mutually established **interchange schedules**.
- **Interchange schedules** associated with SAR shall be ramped out at a ten-minute ramp rate following communications initiated by the Contingent Balancing Authorities, resulting in mutually established **interchange schedules**.

- In the event that a Contingent Balancing Authority is not prepared to replace the remaining portion of its **reserve** obligation within the time specified in section 5.8.4, the Contingent Balancing Authority shall arrange for additional assistance in accordance with applicable policies and agreements covering **interchange** and **emergency** assistance.

5.8.6 Reallocation and/or Subsequent **Contingencies**

In the event that the reliability of an Assisting Balancing Authority becomes jeopardized, that Balancing Authority may cancel all or part of its allocation (using a step schedule change) by notifying the SAR Coordinator, which shall then notify the Contingent Balancing Authority to increase its SAR allocation to replace the assistance that has been withdrawn.

In the event that a subsequent loss of **generation** or imported energy transaction occurs during the period when SAR is in progress, regardless of the size of the **contingency**, the second Contingent Balancing Authority may, at its discretion, withdraw SAR assistance and request the SAR Coordinator to reallocate the assistance in accordance with the provisions of this procedure. Upon such notification, the SAR Coordinator shall notify the first Contingent Balancing Authority of the amount of withdrawal. Both Contingent Balancing Authorities shall immediately enter new **interchange schedules** that reflect the loss of the assistance, using a zero time ramp.

In the event that a second Balancing Authority experiences a **contingency** that qualifies for SAR, the SAR Coordinator shall allocate assistance from the remaining Assisting Balancing Authorities in accordance with this procedure, upon the request of that Contingent Balancing Authority.

If the second **contingency** occurs in the Balancing Authority that has incurred the first **contingency**, that Balancing Authority may request additional assistance, in accordance with this procedure, regardless of the size of the **contingency**.

## 5.9 Energy Scheduling and Managing **Reserve**

A Balancing Authority shall meet its requirement for **reserve** using resources within its Balancing Area and/or obtain deliverable **reserve** from other Balancing Authorities.

When a Balancing Authority acquires energy from another Balancing Authority that is immediately recallable, the acquiring Balancing Authority:

a. shall not use such energy to meet its **reserve** requirements, and resources displaced by the energy must remain available to cover for the curtailment of said energy at any time; and,

b. shall adjust its **ten-minute reserve** requirement to cover the larger of the Balancing Authority's **first contingency loss**, or the largest sum of such energy acquisitions that could be withdrawn at the same time due to a single contingency or event.

A Balancing Authority acquiring energy not associated with the capacity used to meet **reserve** requirements of another Balancing Authority is the only Balancing Authority that can use this energy to augment its **reserve**. The Balancing Authority providing such energy is obligated to advise the acquiring Balancing Authority of any change in the surplus status of the energy.

## 5.10 Requirements for **Reserve on Automatic Generation Control (AGC)**

Balancing Authorities shall have available and deploy sufficient **reserve on Automatic Generation Control (AGC)** to meet NERC control performance standards. R**eserve on Automatic Generation Control (AGC)** shall be sustainable as specified in section 5.13. NPCC Balancing Authorities operating synchronously within the Eastern Interconnection may meet a portion of their requirements for **reserve on Automatic Generation Control (AGC)** by participating in ACE Diversity Interchange as described in section 5.11. See Appendix 5 for the NPCC control performance standard reporting processes.

## 5.11 ACE Diversity Interchange

ACE Diversity Interchange (ADI) is a method of regional regulation among participating Balancing Authorities that can achieve a mutual reduction in requirements for **reserve on Automatic Generation Control (AGC)** and generator output adjustments. ADI uses the sign diversity of the Area Control Error (ACE) values of the participating Balancing Authorities to achieve this mutual reduction. ADI is a form of supplemental regulation as permitted by NERC Standards.

All participating Balancing Authorities in ACE Diversity Interchange shall form an electrically contiguous area. Adjacent and directly connected non NPCC Balancing Authorities may participate in ACE Diversity Interchange. Participation in ACE Diversity Interchange is contingent on submission of the form located in Appendix 7 and approval by TFCO.

This form will also be used to indicate if a Balancing Authority wishes to act as the ADI Coordinator for the ADI participants, contingent upon the approval of TFCO.

Balancing Authorities that participate in Ace Diversity Interchange (ADI) shall do so in accordance with the requirements in section 5.11.1 & 5.11.2 below.

5.11.1 ADI General Requirements

In order to participate in ADI, Balancing Authorities shall establish the appropriate data exchange and apply the ADI term to their respective ACE in AGC.

Transmission limits or other internal constraints that preclude the normal implementation of ADI shall be communicated immediately to the ADI Coordinator. Whenever normal implementation of the procedure is precluded, the ADI Coordinator shall notify the other participants.

The industry sign standard for ACE is used, i.e., a negative ACE indicates under-generation. The ADI sign convention is such that a positive ADI allocation will make the adjusted ACE of the participating Balancing Authority less negative with respect to the unadjusted ACE. The positive ADI limit will restrict the amount of positive ADI that can be allocated to make a participating Balancing Authority's adjusted ACE less negative with respect to a negative unadjusted ACE. The converse is applied to positive ACE values and negative ADI allocation and limits.

**Inadvertent interchange** is affected by the implementation of ADI. In general the unadjusted ACE values have equal likelihood over an hour to be positive or negative. ADI allocations will be monitored carefully for inequitable or inordinately large accumulations of inadvertent. These issues will be addressed and remedied promptly.

ADI may be biased to correct for inadvertent among participants that have accumulated balances that are opposite in sign. Two or more ADI participants may engage in this activity. At least one participant's accumulated inadvertent balance must be opposite in sign to the other's.

5.11.2 ADI Methodology

Changes to the ADI states (enable/disable) and parameters are coordinated through the ADI Coordinator. The ADI Coordinator has the authority to globally disable ADI. Following this action, all participants shall be

notified. A change to an individual participating Balancing Authority's enable/disable status is communicated electronically and is available to all participants.

The participating Balancing Authorities have the authority to disable their respective participation in ADI. The ADI Coordinator has the capability to disable any individual participating Balancing Authority, but shall only do so at the participating Balancing Authority's request, unless a reliability problem requires immediate action by the ADI Coordinator.

a) The ADI Coordinator notifies all participating Balancing Authorities of any changes in a participating Balancing Authority's ADI state.
b) The ADI Coordinator has the authority to enable or disable ADI exchange and/or related parameters if:

- Control Performance is adversely affected by the ADI
- ADI contributes to inordinately large or inequitable accumulations of inadvertent
- Flows on the transmission system are affected adversely by ADI.
- Data received from a participating Balancing Authority do not meet the data refresh criterion.

c) Participating Balancing Authorities determine their level of participation in conjunction with the NPCC Working Group CO-1. ADI values that determine the limit for total ADI participation shall be recommended by NPCC Working Group CO-1 and require approval by the TFCO. All changes that affect ADI participation must be communicated through the ADI Coordinator. Limit changes to control inadvertent accumulations will be made simultaneously by the ADI Coordinator and communicated to all participants.
d) Any Participating Balancing Authority may request that ADI be enabled or disabled globally.
e) All actions to globally enable or disable ADI or otherwise modify ADI parameters shall be communicated by the ADI Coordinator to the other ADI participants. A concise reason for the change is to be given.
f) Participating Balancing Authorities will disable ADI participation if AGC execution is paused, suspended, placed in a monitor mode, or if data quality problems result in an unreliable calculation of the unadjusted ACE.
g) The NPCC Control Performance Working Group (CO-1) shall monitor the ADI process to determine the appropriate ADI operating parameters and to assure that reliability is not adversely affected by its use. CO-1 shall periodically verify that unadjusted ACE values used

for ADI assignments are reasonably close to an equal distribution of positive and negative values, and monitor ADI monthly on and off peak accumulations to assure that inadvertent accumulations are not experiencing a significant adverse impact. CO-1 will assure that any increase in ADI limits will not have an adverse impact on reliability, and will coordinate any limit and parameter changes with NPCC CO-8 members of participating Balancing Authorities.

h) As ADI is treated as a pseudo-tie, data retention requirements shall match those specified for tie-line data in accordance with applicable NERC standards.

## 5.12 Frequency Responsive **Reserve**

See Appendix 1 for NPCC-specific reporting procedures.

## 5.13 Sustainability of **Operating Reserve**

**Synchronized reserve**, **ten-minute reserve**, and **thirty-minute reserve** available to a Balancing Authority, if activated, shall be sustainable for at least one hour from the time of activation. Balancing Authorities shall determine their sustainability requirement for reserve on Automatic Generation Control (AGC) based on their ability to achieve compliance with relevant standards, with due consideration of their operating characteristics.

## 5.14 Resource-Specific Requirements

The Balancing Authority is responsible for meeting the following:

a) **Synchronized reserve**, **ten-minute reserve**, and **thirty-minute reserve** cannot be provided from loads where the same capacity is included in demand response programs and would result in double counting the same capacity.
b) Loads cannot provide **synchronized reserve** if the reduction in load is dependent on starting a generator to replace energy that is supplied from the grid.
c) To be eligible to provide **synchronized reserve**, **ten-minute reserve**, or **thirty-minute reserve**, the Load Serving Entity or Generator Owner responsible for the **Resource** shall meet the metering and testing requirements of the relevant Balancing Authorities.
d) To be eligible to provide **synchronized reserve**, **ten-minute reserve**, or **thirty-minute reserve**, the **Resource** shall continuously meet the dispatch instruction requirements of the relevant Balancing Authority(s).

e) To be eligible to provide **synchronized reserve**, **ten-minute reserve**, or **thirty-minute reserve**, the Load Serving Entity or Generator Owner responsible for the **Resource** shall meet the requirements specified by the relevant Balancing Authorities for operating limits and response rate, so that available **reserve** shall be computed accurately.

f) To be eligible to provide **synchronized reserve**, **ten-minute reserve**, or **thirty-minute reserve**, the Load Serving Entity or Generator Owner responsible for the **Resource** providing inter-Balancing Area **reserve** shall not offer the same reserve to more than one acquiring Balancing Authority for the same scheduling interval.

g) When energy and **reserve** are being provided concurrently from a **Resource** for a host and acquiring Balancing Authority respectively, a host Balancing Authority providing inter-Balancing Area **reserve** cannot count that **reserve** to meet its own **reserve** requirement, and, the acquiring Balancing Authority cannot count capacity that is allocated for energy to the host Balancing Authority as **reserve**.

5.15 Reporting of Simultaneous Activation of **Reserve** Events

Contingent Balancing Authorities initiating a SAR event have successfully recovered when their ACE crosses zero (or returns to the ACE value just prior to the loss of resource if it was negative) within 15 minutes of the occurrence of the contingency.

Assisting Balancing Authorities have successfully provided their assistance if either of the following conditions exists:

(1) ACE crosses zero after the step schedule change to provide their assistance has been entered and within fifteen minutes of the time of the contingency, or;
(2) If their ACE was negative just prior to the step schedule change to provide their assistance, their ACE returns to the negative ACE value just prior to the schedule change and within fifteen minutes of the time of the contingency.

Assisting Balancing Authorities are not subject to the above recovery evaluations if the notification time for assistance supplied by the SAR Coordinator is not less than five minutes from the time of contingency.

If an assisting Balancing Authority has not provided its assistance successfully per either (1) or (2) above, and, the notification time was within five minutes of the occurrence of the contingency, then the assisting Balancing Authority shall provide a written explanation to the TFCO. If an assisting Balancing Authority incurs 3 shortfalls within the most recently completed twelve months, TFCO is empowered to take actions they deem to be appropriate up to and including

termination from future participation in the SAR program. See Appendix 2 for reporting details.

If a Balancing Authority receiving or providing assistance experiences a resource loss when an SAR event is in progress, that Balancing Authority may adjust their ACE by the amount of the resource loss and use that adjusted ACE in the evaluation of the success of its recovery.

5.16 Light Load Conditions

Guidance for mitigating adverse light load conditions is provided in Appendix 6.

5.17 Determining the Time Associated With the Loss of a Resource

The determination of time T+0 for resource losses is consistent with the methodology described in the NERC Performance Standard Reference Guide. For performing compliance evaluations, time T+0 for NPCC Reportable Events is determined by the following process:

1. A sliding 60 second interval (with EMS scan rate data as a source) is used to determine when the magnitude of the resource loss qualifies as an NPCC Reportable Event.
2. When the change in output of the resource loss exceeds the NPCC Reportable Event Threshold within a sliding 60 second interval, time T+0 is the first observation of declining output within that sliding 60 second interval.
3. When the change in output of the resource loss exceeds the DCS Event Threshold within a sliding 60 second interval, time T+0 is the first observation of declining output within that sliding 60 second interval.
4. If (2) and (3) above result in differing computations of T+0, the DCS computation in (3) takes precedence.
5. Any portion of the resource loss preceding the sliding 60 second interval identified in (2) and/or (3) is not included in the determination of the megawatts lost for the event.

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Prepared by: Task Force on Coordination of Operation

Review and Approval: Revision to any portion of this Directory will be posted by the lead Task Force in the NPCC Open Process for a 45 day review and comment period. Upon satisfactorily addressing all the comments in this forum, the Directory document will be sent to the remaining Task Forces for their recommendation to seek RCC approval.

Upon approval of the RCC, this Directory will be sent to the Full Member Representatives for their final approval if sections pertaining to the Requirements and Criteria portion have been revised. All voting and approvals will be conducted according to the most current "NPCC. Bylaws" in effect at the time the ballots are cast.

Revisions pertaining to the Appendices or any other portion of the document such as Links glossary terms, etc., only RCC Members will need to conduct the final approval ballot of the document.

This Directory will be updated at least once every three years and as often as necessary to keep it current and consistent with NERC, Regional Reliability Standards and other NPCC documents.

References: *NPCC Glossary of Terms* (Document A-7)
*Emergency Operations* (NPCC Directory #2)

# *Appendix 1 - Monitoring Procedures for Interconnected System Frequency Response*

Introduction

The objective of this procedure is to provide a broader data base for further studies and to aid in the calculation of the observed frequency response. These frequency response observations are also used in determining the frequency bias settings to be used in the AGC systems of the NPCC Balancing Authorities. The NPCC Control Performance Working Group (CO-1) will monitor the results of all NPCC Balancing Authorities produced from the procedure.

Definition

For this reporting process, the system frequency deviation threshold specified for NPCC **reportable events** is used, but only those deviations occurring within 5 seconds are included in the analyses specified below.

Procedure

Balancing Authorities will record the following data for each reportable Frequency Deviation Event:

- date and time of the event
- pre-contingent Balancing Authority load
- Balancing Area response, which is the difference between the pre-contingent actual net interchange and the average actual net interchange during the post-event steady state period as defined below. (For HQTE, the Balancing Area response equals the magnitude of the **resource** loss.)
- pre-event frequency
- minimum transient frequency
- post-event steady-state frequency before AGC action.

The post event steady state period is typically between 12 seconds and 20 seconds following disturbance initiation. From this data, the following information will be derived:

- transient frequency deviation
- steady-state frequency deviation
- observed frequency response for the event

- frequency response as a percentage of pre-contingent Balancing Authority load

Data Reporting

Balancing Authorities will report events with a calculated frequency response (MW/ .1 Hz) that is less than 1% of the pre-contingent actual load on an annual basis.

To comply with NERC requirements for computing the frequency bias setting within AGC, the average value of the observed frequency response samples computed within this procedure is determined on an annual basis.

Data and results from this procedure are retained for at least 5 years.

# *Appendix 2 - Monitoring Procedures for Reserve Criteria*

Introduction

This procedure establishes the monitoring and reporting processes for resource losses in addition to those required for meeting the NERC Disturbance Control Standard (DCS). NPCC Control Performance Working Group (CO-1) has primary responsibility for performing the monitoring and reporting processes described herein.

Monitoring Criteria

As an indication of adequacy **of ten-minute reserve**, the monitoring and reporting criteria for Balancing Authorities within NPCC focus on performance during **reportable events** where the supply side **resource** loss is equal to or less than the **first contingency loss**.

NBSO and NSPI function as a reserve sharing group for recovery from their larger losses of **resource**, the 80% threshold applies to the largest **first contingency loss** within their combined Balancing Areas.

All supply side **resource** losses that resulted in the utilization of Procedures for Simultaneous Activation of ten-minute reserve (SAR) are reported to and reviewed by CO-1.

Monthly Monitoring Procedures

For each **reportable event** not utilizing Simultaneous Activation of Reserve (SAR), an NPCC Area Trouble Report is completed by the Balancing Authority experiencing the contingency, using the appropriate reporting form. Balancing Authorities requesting SAR assistance complete the appropriate contingent SAR reporting form. Balancing Authorities providing SAR assistance complete the appropriate assistance SAR reporting form.

At the conclusion of each calendar month, NPCC Balancing Authorities review all of their **reportable events** and any SAR assistance that was provided. Each Balancing Authority sends an electronic copy of the report completed for each of their **reportable events** and any SAR assistance within a month to the Chair of CO-1 (or his/her designee). All reports in a month are due by the tenth calendar day of the following month.

Each month, CO-1 monitors the performance of the SAR program, including the timeliness of schedule changes, the successful provision of the assigned assistance, and any anomalies that may have occurred in each SAR event. CO-1 shall report any anomalies or performance shortfalls to the TFCO.

Quarterly Monitoring Procedures

The Chair (or his or her designee) of CO-1 compiles all monthly submissions at the end of each quarter to determine Disturbance Control Standard (DCS) compliance for all NPCC Balancing Authorities. The DCS results are forwarded to the NERC office, the NPCC Compliance Committee, and to CO-1.

Annual Monitoring Procedures

CO-1 prepares an annual summary for the Task Force on Coordination of Operation (TFCO) indicating, for each Balancing Authority and for NPCC as a whole, the number of violations and the number of events for which performance was successful. The summary report also compares current year's performance with the performance of the four previous years. CO-1 provides supplementary information, as necessary, to the TFCO for their review.

The Chair of CO-1 (or his/her designee) on an annual basis produces an electronic archive of all reportable events, and distributes the archive to CO-1 members and NPCC Staff.

# *Appendix 3 - Procedures during Abnormal Operating Conditions*

## **1.0** Introduction

This procedure provides specific instructions to Balancing Authorities for: making notifications upon the occurrence of deficiencies in **reserve;** restoration of **ten minute reserve**, **synchronized reserve** available within ten minutes, and **thirty minute reserve;** addressing persisting deficiencies of **ten-minute reserve;** and, addressing a regional deficiency of **ten-minute reserve.**

## **2.0** Objectives

2.1 To mitigate the impact of an evolving event.

2.2 To alert other Balancing Authorities and Reliability Coordinators when any Balancing Authority is deficient, or anticipates being deficient, in **reserve**.

2.3 To enhance reliability within NPCC through the sharing of resources when any Balancing Authority becomes deficient in **ten-minute reserve** and cannot restore it in a timely manner as described in section 5.2 of Directory 5.

2.4 To return to normal operating conditions as soon as possible.

## **3.0** Action to Mitigate Ten-Minute Reserve Shortages

Procedures to address shortages of **ten-minute reserve** are provided in this section.

### 3.1 Actions When Becoming Deficient in **Ten-Minute Reserve**

To minimize the magnitude and duration of **ten-minute reserve** deficiency, a Balancing Authority may implement any or all of the actions below, in no implied order:

- Commit sufficient off-line supply-side **resources** to create additional **ten-minute reserve** within the restoration period specified in section 5.2 above.
- Recall applicable exports respecting Balancing Authority operating procedures. The source Balancing Authority of the applicable exports shall give proper notification to the sink Balancing Authority**.**
- Obtain additional **resources** from outside the Balancing Authority in accordance with regional and local practices. These additional **resources** shall not be from the portion of another Balancing Authority's **reserve** that is needed to meet the other Balancing Authority's **reserve** requirements in coincident hours.

- Recall planned generator outages and coordinate with the Reliability Coordinator for possible assistance available by recalling transmission outages (or taking other actions) that will increase **reserve** or **transfer capability** if it can reasonably be expected that additional **resources** are available to assist in reducing or eliminating the shortage.
- Count **interruptible load** (not firm **load**) that can be interrupted within ten minutes in its **ten-minute reserve**, if it has not already been counted.
- Count voltage reduction that can be implemented within ten minutes in its **ten-minute reserve**, if it has not already been counted.
- Consider the use of Public Appeals if sufficient time exists to activate them, or if the shortage is expected to last for an extended period.

3.2 Deficiencies of the **Synchronized Reserve** Available Within Ten Minutes

When a Balancing Authority becomes deficient in the **synchronized reserve** available within ten minutes but is not deficient in **ten-minute reserve**, the deficient Balancing Authority considers any or all of the following actions in no implied order to eliminate or minimize the deficiency as soon as practical:

- Activate off-line generation to increase the supply of the **synchronized reserve available within ten minutes**.
- Re-dispatch online generation to increase the supply of the **synchronized reserve** available within ten minutes.
- Obtain additional **resources** from outside the Balancing Area in accordance with regional and local practices. These **resources** cannot be from the portion of another Balancing Authority's **reserve** that is needed to meet the other Balancing Authority's **reserve** requirements in coincident hours.
- Disconnect **interruptible load** (not firm **load**), which are not contributing to the **synchronized reserve** available within ten minutes due to implementation delays in excess of ten minutes, if permitted by market and other applicable rules.

3.3 Notifications

When a Balancing Authority becomes deficient or forecasts a deficiency in either the **synchronized reserve** available within ten minutes or **ten-minute reserve**, and, the Balancing Authority cannot restore these reserves using the actions specified in section 3.1 and 3.2 of this Appendix, the following actions are required:

- The Balancing Authority informs its Reliability Coordinator.
- The Reliability Coordinator considers the need to initiate, or request NPCC Staff to initiate, an NPCC Emergency Preparedness Conference Call among the Reliability Coordinators of NPCC, and PJM and MISO if necessary.

These actions are repeated whenever there is a change in the status of the available **reserve** with respect to their corresponding restoration requirements specified above.

3.4 Persisting Deficiency of **Ten-Minute Reserve**

If the Balancing Authority remains deficient after implementing all of the applicable actions stated above, the Balancing Authority notifies its Reliability Coordinator so that the Reliability Coordinator may request that the NPCC Staff survey each Balancing Authority to complete the information in Attachment A, providing each Balancing Authority's **first contingency loss**, **ten-minute reserve** and its requirement**, thirty-minute reserve** and its requirement, and each Balancing Authority's **Total Transfer Capability (TTC)** to and from other Balancing Authorities. In response to the above notification from the Balancing Authority, its Reliability Coordinator coordinates the transfer of emergency energy between Balancing Authorities so that the deficient Balancing Authority will ultimately increase the **ten-minute reserve** available to it.

3.5 Regional Deficiency of **Ten-Minute Reserve**

When two or more NPCC Balancing Authorities are deficient in **ten-minute reserve** and all off line generation that could contribute to alleviating the shortages in the deficient Balancing Authorities has been activated, then a **Regional Reserve Deficiency** is declared. During a **Regional Reserve Deficiency**, the Regional Reserve Deficiency Coordinator performs a manual **Emergency Regional Reserve Re dispatch**, allocating **Emergency Regional Reserve Dispatch Energy** (as energy or capacity) optimally among NPCC Balancing Authorities, coordinating available resources within or between Balancing Authorities:

- To provide for greater transfer capability between the Balancing Authorities**.**
- To free transmission-constrained energy and/or capacity.
- To allocate the remaining **ten-minute reserve** among the Balancing Authorities in a manner which will improve reliability, considering each Balancing Authority's ability to control schedules at its electrical boundaries and the Balancing Authority's ability to recover from its **first contingency loss.**

An NPCC Reliability Coordinator serves as the Regional Reserve Deficiency Coordinator. To serve as the Regional Reserve Deficiency Coordinator, an NPCC Reliability Coordinator shall submit a form requesting this role as described in Appendix 7, subject to approval by TFCO.

3.6 Actions When Becoming Deficient in **Thirty-Minute Reserve**

To minimize the magnitude and duration of a **thirty-minute reserve** deficiency, a Balancing Authority may implement any or all of the actions below, in no implied order:

- Obtain additional **resources** from outside the Balancing Authority in accordance with regional and local practices. These additional **resources** shall not be from the portion of another Balancing Authority's **reserve** that is needed to meet the other Balancing Authority's **reserve** requirements in coincident hours.
- Recall planned generator outages and coordinate with the Reliability Coordinator for possible assistance available by recalling transmission outages that will increase **reserve** or **transfer capability** if it can reasonably be expected that additional resources are available to assist in reducing or eliminating the shortage.
- Recall applicable exports or convert applicable exports to a recallable product and include this energy and/or capacity in its **thirty-minute reserve,** while respecting Balancing Authority operating procedures. The source Balancing Authority of the applicable exports gives proper notification to the sink Balancing Authority if this action is taken**.**
- Count **interruptible load** (not firm **load**) that can be interrupted within thirty minutes in its **thirty-minute reserve**, if it has not already been counted.
- Count voltage reduction that can be implemented within thirty minutes in its **thirty-minute reserve**, if it has not already been counted.

3.7 Actions When Forecasting a Deficiency Of **Thirty Minute Reserve**

- Count additional **resources** from outside the Balancing Authority in accordance with regional and local practices. These additional **resources** shall not be from the portion of another Balancing Authority's **reserve** that is needed to meet the other Balancing Authority's **reserve** requirements in coincident hours.
- Obtain additional resources from inside the Balancing Authority in accordance with regional and local practices.

## Attachment A

## Reserve Summary

| **Area** | First Contingency Loss | Required 30 Minute Reserves | Available 30 Minute Reserves | Required 10 Minute Reserves | Available 10 Minute Reserves |
|---|---|---|---|---|---|
| | | | | | |
| Maritimes | | | | | |
| | | | | | |
| Michigan | | | | | |
| | | | | | |
| NE | | | | | |
| | | | | | |
| NY | | | | | |
| | | | | | |
| Ontario | | | | | |
| | | | | | |
| PJM | | | | | |
| | | | | | |
| Québec | | | | | |

Total Transfer Capability

| **To >** | Mar. | Mich. | NE | NY | Ontario | PJM | Québec |
|---|---|---|---|---|---|---|---|
| **From:** | | | | | | | |
| | | | | | | | |
| Maritimes | | | | | | | |
| | | | | | | | |
| Michigan | | | | | | | |
| | | | | | | | |
| NE | | | | | | | |
| | | | | | | | |
| NY | | | | | | | |
| | | | | | | | |
| Ontario | | | | | | | |
| | | | | | | | |
| PJM | | | | | | | |
| | | | | | | | |
| Québec | | | | | | | |

# Appendix 4 - Guidelines for SAR Allocation Following Radial Source Contingencies

**1.0** Introduction

If the resource loss is an energy transaction being received from another Balancing Authority connecting via radial source lines and that energy can no longer be delivered at the point of delivery, the source Balancing Authority has no practical means of replacing that energy. The energy that was sinking in the other Balancing Authorities must be replaced in a timely manner.

**2.0** Handling of Radial Source Contingencies with Several Balancing Authorities Receiving Energy

Radial source tie lines crossing Balancing Area boundaries may have energy delivered over these lines to more than one Balancing Authority. Handling of large contingencies on radial sources crossing Balancing Area boundaries is described in section 4 below. The methodology presented in section 4.0 below is a generic guide to be used for allocation of SAR assistance whenever a contingency occurs on a radial source tie line that results in more than one Balancing Authority losing an energy transaction. .

**3.0** Radial Source Contingencies with Counter flow Transactions

Coincident with energy transactions delivered out of the Balancing Authority on radial source tie lines, countervailing transactions may be scheduled simultaneously into the Balancing Authority. The contingency loss of one of these lines when it is carrying counter flow transactions may be a relatively small net energy loss to the interconnection. However, the size of the individual counter flow transactions could be quite large. The methodology presented in section 4 below may be used for allocation of SAR assistance whenever radial line contingencies with counter flow transactions occur. In instances when the net of the scheduled transactions is less than the **reportable event** threshold, the net interchange schedules may be ramped out instead of using the SAR procedure. The SAR Coordinator and the Balancing Authorities party to the transactions may agree to this action and the duration of the ramp.

**4.0** SAR Allocations for Radial Source Contingencies with More Than One Balancing Authority Receiving Energy

Some of the radial source tie lines crossing Balancing Area boundaries from HQTE to NYISO, ISO-NE, and NBSO have maximum transfer capabilities in excess of the Balancing Authority's single largest internal capacity contingency. Energy may be delivered over these lines to more than one Balancing Authority, with transmission service being provided by the Transmission Service Provider for the Balancing Authority to which the respective line is directly connected. A Balancing Authority may limit the flow such that the loss would not exceed its largest single contingency to maintain

**reserve** requirements at reasonable levels. Transmission restrictions in other Balancing Authorities may also limit these flows.

As the delivering entity, HQTE has no practical means to provide **reserves** from its own system in the event of the loss of a radial source tie line. When only the directly connected Balancing Authority receives the delivery, it can treat the energy as an internal source and carry reserve to cover the sudden loss. However, when the energy is delivered to more than one Balancing Authority, the responsibility for the directly connected Balancing Authority to carry all of the reserve can become overly burdensome.

This section describes the handling of large contingencies on radial sources crossing Balancing Area boundaries, such as Hydro-Québec (HQTE) to NYISO. At times, these flows may be composed of simultaneous energy deliveries to the directly connected Balancing Authority and one or more other Balancing Authorities. It allows for the use of the SAR procedure to allocate the portion of energy not designated for the directly connected receiving Balancing Authority to other Balancing Authorities participating in the Simultaneous Activation of **Ten-Minute Reserve** Procedure.

This same methodology can be applied for scenarios with simultaneous imports and exports of energy (counter flow transactions) by one or more Balancing Authorities on radial sources crossing Balancing Area boundaries. The Balancing Authority losing its ability to deliver energy may receive negative assistance shares from other Balancing Authorities. In these scenarios, affected Balancing Authorities should require smaller generation changes to restore ACE while the procedure is in effect and should have a longer period to adjust fully after the contingency. The use of negative assistance is illustrated in examples 5 and 6 in Section 4.2 below.

## 4.1 Management of NPCC Radial Source Contingencies

SAR support for radial source contingencies will be limited to SAR participants. Radial Source transactions will be limited to only one intermediary Balancing Authority (BA) unless all Balancing Authorities on the scheduling path are SAR participants. Non-SAR participants are expected to recover energy sinking in their respective BAs in accordance with prevailing NERC Standards.

Each hour the SAR Coordinator must be notified of scheduled wheel-through transactions among SAR participants.

Due to current software limitations, the New Brunswick Balancing Authority is exempt from the requirement to provide hourly schedule information to the SAR Coordinator. Such information will be provided at the time of the contingency.

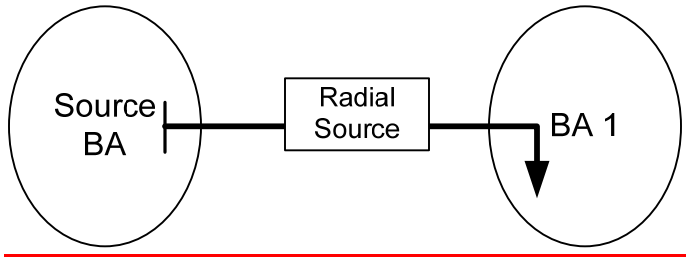
When SAR is requested, the SAR Coordinator will incorporate wheel-through transactions in its SAR software.

All ETAG(s) will be curtailed using phone communications by all applicable BAs.

E-tags will be maintained to account for the contingency and relevant SAR related activity. Four examples that apply to the management of Radial Source Contingencies that occur within NPCC for SAR and non-SAR events are provided below.

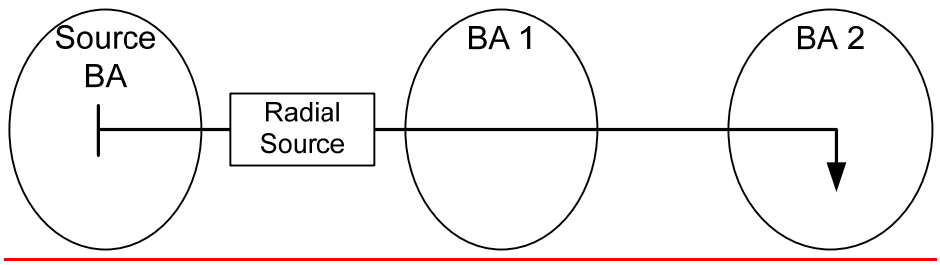
## Example 1 Source BA and Sink BA1

| | |
|---|---|
| The net energy flows from the radial Source BA and sinks in BA1 at the receiving end of that radial tie. | BA1 is responsible to recover for the entire loss as if the source was a generator inside the BA 1 footprint. Immediately following the contingency loss of the radial tie, the source and directly connected Balancing Authorities will verbally communicate.<br><br>If the MW loss is greater than the NPCC reportable event threshold, or, if system conditions are stressed, BA1 may call for SAR. When SAR is requested, BA1 notifies the SAR Coordinator<br><br>The ETAG(s) associated with the energy delivered to BA1 is curtailed immediately over a zero minute ramp due to the flow path being removed. |



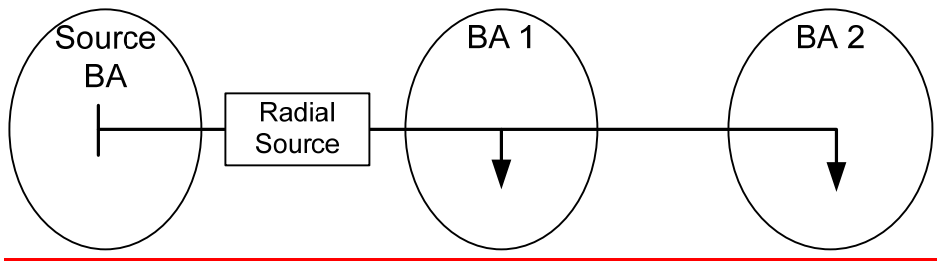
## Example 2 Source BA, intermediary BA1, and sink BA2.

| | |
|---|---|
| The net energy is wheeled from the radial Source BA through BA1 and sinks in BA2. This example applies to SAR participants. | BA2 is responsible to recover the MW sinking in its BA. Immediately following the contingency loss of the radial tie, the source and directly connected Balancing Authorities will verbally communicate.<br><br>If the MW loss is greater than NPCC reportable event threshold, or for stressed system conditions, BA1 notifies the SAR Coordinator to request SAR activation.<br><br>Verbal communications between the Balancing Authorities will be as follows:<br><br>▪ Pre-Contingency:<br>BA1 will communicate BA2 schedule to SAR Coordinator<br><br>▪ Post Contingency:<br>BA1 contacts SAR Coordinator to activate SAR. The SAR Coordinator issues shares.<br><br>All ETAG(s) associated with the energy wheeled through BA1 and into BA2 will be curtailed upon termination of the SAR using a ten minute ramp.<br><br>For non-SAR events:<br><br>If SAR is not requested, all ETAG(s) associated with the energy wheeled through BA1 and into BA2 will be curtailed on a mutually agreed upon start time and ramp duration by the affected BAs. |



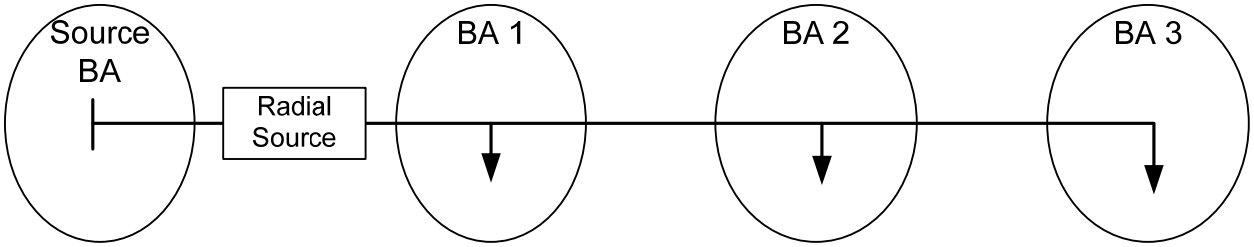
## Example 3 Source BA, intermediary sink BA1, and sink BA2

| | |
|---|---|
| The energy is flowing from the radial Source BA with portions sinking in BA1, and BA 2. This example applies to SAR participants. | BA1 and BA2 are responsible to recover the portions of the MW sinking in each of their BAs. Immediately following the contingency loss of the radial tie the source and directly connected Balancing Authorities will verbally communicate.<br><br>If the net MW loss is greater than NPCC reportable event threshold, or for stressed system conditions, BA1 notifies the SAR Coordinator to request SAR activation.<br><br>Verbal communications between the Balancing Authorities will be as follows:<br><br>▪ Pre-Contingency:<br>BA1 will communicate the BA1 and BA2 schedules to SAR Coordinator<br><br>▪ Post Contingency:<br>BA1 contacts SAR Coordinator to activate SAR. The SAR Coordinator issues shares.<br><br>The ETAG(s) associated with the energy sinking in BA1 is curtailed immediately over a zero minute ramp due to the flow path being removed.<br><br>The ETAG(s) associated with the energy wheeled through BA1 and sinking in BA2 will be curtailed upon termination of the SAR using a ten minute ramp.<br><br>For non-SAR events:<br>• The ETAG(s) associated with the energy sinking in BA1 is curtailed immediately over a zero minute ramp.<br>• All ETAG(s) associated with the energy wheeled through BA1 and into BA2 will be curtailed on a mutually agreed upon start time and ramp duration by the affected BAs. |



**Example 4 Source BA, intermediary sink BA1, intermediary sink BA2, and sink BA3**

| | |
|---|---|
| The energy is flowing from the radial Source BA, with portions sinking in BA 1, BA 2, and BA3. | The rules governing this scenario are the same as presented in Example 3. Radial Source transactions will be limited to only one intermediary Balancing Authority (BA) unless all Balancing Authorities on the scheduling path are SAR participants. |




4.~~1~~2 Modification to the SAR Procedure

The SAR procedure is modified to allocate portions of the total delivery to Balancing Authorities in addition to the directly connected Balancing Authority during an ordinary simultaneous activation of reserve. When the tie line trips, the directly connected Balancing Authority activates the SAR procedure (if the loss exceeds the NPCC Reportable Event Threshold or for stressed system conditions), and then each recipient's share will be allocated to other participants based on the principle of mutual assistance, according to share allocation rules in the SAR procedure.

Each Balancing Authority receiving a portion of energy from the tie line through the directly connected Balancing Authority will contribute energy to and receive assistance for their portion of the contingency. The Balancing Authorities supplying this assistance would not have this energy replaced by the directly connected Balancing Authority when the directly connected Balancing Authority picks up its reserve to cover its energy import from HQTE. Thus, the directly connected Balancing Area's **reserve** requirement remains the greater of the largest internal contingency or its share of the respective tie line flow.

Initially, SAR shares would be calculated based on energy scheduled to the Balancing Authorities receiving energy from the tripped element. Initial shares

would be allocated to each energy recipient according to the ordinary share allocation rules in the SAR procedure. Thus each energy recipient is assigned one half of the energy received initially. A Balancing Authority would then receive additional allocations to provide assistance to each other Balancing Authority**,** until the total amount of the contingency is allocated.

Once recovery from the contingency occurs, the contingent and recipient Balancing Authorities provide the remainder of their respective **reserve** obligations. A recipient Balancing Authority uses its own generation to replace the energy initially received (unless additional alternative arrangements are made) after SAR assistance is withdrawn.

The methodology is iterative. One pass is required to allocate shares for each of the Balancing Authorities requiring assistance. Key features of the method are demonstrated in the examples below. NBSO participation is excluded from these examples for simplicity. The values shown are rounded to whole numbers.

Each SAR participant Balancing Authority receiving energy compares the energy sinking within its Balancing Authority with applicable NERC and NPCC reporting thresholds to determine their reporting requirements.

**Example 1.** PJM imports 400 MW from HQTE on MSC 7040, NYISO imports 1200 MW:

MSC 7040 flow = 1600 MW
HQTE – NYISO transaction = 1200 MW
HQTE – PJM transaction = 400 MW

| Area | **Initial Share/ Assistance Sought** | **First Pass** | **Second Pass** | **Total Generation Picked Up When SAR Energy Is Supplied Fully** | **Total Gen. Picked Up After SAR Is Canceled And All ACEs = 0** |
|---|---|---|---|---|---|
| IESO | | 200 | 67 | 267 | 0 |
| ISO-NE | | 200 | 67 | 267 | 0 |
| NYISO | 600 | | 67 | 667 | 1200 |
| PJM | 200 | 200 | | 400 | 400 |
| Sum | 800 | 600 | 200 | 1600 | 1600 |

Initial Shares – NYISO and PJM are initially assigned one half of their respective energy imports from HQTE. Consequently, under the ordinary SAR rules, they would be 'seeking' assistance for an equal amount. The total assistance sought is 800 MW for the entire contingency amount.

First Pass – NYISO is provided 600 MW of assistance. These shares are allocated equally, 200 MW each, among the other three participants – including PJM.

Second Pass – PJM is provided 200 MW of assistance. These shares are allocated equally, 67 MW each, among the other three participants – including NYISO.

Total Generation Picked up – The additional generation in each Balancing Authority**,** after all Balancing Authorities provided their shares, and the composite NPCC/PJM ACE is restored, and the SAR procedure is about to be canceled, is shown in the next to last column of the table above. The additional generation after the SAR procedure is canceled and each Balancing Authority returns it ACE to zero is shown in the last column.

The table below summarizes the changes in schedule and ACE from just prior to the contingency, through the cancellation of assistance and full recovery by both Balancing Authorities losing energy due to the contingency. In practice, the SAR Coordinator merges the negation of the initial schedule (third row of numeric data) and the SAR share entries (fourth row of numeric data) into a single step to promote timely implementation, achieving the same desired net effect. Note that the ACE in step 4 matches the **Total Generation Picked Up When SAR Energy Is Supplied Fully** column in the previous table, but is opposite in sign.

| **Time** | **IESO Sch** | **IESO ACE** | **NE Sch** | **NE ACE** | **PJM to NY Sch** | **PJM ACE** | **NY to PJM Sch** | **NY ACE** | **Tot Sch** | **Tot ACE** |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-contingency | 0 | 0 | 0 | 0 | -400 | 0 | +400 | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 | 0 | -400 | 0 | +400 | -1600 | 0 | -1600 |
| Negation of PJM/NY schedule | 0 | 0 | 0 | 0 | 0 | -400 | 0 | -1200 | 0 | -1600 |
| No response, SAR entries | +267 | -267 | +267 | -267 | -200 +200 = 0 | -400 | -600 +67= -533 | -667 | 0 | -1600 |
| Full response, SAR not canceled | +267 | 0 | +267 | 0 | 0 | 0 | -533 | 0 | 0 | 0 |
| SAR just canceled | 0 | +267 | 0 | +267 | 0 | 0 | 0 | -533 | 0 | 0 |
| All get back to ACE = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note that IESO, ISO-NE, and NBSO model their HVDC radial tie line imports as an internal generator, and their ACE will immediately reflect the loss of resource. NYISO includes HQTE HVDC interchange schedules within its AGC system, so NYISO must set that schedule to zero as soon as possible so its ACE reflects the loss of resource.

**Example 2.** PJM imports 1200 MW from HQTE on MSC 7040, NYISO imports 400 MW:

MSC 7040 flow = 1600 MW
HQTE – NYISO transaction = 400 MW
HQTE – PJM transaction = 1200 MW

| Area | **Initial Share/ Assistance Sought** | **First Pass** | **Second Pass** | **Total Generation Picked Up When SAR Energy Is Supplied Fully** | **Total Gen. Picked Up After SAR Is Canceled And All ACEs = 0** |
|---|---|---|---|---|---|
| IESO | | 67 | 200 | 267 | 0 |
| ISO-NE | | 67 | 200 | 267 | 0 |
| NYISO | 200 | | 200 | 400 | 400 |
| PJM | 600 | 67 | | 667 | 1200 |
| Sum | 800 | 200 | 600 | 1600 | 1600 |

Initial Shares – NYISO and PJM are initially assigned one half of their respective energy imports from HQTE. Consequently, under the ordinary SAR rules, they would be 'seeking' assistance for an equal amount. The total assistance sought is 800 MW for the entire contingency amount.

First Pass – NYISO is provided 200 MW of assistance. These shares are allocated equally, 67 MW each, among the other three participants – including PJM.

Second Pass – PJM is provided 600 MW of assistance. These shares are allocated equally, 200 MW each, among the other three participants- including NYISO.

Total Generation Picked up –The additional generation in each Balancing Authority**,** after all Balancing Authorities provided their shares, and the composite NPCC/PJM ACE is restored, and the SAR procedure is about to be canceled, is shown in the next to last column of the table above. The additional generation after the SAR procedure is canceled and each Balancing Authority returns it ACE to zero is shown in the last column.

The table below summarizes the changes in schedule and ACE from just prior to the contingency, through the cancellation of assistance and full recovery by both Balancing Authorities losing energy due to the contingency. In practice, the SAR Coordinator merges the negation of the initial schedule (third row of numeric data) and the SAR share entries (fourth row of numeric data) into a single step to promote timely implementation, achieving the same desired net effect. Note that the ACE in step 4 matches the **Total Generation Picked Up When SAR Energy Is Supplied Fully** column in the previous table, but is opposite in sign.

| Time | IESO Sch | IESO ACE | NE Sch | NE ACE | PJM to NY Sch | PJM ACE | NY to PJM Sch | NY ACE | Tot Sch | Tot ACE |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-contingency | 0 | 0 | 0 | 0 | -1200 | 0 | +1200 | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 | 0 | -1200 | 0 | +1200 | -1600 | 0 | -1600 |
| Negation of PJM/NY schedule | 0 | 0 | 0 | 0 | 0 | -1200 | 0 | -400 | 0 | -1600 |
| No response, SAR entries | +267 | -267 | +267 | -267 | -600 +67 =-533 | -667 | -200 +200 = 0 | -400 | 0 | -1600 |
| Full response, SAR not canceled | +267 | 0 | +267 | 0 | -533 | 0 | 0 | 0 | 0 | 0 |
| SAR just canceled | 0 | +267 | 0 | +267 | 0 | -533 | 0 | 0 | 0 | 0 |
| All get back to ACE = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note that IESO, ISO-NE, and NBSO model their HVDC radial tie line imports as an internal generator, and their ACE will immediately reflect the loss of resource. NYISO includes HQTE HVDC interchange schedules within its AGC system, so NYISO must set that schedule to zero as soon as possible so its ACE reflects the loss of resource.

**Example 3.** PJM and NYISO each import 200 MW from Québec on Sandy Pond, NE imports 1200 MW:

| | |
|---|---|
| Sandy Pond flow = | 1600 MW |
| HQTE – NY transaction = | 200 MW |
| HQTE – NE transaction = | 1200 MW |
| HQTE – PJM transaction = | 200 MW |

| Area | **Initial Share/ Assistance Sought** | **First Pass** | **Second Pass** | **Third Pass** | **Total Generation Picked Up When SAR Energy Is Supplied Fully** | **Total Gen. Picked Up After SAR Is Canceled And All ACEs = 0** |
|---|---|---|---|---|---|---|
| IESO | | 200 | 33 | 33 | 267 | 0 |
| ISO-NE | 600 | | 33 | 33 | 667 | 1200 |
| NYISO | 100 | 200 | | 33 | 333 | 200 |
| PJM | 100 | 200 | 33 | | 333 | 200 |
| Sum | 800 | 600 | 100 | 100 | 1600 | 1600 |

Initial Shares – ISO-NE, NYISO and PJM are initially assigned one half of their respective energy imports from HQTE. Consequently, under the ordinary SAR rules, they would be 'seeking' assistance for an equal amount. The total assistance sought is 800 MW for the entire contingency amount.

First Pass – ISO-NE is provided with 600 MW of assistance. These shares are allocated equally, 200 MW each, among the other three participants.

Second Pass – NYISO is provided 100 MW of assistance. These shares are allocated equally, 33 MW each, among the other three participants.

Third Pass – A third pass is now required to allocate assistance shares to the third component of the contingency. PJM is provided 100 MW of assistance. These shares are allocated equally, 33 MW each, among the other three participants.

Total Generation Picked up – The additional generation in each Balancing Authority**,** after all Balancing Authorities provided their shares, and the composite NPCC/PJM ACE is restored, and the SAR procedure is about to be canceled, is shown in the next to last column of the table above. The additional generation after the SAR procedure is canceled and each Balancing Authority returns it ACE to zero is shown in the last column.

The table below summarizes the changes in schedule and ACE from just prior to the contingency, through the cancellation of assistance and full recovery by both Balancing Authorities losing energy due to the contingency. In practice, the SAR Coordinator

merges the negation of the initial schedules (third row of numeric data) and the SAR share entries (fourth row of numeric data) into a single step to promote timely implementation, achieving the same desired net effect. Note that the ACE in step 4 matches the **Total Generation Picked Up When SAR Energy Is Supplied Fully** column in the previous table, but is opposite in sign.

| **Time** | **IESO Sch** | **IESO** | **NE Sch** | **NE ACE** | **PJM Sch** | **PJM ACE** | **NY Sch** | **NY ACE** | **Tot Sch** | **Tot ACE** |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-contingency | 0 | 0 | +400 | 0 | -200 | 0 | -200 | 0 | 0 | 0 |
| Contingency | 0 | 0 | +400 | -1600 | -200 | 0 | -200 | 0 | 0 | -1600 |
| Negation of PJM/NY/NE schedules | 0 | 0 | 0 | -1200 | 0 | -200 | 0 | -200 | 0 | -1600 |
| No response, SAR entries | +267 | -267 | -600<br>+33<br>+33=<br>-533 | -667 | -100<br>+200<br>+33=<br>+133 | -333 | -100<br>+200<br>+33=<br>+133 | -333 | 0 | -1600 |
| Full response, SAR not canceled | +267 | 0 | -533 | 0 | +133 | 0 | +133 | 0 | 0 | 0 |
| SAR just canceled | 0 | +267 | 0 | -533 | 0 | +133 | 0 | +133 | 0 | 0 |
| All get back to ACE = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

In the table above, NE Sch represents the sum of the energy exports wheeled from HQTE through ISO-NE to NYISO and PJM. PJM Sch represents the energy being wheeled from HQTE through ISO-NE and NYISO for PJM. NY Sch represents the energy being wheeled from HQTE through ISO-NE for NYISO.

Note that IESO, ISO-NE, and NBSO model their HVDC radial tie line imports as an internal generator, and their ACE will immediately reflect the loss of resource. NYISO includes HQTE HVDC interchange schedules within its AGC system, so NYISO must set that schedule to zero as soon as possible so its ACE reflects the loss of resource.

**Example 4.** ISO-NE, PJM and NYISO each import 700 MW each from Québec on Sandy Pond:

| | |
|---|---|
| Sandy Pond flow = | 2100 MW |
| HQTE – NYISO transaction = | 700 MW |
| HQTE – ISONE transaction = | 700 MW |
| HQTE – PJM transaction = | 700 MW |

| Area | **Initial Share/ Assistance Sought** | **First Pass** | **Second Pass** | **Third Pass** | **Total Generation Picked Up When SAR Energy Is Supplied Fully** | **Total Gen. Picked Up After SAR Is Canceled And All ACEs = 0** |
|---|---|---|---|---|---|---|
| IESO | | 117 | 117 | 117 | 350 | 0 |
| ISO-NE | 350 | | 117 | 117 | 584 | 700 |
| NYISO | 350 | 117 | | 117 | 584 | 700 |
| PJM | 350 | 117 | 117 | | 584 | 700 |
| Sum | 1050 | 350 | 350 | 350 | 2100 | 2100 |

Initial Shares – ISO-NE, NYISO, and PJM are initially assigned one half of their respective energy imports from HQTE. Consequently, under the ordinary SAR rules, they would be 'seeking' assistance for an equal amount. The total assistance sought is 1050 MW for the entire contingency amount.

First Pass – ISO-NE is provided 350 MW of assistance. These shares are allocated equally, 117 MW each, among the other three participants.

Second Pass – NYISO is provided 350 MW of assistance. These shares are allocated equally, 117 MW each, among the other three participants.

Third Pass –PJM is provided 350 MW of assistance. These shares are allocated equally, 117 MW each, among the other three participants.

Total Generation Picked up – The additional generation in each Balancing Authority after all Balancing Authorities provided their shares, and the composite NPCC/PJM ACE is restored, and the SAR procedure is about to be canceled, is shown in the next to last column of the table above. The additional generation after the SAR procedure is canceled and each Balancing Authority returns it ACE to zero is shown in the last column.

The table below summarizes the changes in schedule and ACE from just prior to the contingency, through the cancellation of assistance and full recovery by both Balancing Authorities losing energy due to the contingency. In practice, the SAR Coordinator

merges the negation of the initial schedules (third row of numeric data) and the SAR share entries (fourth row of numeric data) into a single step to promote timely implementation, achieving the same desired net effect. Note that the ACE in step 4 matches the **Total Generation Picked Up When SAR Energy Is Supplied Fully** column in the previous table, but is opposite in sign.

| Time | IESO Sch | IESO ACE | NE Sch | NE ACE | PJM Sch | PJM ACE | NY Sch | NY ACE | Tot Sch | Tot ACE |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-contingency | 0 | 0 | +1400 | 0 | -700 | 0 | -700 | 0 | 0 | 0 |
| Contingency | 0 | 0 | +1400 | -2100 | -700 | 0 | -700 | 0 | 0 | -2100 |
| Negation of PJM/NY/NE schedules | 0 | 0 | 0 | -700 | 0 | -700 | 0 | -700 | 0 | -2100 |
| No response, SAR entries | +350 | -350 | -117 | -583 | -117 | -583 | -117 | -583 | 0 | -2100 |
| Full response, SAR not canceled | +350 | 0 | -117 | 0 | -117 | 0 | -117 | 0 | 0 | 0 |
| SAR just canceled | 0 | +350 | 0 | -117 | 0 | -117 | 0 | -117 | 0 | 0 |
| All get back to ACE = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

In the table above, NE Sch represents the sum of the energy exports wheeled from HQTE through ISO-NE to NYISO and PJM. PJM Sch represents the energy being wheeled from HQTE through ISO-NE and NYISO for PJM. NY Sch represents the energy being wheeled from HQTE through ISO-NE for NYISO.

Note that IESO, ISO-NE, and NBSO model their HVDC radial tie line imports as an internal generator, and their ACE will immediately reflect the loss of resource. NYISO includes HQTE HVDC interchange schedules within its AGC system, so NYISO must set that schedule to zero as soon as possible so its ACE reflects the loss of resource.

**Radial Source Contingencies With Counter flow Transactions**

**Example 5.** Counter flow Transactions on MSC 7040
PJM Exports 400 MW to HQTE on MSC 7040, NYISO Imports 1200 MW:

| | |
|---|---|
| MSC 7040 flow = | 800 MW |
| HQTE – NYISO transaction = | 1200 MW |
| HQTE – PJM transaction = | -400 MW (flow is PJM to HQTE) |

| Area | **Initial Share/ Assistance Sought** | **First Pass** | **Second Pass** | **Total Generation Picked Up When SAR Energy Is Supplied Fully** | **Total Gen. Picked Up After SAR Is Canceled And All ACEs = 0** |
|---|---|---|---|---|---|
| IESO | | 200 | -67 | 133 | 0 |
| ISO-NE | | 200 | -67 | 133 | 0 |
| NYISO | 600 | | -67 | 533 | 1200 |
| PJM | -200 | 200 | | 0 | -400 |
| Sum | 400 | 600 | -200 | 800 | 800 |

Initial Shares – NYISO and PJM are initially assigned one half of their respective energy import from and energy export to HQTE. Consequently, under the ordinary SAR rules, they would be 'seeking' assistance for both flows into and out of Québec. The total net assistance sought is 400 MW for the net contingency amount.

First Pass – NYISO is provided 600 MW of assistance. These shares are allocated equally, 200 MW each, among the other three participants – including PJM.

Second Pass – PJM is provided -200 MW of assistance. These shares are allocated equally, -67 MW each, among the other three participants – including NYISO. These negative shares reduce the net pick-ups required of the assisting Balancing Authorities**.**

Total Generation Picked up – The additional generation in each Balancing Authority**,** after all Balancing Authorities provided their shares, and the composite NPCC/PJM ACE is restored, and the SAR procedure is about to be canceled, is shown in the next to last column of the table above. The additional generation after the SAR procedure is canceled and each Balancing Authority returns it ACE to zero is shown in the last column.

The table below summarizes the changes in schedule and ACE from just prior to the contingency, through the cancellation of assistance and full recovery by both Balancing Authorities losing energy due to the. In practice, the SAR Coordinator merges the negation of the initial schedule (third row of numeric data) and the SAR share entries (fourth row of numeric data) into a single step to promote timely implementation, achieving the same desired net effect. Note that the ACE in step 4 matches the **Total Generation Picked Up When SAR Energy Is Supplied Fully** column in the previous table, but is opposite in sign.

| Time | IESO Sch | IESO ACE | NE Sch | NE ACE | PJM/ NY Sch | PJM ACE | PJM/ NY Sch | NY ACE | Tot Sch | Tot ACE |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-contingency | 0 | 0 | 0 | 0 | +400 | 0 | -400 | 0 | 0 | 0 |
| Contingency | 0 | 0 | 0 | 0 | +400 | 0 | -400 | -800 | 0 | -800 |
| Negation of PJM/NY schedule | 0 | 0 | 0 | 0 | 0 | +400 | 0 | -1200 | 0 | -800 |
| No response, SAR entries | +133 | -133 | +133 | -133 | +200 +200 =400 | 0 | -600-67 =-667 | -533 | 0 | -800 |
| Full response, SAR not canceled | +133 | 0 | +133 | 0 | 400 | 0 | -667 | 0 | 0 | 0 |
| SAR just canceled | 0 | +133 | 0 | +133 | 0 | +400 | 0 | -667 | 0 | 0 |
| All get back to ACE = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Note that IESO, ISO-NE, and NBSO model their HVDC radial tie line imports as an internal generator, and their ACE will immediately reflect the loss of resource. NYISO includes HQTE HVDC interchange schedules within its AGC system, so NYISO must set that schedule to zero as soon as possible so its ACE reflects the loss of resource.

**Example 6.** ISO-NE imports 2000 MW from HQTE, PJM and NYISO export 500 MW each to Québec on Sandy Pond:

| | |
|---|---|
| Sandy Pond flow = | 1000 MW |
| NYISO - HQTE transaction = | -500 MW (flow is NY to HQTE) |
| HQTE – ISONE transaction = | 2000 MW |
| PJM – HQTE transaction = | -500 MW (flow is PJM to HQTE) |

| Area | **Initial Share/ Assistance Sought** | **First Pass** | **Second Pass** | **Third Pass** | **Total Generation Picked Up When SAR Energy Is Supplied Fully** | **Total Gen. Picked Up After SAR Is Canceled And All ACEs = 0** |
|---|---|---|---|---|---|---|
| IESO | | 333 | -83 | -83 | 167 | 0 |
| ISO-NE | 1000 | | -83 | -83 | 834 | 2000 |
| NYISO | -250 | 333 | | -83 | 0 | -500 |
| PJM | -250 | 333 | -83 | | 0 | -500 |
| Sum | 500 | 1000 | -250 | -250 | 1000 | 1000 |

Initial Shares – ISO-NE, NYISO and PJM are initially assigned one half of their respective energy imports from and energy exports to Québec. Consequently, under the ordinary SAR rules, they would be 'seeking' assistance for flows into and out of Québec. The total assistance sought is 500 MW for the net contingency amount.

First Pass – ISO-NE is provided 1000 MW of assistance. These shares are allocated equally, 333 MW each, among the other three participants.

Second Pass – NYISO is provided -250 MW of assistance. These shares are allocated equally, -83 MW each, among the other three participants.

Third Pass –PJM is provided -250 MW of assistance. These shares are allocated equally, -83 MW each, among the other three participants.

Total Generation Picked up – The additional generation in each Balancing Authority after all Balancing Authorities provided their shares, and the composite NPCC/PJM ACE is restored, and the SAR procedure is about to be canceled, is shown in the next to last column of the table above. The additional generation after the SAR procedure is canceled and each Balancing Authority returns its ACE to zero is shown in the last column.

The table below summarizes the changes in schedule and ACE from just prior to the contingency, through the cancellation of assistance and full recovery by both Balancing Authorities losing energy due to the contingency. In practice, the SAR Coordinator merges the

negation of the initial schedules (third row of numeric data) and the SAR share entries (fourth row of numeric data) into a single step to promote timely implementation, achieving the same desired net effect. Note that the ACE in step 4 matches the **Total Generation Picked Up When SAR Energy Is Supplied Fully** column in the previous table, but is opposite in sign.

| **Time** | **IESO Sch** | **IESO ACE** | **NE Sch** | **NE ACE** | **PJM Sch** | **PJM ACE** | **NY Sch** | **NY ACE** | **Tot Sch** | **Tot ACE** |
|---|---|---|---|---|---|---|---|---|---|---|
| Pre-contingency | 0 | 0 | -1000 | 0 | +500 | 0 | +500 | 0 | 0 | 0 |
| Contingency | 0 | 0 | -1000 | -1000 | +500 | 0 | +500 | 0 | 0 | -1000 |
| Negation of NE PJM/NY schedules | 0 | 0 | 0 | -2000 | 0 | +500 | 0 | +500 | 0 | -1000 |
| No response, SAR entries | +167 | -167 | -1000-83-83 = -1166 | -834 | +250 +333-83 =500 | 0 | +250 +333-83 =500 | 0 | 0 | -1000 |
| Full response, SAR not canceled | +167 | 0 | -1166 | 0 | 500 | 0 | 500 | 0 | 0 | 0 |
| SAR just canceled | 0 | +167 | 0 | -1166 | 0 | +500 | 0 | +500 | 0 | 0 |
| All get back to ACE = 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

In the table above, NE Sch represents the sum of the energy exports wheeled from PJM and NYISO through ISO-NE to HQTE. PJM Sch represents the energy being wheeled to HQTE through ISO-NE and NYISO for PJM. NY Sch represents the energy being wheeled to HQTE through ISO-NE for NYISO.

Note that IESO, ISO-NE, and NBSO model their HVDC radial tie line imports as an internal generator, and their ACE will immediately reflect the loss of resource. NYISO includes HQTE HVDC interchange schedules within its AGC system, so NYISO must set that schedule to zero as soon as possible so its ACE reflects the loss of resource.

# *Appendix 5 - NPCC Control Performance Reporting Process*

Reporting Processes

a. Each Balancing Authority not receiving overlap regulation service determines their CPS 1 and CPS 2 scores for the recently completed month by the tenth day after the end of the month.
b. Each Balancing Authority's NPCC CO-1 member (or his/her designee) collects and reviews the CPS1 and CPS 2 results for accuracy.
c. Each Balancing Authority's NPCC CO-1 member (or his/her designee) sends their CPS results to the appropriate NPCC compliance monitoring personnel.
d. The NPCC CO-1 Chair (or his/her designee) summarizes recent CPS 1 and CPS 2 performance in a running annual summary.
e. The NPCC CO-1 Chair (or his/her designee) informs TFCO when a substantive change in performance has occurred for any NPCC Balancing Authority that reports CPS 1 and CPS 2 compliance.
f. NPCC CO-1 has primary responsibility for monitoring the control performance of the NPCC region.

# *Appendix 6 Light Load Conditions*

Relatively large quantities of excess generation within a Balancing Area occurring during light load conditions may affect reliability adversely, and will cause actual interchange to deviate from scheduled interchange. Guidance to alleviate possibly adverse impacts on reliability and to lessen actual interchange deviations from schedule is provided in this appendix. A Balancing Authority that is anticipating or actually experiencing a Light Load Condition should consider implementing any of the following actions that are applicable and can lessen the adverse impacts noted above:

1. Adjust interchange schedules to reduce the import and/or increase the export of energy.
2. If permitted by operating policies, increase load by scheduling available pumped storage facilities in the pumping mode.
3. Arrange for bilateral inadvertent payback to increase the export of energy.
4. If permitted by operating policies, request that an appropriate amount of supply-side **resources** be reduced to the absolute minimum.
5. Review all supply-side **resource** "must-run" requirements. Determine if any may be temporarily removed or if other supply-side **resources** with lower limits could be brought on in place of normal "must-run" supply-side **resources**.
6. Review all supply-side **resource** "low-limits" and temporarily reduce them as low as possible.
7. De-commit sufficient ge**neration** to alleviate or minimize the excess generation condition.

# *Appendix 7 – Participation Request Form*

Instructions

NPCC Balancing Authorities and adjacent Balancing Authorities must complete this form to request participation in the following NPCC Programs:

- Simultaneous Activation of Reserve (SAR)
- Ace Diversity Interchange (ADI)
- Regional Reserve Deficiency

This form must be completed in full and submitted to the NPCC Task Force on Coordination of Operation (TFCO) for review and approval. The form must be authorized by an officer of the company submitting the form. On review of the form, the TFCO will notify the submitting Balancing Authority of the programs that they are approved to participate in.

The Coordinator role for all programs must also be approved by the TFCO.

**Participation Request Form**

**Balancing Authority Name: _____**

The Balancing Authority named above requests participation in the following programs (check one or more):

**Simultaneous Activation of Reserve:** ☐

**Ace Diversity Interchange:** ☐

**Regional Reserve Deficiency** ☐

The Balancing Authority named above wishes to act as the coordinator for:

**Coordinator: (SAR)** ☐

**Coordinator: (ADI)** ☐

**Coordinator:**
**Regional Reserve Deficiency** ☐

The undersigned must be an officer of the Balancing Authority named above with the authority to authorize participation by their company.

**Name: _____**

**Title: _____**

**Signature: _____**

**Date: _____**