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## **NPCC Regional Reliability Reference Directory # 2 Emergency Operations**

Task Force on Coordination of Operations Revision Review Record:
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Adopted by the Members of the Northeast Power Coordinating Council, Inc. this October 21, 2008 based on recommendation by the Reliability Coordinating Committee, in accordance with Section VIII of the NPCC Amended and Restated Bylaws dated January 1, 2012 as amended to date.

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### Revision History

<b>Version</b>	<b>Date</b>	<b>Action</b>	<b>Change Tracking (New, Errata or Revisions)</b>
<b>0</b>	<b>10/21/08</b>	<b>Effective Date</b>	<b>New</b>
<b>1</b>	<b>6/26/09</b>	<b>Transfer Auto UFLS language to D#12</b>	<b>Revision</b>
<b>2</b>	<b>8/19/09</b>	<b>Removed references to Automatic UFLS in Section 7 to reflect transfer of Automatic UFLS language to D#12.</b>	<b>Errata</b>
<b>3</b>	<b>1/06/2011</b>	<b>Inserted proper reference to Directory #12 Figure #1 App. B Sect. 6</b>	<b>Errata</b>
<b>4</b>	<b>12/09/2014</b>	<b>Appendix B Sections 4.1.5, 4.2.4, 4.3.2.1 and 4.3.5.3; conforming changes.</b>	<b>Errata</b>
<b>5</b>	<b>3/30/2015</b>	<b>Inserted Applicability of NPCC Criteria</b>	<b>New</b>
<b>6</b>	<b>6/29/2018</b>	<b>Reformatted Criteria NERC Style Requirements; Removal of a part 5.2.2 - requirement for studies</b>	<b>Revision</b>

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## 1.0 Introduction

1.1 Title Emergency Operations

1.2 Directory Number 2

1.3 Objective

The purpose of this Directory is to present the basic factors to be considered in formulating plans and procedures to be followed in an **emergency** or during conditions which could lead to an **emergency**, in order to facilitate mutual assistance and coordination within NPCC and adjacent areas.

The objectives in formulating plans related to **emergency** operating conditions are:

- a. To avoid the interruption of service to firm **load** to the extent possible.
- b. To minimize the occurrence of **system disturbances**.
- c. To contain any **system disturbance** and limit its effects to the area initially affected.
- d. To minimize the effects of any **system disturbances** on customers.
- e. To avoid damages to system **elements**.
- f. To avoid hazard to the public.

1.4 Effective Date October 21, 2008

1.5 Background

This Directory was developed from the NPCC A-03 Emergency Operations Criteria and associated B-3 Guideline and C-20 Procedure documents. Guidelines and procedures for consideration in the implementation of this Directory are provided in Appendix B.

1.6 Applicability

1.6.1 Functional Entities

- Reliability Coordinators
- Balancing Authorities
- Transmission Operators

1.6.2 Applicability of NPCC Criteria

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The requirements of an NPCC Directory apply only to those facilities defined as NPCC bulk power system elements as identified through the performance based methodology of NPCC Document A-10, “Classification of Bulk Power System Elements,” the list of which is maintained by the NPCC Task Force on System Studies and approved by the NPCC Reliability Coordinating Committee.

Requirements to abide by an NPCC Directory may also reside in external tariff requirements, bilateral contracts and other agreements between facility owners and/or operators and their assigned Reliability Coordinator, Planning Coordinator, Transmission Operator, Balancing Authority and/or Transmission Owner as applicable and may be enforceable through those external tariff requirements, bilateral contracts and other agreements. NPCC will not enforce compliance to the NPCC Directory requirements in this document on any entity that is not an NPCC Full Member.

## 2.0 Defined Terms

Unless specifically noted in this document terms in bold typeface are defined in the NPCC Glossary of Terms.

## 3.0 NPCC Full Member, More Stringent Criteria

### Requirements

- R1.** The Transmission Operator, Balancing Authority and Reliability Coordinator shall observe **normal transfer capabilities** unless there is insufficient **capacity** or voltage support in a Balancing Authority or Transmission Operator area, in which case **emergency transfer capabilities** may be used prior to shedding **firm load**. **Emergency transfer capabilities** shall not be exceeded.
- R1.1.** The Transmission Operator, Balancing Authority and Reliability Coordinator shall have documented procedures to indicate the circumstances under which **normal** and **emergency transfer capabilities** limits are applied.
- R2.** Each Balancing Authority and Transmission Operator shall have the capability to manually shed at least fifty percent of its area **load** in ten minutes or less. Manual **load shedding** plans shall not interrupt **bulk power system elements**.

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**R2.1.** The Balancing Authority and Transmission Operator shall review manual **load shedding** procedures at least annually to ensure that the proper amount of **load** can be shed within the time limits prescribed.

#### 4.0 Compliance

##### 3.1 Compliance Monitoring Process

Compliance with the requirements set forth in this Directory will be in accordance with the NPCC Criteria Compliance and Enforcement Program (CCEP).

##### 3.2 Data Retention

Responsible Entities shall keep evidence of compliance for a minimum of three (3) years. A Responsible Entity found non-compliant shall keep information related to the non-compliance until found compliant.

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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 of terms, etc., will only require RCC Members' approval. Errata may be corrected by the Lead Task Force at any time and provide the appropriate notifications to the NPCC Inc. membership.

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.

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References: NPCC Glossary of Terms

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**Appendix A – NERC ERO Reliability Standards Requirements:**

The NERC ERO Reliability Standards containing requirements associated with this Directory, but not necessarily enforceable in all NPCC areas include, but may not be limited to:

- BAL-002-2: Disturbance Control Standard – Contingency Reserve for Recovery from a Balancing Contingency Event
- BAL-003-1.1: Frequency Response and Frequency Bias
- BAL-005-0.2b: Automatic Generation Control
- EOP-011-1: Emergency Operations
- IRO-009-2: Reliability Coordinator Actions to Operate Within IROLs
- TOP-001-3: Transmission Operations
- TOP-002-4: Operations Planning

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## Appendix B - Guideline and Procedure for Emergency Operation

### 1.0 Introduction

This Appendix provides the guidelines and procedures for anticipating and operating under **emergency** conditions. These guidelines and procedures are intended to provide specific instructions to the **System Operator** during such conditions in an NPCC Balancing Authority area, Transmission Operator area or Reliability Coordinator area with an objective to minimize, when possible, the impact of an evolving event and to prevent, contain and control an **emergency**. Assistance from the Reliability Coordinators may be required to implement some of the actions specified below.

### 2.0 Minimizing the Impact of Events

2.1 It is recognized that provisions are made in the design of a power system for the satisfactory performance of the system during certain **faults** or incidents of equipment failure. It is also recognized that the power system should be operated in a prescribed manner to withstand these **contingencies**.

2.2 When planning for near term forecast conditions, each Balancing Authority and Transmission Operator should develop operating strategies that provide for sufficient generation and transmission to meet the following objectives:

2.2.1 **Operating reserve** requirements.

2.2.2 **Automatic generation control (AGC)** and frequency control requirements.

2.2.3 Line/tie line loadings within applicable normal operating limits.

2.2.4 **Bulk power system** voltage within normal limits.

2.3 When operating conditions deviate from the boundaries that are planned for, a Balancing Authority area or a Transmission Operator area may experience abnormal operating conditions. If such conditions persist, the Balancing Authority or the Transmission Operator may need to declare and enter into an **emergency**. When operating under abnormal or **emergency** conditions, the guideline and procedure as presented in Sections 3.0 to 6.0 should be followed.

### 3.0 Operating Under Abnormal Voltage Conditions

3.1 The **bulk power system** is operating with abnormal voltage conditions when:

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- 3.1.1 actual voltages are outside applicable normal (pre-**contingency**) voltage ranges.
- 3.1.2 expected post-**contingency** voltages violate applicable post-**contingency** minimum and maximum levels following applicable NPCC normal or **emergency** criteria **contingencies**.

Transmission Operators that anticipate or experiencing an abnormal voltage condition should follow the procedures specified in Section 3.2.

### 3.2 Correction of Abnormal Voltage Conditions

Abnormal voltage conditions in a Transmission Operator area can be caused by changes within the Transmission Operating area or external Transmission Operator areas, or by changes in load-generation-interchange balance in external Balancing Authority areas. In determining the appropriate steps to correct abnormal voltage conditions, attempts should be made to identify the root cause of the problems.

- 3.2.1 If a Transmission Operator area is experiencing abnormal voltage conditions, the Transmission Operator should implement the steps in Section 3.2.2 and 3.2.3 to return voltages to normal condition.
- 3.2.2 If the **bulk power system** voltage is rapidly decaying, the Balancing Authority or Transmission Operator area, if identifiable, causing the decay should immediately implement all possible action, including the shedding of **firm load**, to correct the problem. All other Transmission Operator areas experiencing the rapid voltage decay should immediately implement all possible action, including the shedding of **firm load**, to correct the problem, until such time that the Balancing Authority or Transmission Operator area causing the decay has implemented actions to correct the problem.
- 3.2.3 When a Transmission Operator anticipates or is experiencing an abnormal, but stable, or gradually changing **bulk power system** voltage condition, it should implement steps to correct the situation. Recognizing that voltage problems are most effectively corrected by control actions as close to the source as possible, the Transmission Operator should use its own resources, but may request assistance from adjacent Transmission Operator areas. Provided below is a guide for the implementation of potential control actions with the provision that individual steps may be eliminated if considered ineffective for the particular situation.

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3.2.3.1 The Transmission Operator area anticipating or experiencing the abnormal **bulk power system** voltage condition should implement the following control actions, where effective and as available, in accordance with the Transmission Operator's voltage control procedures:

3.2.3.1.1 adjust transformer taps.

3.2.3.1.2 switch capacitors/reactors.

3.2.3.1.3 adjust static VAR compensators.

3.2.3.1.4 utilize full reactive capability of on-line generators.

3.2.3.1.5 deploy synchronous condensers.

3.2.3.1.6 other actions as local voltage control procedures allow.

3.2.3.1.7 dispatch additional generation.

3.2.3.2 If the steps in Section 3.2.3.1 are insufficient to correct the problem, adjacent Transmission Operators should be advised of the need to depart from normal reactive schedules and should be requested to provide assistance if this will be effective. The adjacent Transmission Operators should assist by using some or all of the control actions listed in Section 3.2.3.1 where effective and as available, in accordance with their respective voltage control procedures.

3.2.3.3 If the steps in Sections 3.2.3.1 and 3.2.3.2 are insufficient to correct the problem, the Transmission Operator experiencing the abnormal voltage condition should take the following actions, where effective and as available, in accordance with its voltage control procedure:

3.2.3.3.1 request the Balancing Authority to modify transactions with other Balancing Authority areas, and/or deviate from economic dispatch.

3.2.3.3.2 operate hydraulic units as synchronous condensers, where possible.

3.2.3.3.3 reschedule pumped hydro units to generate or motor over the critical period.

- 3.2.3.3.4 purchase energy.
- 3.2.3.3.5 reduce generator **real power** output to increase reactive capability.
- 3.2.3.3.6 start additional **generation**.
- 3.2.3.3.7 switch out internal transmission lines provided system operating limits are not violated.

3.2.3.4 If the steps listed in Section 3.2.3.3 fail to correct the problem, the Transmission Operator experiencing the **bulk power system** voltage problem should request adjacent Transmission Operators to assist by using some or all of the steps listed in Section 3.2.3.3 where effective and as available.

3.2.3.5 If the steps listed in Section 3.2.3.3 and 3.2.3.4 are insufficient to correct the problem, the Transmission Operator experiencing the problem should implement voltage reduction procedures if this will improve transmission voltage levels. If, after this step, additional assistance is required, adjacent Transmission Operators should be requested to reduce customer supply voltage if this will be effective, providing the Transmission Operator in difficulty has already taken this step.

3.2.3.6 If the problem is low voltage and it persists after the steps up to Section 3.2.3.5 are exhausted, or if the **bulk power system** voltage is rapidly decaying, the Transmission Operator in difficulty will shed **firm load** as required.

3.2.4 When assistance is provided by an adjacent Balancing Authority and/or Transmission Operator, **emergency transfer capability** must not be exceeded.

3.2.5 If two or more Transmission Operators are experiencing voltage problems simultaneously, they will assist each other as above to the extent feasible. If the problem is so severe as to require the shedding of **firm load**, the shedding should be done to the extent required to control the situation. Transmission Operators that have mutually agreed upon a normal schedule of **reactive power** flow should adhere to this schedule to the extent possible.

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- 3.2.6 If the abnormal voltage is caused by conditions external to NPCC, the following steps should be implemented by the NPCC Transmission Operator experiencing abnormal voltage conditions as required and appropriate.
  - 3.2.6.1 Using available voltage and **reactive power** flow information, determine which system is causing the abnormal voltage or the trend toward abnormal voltage.
  - 3.2.6.2 Establish communication with the system causing the abnormal voltage
  - 3.2.6.3 All NPCC Transmission Operators in a position to assist should take any available action to relieve the abnormal voltage condition, excluding the shedding of **firm load** or opening transmission circuits. Assistance should normally only be requested after similar action has been implemented by the requesting Transmission Operator(s).
  - 3.2.6.4 If the action in 3.2.6.3 above is insufficient, the Transmission Operator experiencing the difficulty should promptly take all steps necessary to relieve the abnormal voltage condition, including shedding **firm load** and/or opening transmission circuits.

#### 4.0 Actions in a Transmission **Emergency**

##### 4.1 Correction of Transmission Loading if Exceeding Limits

When a Transmission Operator area is experiencing internal circuit or tie line loading in excess of applicable system operating limits, the following actions should be implemented as required and appropriate based on industry-wide and/or local procedures (assistance from the Reliability Coordinators may be required to implement some of these actions):

- 4.1.1 Implement local congestion management procedures including but not limited to:
  - 4.1.1.1 adjust internal **generation**
  - 4.1.1.2 transfer **load**
  - 4.1.1.3 adjust phase angle regulators (phase shifters)
  - 4.1.1.4 redeploy reactive resources

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- 4.1.2 Restore out-of-service transmission facilities where possible.
  - 4.1.3 Recall **generation** and transmission **element** outages.
  - 4.1.4 Discontinue **generation** and transmission **element** commissioning.
  - 4.1.5 Activate/implement voltage reduction.
  - 4.1.6 Utilize the NERC TLR process.
  - 4.1.7 Operate to **emergency transfer capabilities**
  - 4.1.8 Establish communication with areas inside and/or outside NPCC and request relief.
  - 4.1.9 All Balancing Authorities and Transmission Operators in a position to assist should take any available action, excluding **load shedding**, to keep loading from exceeding applicable system operating limits. Assistance should normally only be requested after similar action has been implemented by the requesting Transmission Operator.
  - 4.1.10 The Balancing Authority or Transmission Operator causing the overload (if identifiable) should adjust **generation** or perform other actions up to and including **load shedding** to keep loading below applicable system operating limits.
  - 4.1.11 The Transmission Operator experiencing the overload should, when effective, reconfigure the system or implement **load shedding** to return the load on **elements** to within applicable system operating limits.
- 4.2 Action of a Balancing Authority and Transmission Operator Experiencing an Emergency
- If a Transmission Operator area is in a transmission **emergency** because of conditions in another Transmission Operator area, it should implement any of the following actions that removes or lessens the threat to its reliability.
- 4.2.1 Attempt to identify the specific cause(s) and communicate with relevant Transmission Operator. Request assistance if required.
  - 4.2.2 Manually shed **firm load** or reject **generation** as appropriate.

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4.2.3 Communicate (if time permits and only if beneficial) to the adjacent Transmission Operator that the **tie lines** will be opened if immediate action is not taken to alleviate the **emergency**.

4.2.4 Open **tie lines** to prevent damage to equipment, if necessary.

#### 4.3 Action of a Balancing Authority or Transmission Operator Causing an **Emergency**

If operation in a Balancing Authority or Transmission Operator area is having an adverse reliability impact in another area, the Balancing Authority and Transmission Operator are required by NERC and NPCC Standards to respond to requests for assistance from the area in difficulty that remove or lessen the threat to its reliability, including:

4.3.1 Attempt to identify the specific cause(s) and communicate with relevant Balancing Authority or Transmission Operator. Request assistance if required.

4.3.2 Manually shed **firm load** until transmission loading and voltage return to acceptable values at all known problem locations.

4.3.3 Open or close **tie lines** as required.

4.3.4 Issue the appropriate NERC Energy Emergency Alert level and follow procedures in NERC Standard EOP-011 – Emergency Operations.

#### 5.0 Actions of a Balancing Authority to control Frequency and operate under a Capacity/Energy **Emergency**

5.1 A Balancing Authority area may from time to time experience difficulty in controlling frequency or ACE. Under these situations, the Balancing Authority should consider implementing the following actions.

##### 5.1.1 Manual **Load Shedding** for Capacity Shortage and Frequency Control

Each Balancing Authority should normally carry out the following unless an alternative plan is submitted for review by the NPCC Task Forces on Coordination of Operation and System Studies and approved by the NPCC Reliability Coordinating Committee:

5.1.1.1 The first half of the **load** shed manually should not include **load** which is part of any UFLS plan unless following manual **load**

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**shedding**, the requirements of Section 5.2 of NPCC Directory #12 Automatic UFLS Program Requirements can still be met.

5.1.1.2 The plan should include the capability of shedding **load** proportionately over the whole system, unless operating requirements limit **load shedding** to one part of a system.

#### 5.1.2 Frequency Deviation

When a large frequency excursion occurs during normal operations, Balancing Authority areas connected synchronously to the Eastern Interconnection shall continue to operate in the **tie line bias** area control mode unless continued operation in the **tie line bias** area control mode would have an adverse impact on reliability.

#### 5.1.3 Suspension of **Tie Line Bias** Area Control Mode

Balancing Authority areas connected synchronously to the Eastern Interconnection should continue to operate in the **tie line bias** area control mode unless reliability concerns such as but not limited to those shown below require alternative actions:

5.1.3.1 The Balancing Authority area loses synchronism with the Eastern Interconnection.

5.1.3.2 The Balancing Authority area is uncertain whether it is still connected to the Eastern Interconnection.

5.1.3.3 Values included in the ACE equation are suspect and may result in significant errors in control signals issued.

5.1.3.4 Continued operation in the **tie line bias** area control mode is, or has a reasonable probability of, adversely affecting reliability.

In this case, an alternative area control mode should be implemented.

#### 5.1.4 Use of Alternative Balancing Authority Control Mode

Balancing Authority areas connected synchronously to the Eastern Interconnection should develop alternative **AGC** operation strategies to address the concerns of 5.1.1 and 5.1.2 above as needed

#### 5.1.5 Sustained Negative **Area Control Error (ACE)** Causing A Burden

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If a Balancing Authority area has a negative **ACE** that cannot be returned to zero within fifteen minutes with regulation resources presently available and other planned energy resource deployments due to a known and persisting shortage, and the Balancing Authority area is burdening other Balancing Authority areas or Interconnection frequency, then the Balancing Authority should implement **load shedding** sufficient to return **ACE** to zero and perform the following notifications:

5.1.5.1 Inform the senior shift authority in each of the other affected Balancing Authorities of the NPCC.

5.1.5.2 Initiate, or request NPCC Staff to initiate, an NPCC Emergency Preparedness Conference Call, as defined in NPCC Procedure C-01, NPCC Emergency Preparedness Communications Procedures.

5.1.5.3 Issue the appropriate NERC Energy Emergency Alert level and follow procedures in NERC Standard EOP-011 – Emergency Operations.

## 6.0 Generation Tripping at Low Frequency

During a declining frequency event in a Balancing Authority area, generators may trip by underfrequency trip protection. This may aggravate the already declining frequency, possibly leading to a collapse of the area. To arrest the frequency decline, the loss in generation may need to be compensated for by **load shedding**.

### 6.1 Generator Tripping at Frequency below the Curve in Directory #12 Figure 1

If the frequency decays below the curve shown in Directory#12 Figure 1, steps may be taken to protect generating equipment, including separation from the system with or without **load**. In such cases isolation onto a generator's own auxiliaries is preferred to facilitate rapid resynchronization as soon as system conditions permit. For time periods exceeding 300 seconds, manual **load shedding** may need to be implemented to correct the low frequency problem.