



NORTHEAST POWER COORDINATING COUNCIL, INC.
1040 AVE. OF THE AMERICAS, NEW YORK, NY 10018 (212) 840-1070 FAX (212) 302-2782

December 30, 2017

Subject: Open Process Posting of NPCC Directory#2 *Emergency Operations*:

Attached for your review and comment are draft clean and redlined versions of a revised NPCC Directory#2 *Emergency Operations* which has been posted to the NPCC Open Process for a 45-day comment period.

The Task Force on Coordination of Operation (TFCO) and the CO-8 Systems Operations Managers Working Group have conducted a comprehensive review of Directory#2 to ensure that the criteria in the document remains more stringent or specific than the relevant NERC standards.

A summary of the revisions contained in the posted draft include:

- An overall reformatting of the criteria into NERC style requirements consistent with the goals of the NPCC Directory project.
- Appendix A - Definition of Terms removed. (Glossary Terms transferred to NPCC Glossary).
- Functional Entity applicability reviewed and updated as required.
- Revisions to the Appendix – “Guideline and Procedure for Emergency Operation”
- Elimination of content consistent with existing regional reliability practices.

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

<https://www.npcc.org/Standards/SitePages/NonStandardsList.aspx>

Comments on the revised NPCC Directory#2 *Emergency Operations* will be received for 45 days through February 13, 2018 and the TFCO and its Working Group will address all comments.

Please contact me with any questions regarding the NPCC Open Process or the content of this document.

Thank you.

Gerry Dunbar
Northeast Power Coordinating Council, Inc.
212.840.1070
gdunbar@npcc.org



NORTHEAST POWER COORDINATING COUNCIL, INC.
1040 AVE OF THE AMERICAS, NEW YORK, NY 10018 TELEPHONE (212) 840-1070 FAX (212) 302-2782

Drafted December 7, 2017

DRAFT NPCC
Regional Reliability Reference Directory # 2
Emergency Operations

OPEN PROCESS REVIEW
December 30, 2017

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Task Force on Coordination of Operations Revision Review Record:
October 21, 2008
June 26, 2009
March 30, 2015
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**NPCC Directory D2
Emergency Operations**

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 ~~July 24, 2007~~ January 1, 2012 as amended to date.

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Revision History

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

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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.

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

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- ~~1.a.~~ To avoid the interruption of service to firm **load** to the extent possible.
- ~~2.b.~~ To minimize the occurrence of **system disturbances**.
- ~~3.c.~~ To contain any **system disturbance** and limit its effects to the area initially affected.
- ~~4.d.~~ To minimize the effects of any **system disturbances** on customers.
- ~~5.e.~~ To avoid damages to system **elements**.
- ~~6.f.~~ To avoid hazard to the public.

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- 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

~~2.1 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,~~

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~~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.~~

1.6.1 Functional Entities

- ~~Reliability Coordinators~~
- ~~Balancing Authorities~~
- ~~Transmission Operators~~
- ~~Generator Operators~~

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Commented [AO1]: The group recommends removal of GOP from the Applicability section. GOP Functional Entity does not have any specific criteria/requirements applicable to them in the currently effective and revised Directory #2.

1.6.2 Applicability of NPCC Criteria

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.

1.0 ~~Terms Defined in this Directory~~ Terms

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

The definitions of terms found in this Directory appearing in bold typeface can be found in the Appendix A.

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:

Commented [AO2]: This section moved to the Appendix A and updated with the applicable, up-to-date standards.

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- ~~3.1 BAL 005: Automatic Generation Control~~
- ~~3.2 COM 001: Telecommunications~~
- ~~3.3 COM 002: Communications and Coordination~~
- ~~3.4 EOP 001: Emergency Operations Planning~~
- ~~3.5 EOP 002: Capacity and Energy Emergency~~
- ~~3.6 EOP 003: Load Shedding Plans~~
- ~~3.7 PRC 006: Development and Documentation of RRO's UFLS Programs~~
- ~~3.8 PRC 007: Assuring Consistency with Regional UFLS Requirements~~
- ~~3.9 TOP 001: Reliability Responsibilities and Authorities~~
- ~~3.10 TOP 004: Transmission Operations~~
- ~~3.11 TOP 006: Monitoring System Controls~~
- ~~3.12 IRO 003: Reliability Coordination – Wide Area View~~
- ~~3.13 IRO 005: Reliability Coordinator – Current Day Operation~~
- ~~3.14 IRO 015: Notification and Information Exchange Between RCs~~
- ~~3.15 IRO 016: Coordination of Real Time Activities Between RCs~~
- ~~3.16 BAL 001: Real Power Balancing Control Performance~~
- ~~3.17 BAL 002: Disturbance Control Performance~~
- ~~3.18 BAL 003: Frequency Response and Bias~~

~~4.0 NPCC Regional Reliability Standard Requirements~~

~~None.~~

Commented [AO3]: This section will be incorporated into Appendix A, if/when applicable NPCC Regional Reliability Standards are developed (e.g. PRC-006-NPCC-2, which would subsequently require updates to the D12 references if/when D12 is retired)

2.0 NPCC Full Member, More Stringent Criteria

~~These Criteria are in addition, more stringent or more specific than the NERC or any Regional Reliability standard requirements~~

~~General Criteria~~

~~Normal Transfer Capabilities shall be observed 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.~~

~~The circumstances under which each of these system operating limits are applied shall be clearly indicated by written instructions.~~

~~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~~

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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 clear **procedures** to indicate the circumstances under which **normal and emergency transfer capabilities** limits are applied.

Commented [AK4]: The group recommends replacing instructions with procedures to avoid confusion with Operating Instructions.

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**.

Commented [AO5]: BA applicable NERC requirement EOP-011-1, R2, part 2.2.8.
TOP applicable NERC requirement EOP-011-1, R1, part 1.2.5

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.

4.1 Manual Load Shedding Requirement

~~Each Balancing Authority shall have the capability of manually shedding at least fifty percent of its area **load** in ten minutes or less. **Manual load shedding** plans shall not interrupt **bulk power system** elements.~~

~~4.1.1 **Manual load shedding** procedures shall be reviewed at least annually by the Balancing Authority and Transmission Operator, to ensure that the proper amount of **load** can be shed within the time limits prescribed.~~

~~4.1.2 **Studies** shall be performed by the affected Transmission Operator to ensure satisfactory voltage and loading conditions after **manual load shedding**.~~

Commented [GJD6]:
CO-8 notes that no TOP currently performs such studies in real-time (which is the time scope of D2).

TFSS reviewed this requirement and confirmed there is no benefit for such a review from a system studies perspective.

CO-8 recommends eliminating this requirement noting it no longer serves a reliability purpose.

3.0 Measures and Assessments Compliance

4.24.1 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).
~~None developed at this time.~~

Commented [AO7]: Sections 6 and 7 of the currently effective version of D2 are not mapped into this directory. Instead, the standardized compliance and data retention language in other reformatted directories is inserted here.

4.34.2 Compliance Monitoring 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. ~~The monitoring of manual~~

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~~load shedding requirements (Section 5.2) will be carried out by the NPCC Compliance Committee.~~

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.

References: [NPCC Glossary of Terms](#) ~~None~~

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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

Commented [AO8]: Transferred to the NPCC Glossary

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, ~~or~~ 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.

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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**.

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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 and **emergency** conditions, the guideline and procedure as presented in Sections 3.0 to 6.0 should be followed.

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3.0 Operating Under Abnormal Voltage Conditions

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

3.1.1 actual voltages are outside applicable normal (pre-**contingency**) voltage ranges.

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3.1.2 expected post-**contingency** voltages violate applicable post-**contingency** minimum and maximum levels following applicable NPCC **n**Normal or **e**Emergency **c**Criteria **c**Contingencies.

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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

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potential control actions with the provision that individual steps may be eliminated if considered ineffective for the particular situation.

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 ~~economy~~ 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.

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- 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.

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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 Criteria** ~~capability~~ must not be exceeded.

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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

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of **reactive power** flow should adhere to this schedule to the extent possible.

- 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 to Contain an~~ Emergency

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~~If preventative measures as outlined under Sections 2.0 and/or 3.0 have not been adequate, the Balancing Authority or the Transmission Operator experiencing the abnormal conditions may need to declare and enter into an emergency. Actions to contain the emergency should then be taken. These actions should apply to both the Balancing Authority area and Transmission Operator area causing the emergency (if identifiable) and the Balancing Authority area and Transmission Operator area experiencing the emergency. The following is thus a continuation of the preventative and corrective measures implemented in Sections 2.0 and/or 3.0 above. Sections 4.1 and 4.2 apply to scenarios in which operation in one Balancing Authority area or Transmission Operator area is having an adverse impact on the reliability of another Balancing Authority or Transmission Operator area. Section 4.3 applies to the scenario that a Balancing Authority is experiencing difficulties in controlling frequency and/or ACE due to capacity/energy shortfall.~~

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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 steps 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), and

4.1.1.4 redeploy reactive resources:

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

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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.

2.14.2 Action of a Balancing Authority and Transmission Operator Experiencing an **Transmission Emergency**

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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.

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

2.1.24.2.2 Manually shed **firm load** or reject **generation** as appropriate.

2.1.34.2.3 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**.

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

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~~If a Balancing Authority area is experiencing a capacity or emergency, it should issue the appropriate NERC Energy Emergency Alert level and follow procedures in NERC Standard EOP-002-3.1 Capacity and Energy Emergencies Attachment 1.~~

2.24.3 Action of a Balancing Authority or Transmission Operator Causing the **Transmission an Emergency**

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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:

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

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~~2.2.24.3.2~~ Manually shed **firm load** until transmission loading and voltage return to acceptable values at all known problem locations.

~~2.2.24.3.3~~ Open or close **tie lines** as required.

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~~4.3.4~~ Issue the appropriate NERC Energy Emergency Alert level and follow procedures in NERC Standard EOP-002-3-011 – Emergency Operations- Capacity and Energy Emergencies Attachment 1.

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

~~2.35.1~~ 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.

~~2.3.1~~ Large 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.~~

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~~2.3.25.1.1~~ 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:

~~2.3.2.15.1.1.1~~ The first half of the **load** shed manually should not include **load** which is part of any UFLS automatic load shedding plan unless following manual **load shedding**, the requirements of Section 5.2 of NPCC Directory #12 Automatic UFLS Program Requirements can still be met.

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~~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.

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~~2.3.2.2~~

5.1.2 Large Frequency Deviation

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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.

2.3.3.5.1.3 Suspension of **Tie Line Bias** Area Control Mode

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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:

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

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

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

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

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

2.3.4.5.1.4 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 5.14.3.1 and 5.14.3.2 above as needed

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2.3.5.1.5 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

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Balancing Authority should implement **load shedding** sufficient to return **ACE** to zero and perform the following notifications:

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~~2.3.5.15.1.5.1~~ Inform the senior shift authority in each of the other affected Balancing Authorities of the NPCC.

~~2.3.5.25.1.5.2~~ Initiate, or request NPCC Staff to initiate, an NPCC Emergency Preparedness Conference Call, as defined in NPCC ~~Reference Document RD-01, NPCC Emergency Preparedness Conference Call Procedures – NPCC Security Conference Call Procedures~~ 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-002-3.1 ~~Capacity and Energy Emergencies Attachment 1011 – Emergency Operations.~~

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5.96.0 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**.

3.16.1 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.

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NORTHEAST POWER COORDINATING COUNCIL, INC.
1040 AVE OF THE AMERICAS, NEW YORK, NY 10018 TELEPHONE (212) 840-1070 FAX (212) 302-2782

Drafted December 7, 2017

DRAFT NPCC
Regional Reliability Reference Directory # 2
Emergency Operations

OPEN PROCESS REVIEW
December 30, 2017

CLEAN

Task Force on Coordination of Operations Revision Review Record:
October 21, 2008
June 26, 2009
March 30, 2015
XXXX YY, ZZZZ

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

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Section VIII of the NPCC Amended and Restated Bylaws dated January 1, 2012 as amended to date.

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Revision History

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

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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.

1.0 Defined Terms

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

2.0 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 clear 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**.

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.

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3.0 Compliance

4.1 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).

4.2 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.

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.

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 and **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.

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- 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 steps 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), and
- 4.1.1.4 redeploy reactive resources:
- 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.

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- 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.
- 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

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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 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 Large 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.

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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

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.

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