

Meeting Agenda Project 2014-01 Standards Applicability for Dispersed Generation Resources Standards Drafting Team

Monday, January 05, 2015, 1:00 p.m. to 5:00 p.m. Eastern
Tuesday, January 06, 2015, 9:00 a.m. to 5:00 p.m. Eastern
Wednesday, January 07, 2015, 9:00 a.m. to 5:00 p.m. Eastern

West Palm Beach, Florida

Dial-in: 866.740.1260 | Access Code: 5506033 | Security Code: 10515

Webinar: www.readytalk.com, enter access code 5506033

Administrative

1. **Introductions**
2. **Review NERC Antitrust Compliance Guidelines and Public Announcement***
3. **Participant Conduct Policy***
4. **Email List Policy***
5. **Review Meeting Agenda and Objectives***

Agenda Items

1. **Finalize PRC-001-1.1(X), PRC-019-2, and PRC-024-1(X) for Posting and Ballot***
 - a. Discuss ballot results
 - b. Finalize response to comments
 - c. Finalize standard revisions
2. **DGR/CIP SDT Coordination Update**

Scheduled for January 6, 2015 at 1:00 p.m. Eastern
3. **Update White Paper***
 - a. CIP
 - b. FAC

c. MOD

d. PRC

4. **Outreach**

5. **Future Meeting and Action Dates**

a. Future SDT meeting dates and locations to be determined

6. **Adjourn**

*Background materials included.

Antitrust Compliance Guidelines

I. General

It is NERC's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct that violates, or that might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition.

It is the responsibility of every NERC participant and employee who may in any way affect NERC's compliance with the antitrust laws to carry out this commitment.

Antitrust laws are complex and subject to court interpretation that can vary over time and from one court to another. The purpose of these guidelines is to alert NERC participants and employees to potential antitrust problems and to set forth policies to be followed with respect to activities that may involve antitrust considerations. In some instances, the NERC policy contained in these guidelines is stricter than the applicable antitrust laws. Any NERC participant or employee who is uncertain about the legal ramifications of a particular course of conduct or who has doubts or concerns about whether NERC's antitrust compliance policy is implicated in any situation should consult NERC's General Counsel immediately.

II. Prohibited Activities

Participants in NERC activities (including those of its committees and subgroups) should refrain from the following when acting in their capacity as participants in NERC activities (e.g., at NERC meetings, conference calls and in informal discussions):

- Discussions involving pricing information, especially margin (profit) and internal cost information and participants' expectations as to their future prices or internal costs.
- Discussions of a participant's marketing strategies.
- Discussions regarding how customers and geographical areas are to be divided among competitors.
- Discussions concerning the exclusion of competitors from markets.
- Discussions concerning boycotting or group refusals to deal with competitors, vendors or suppliers.

- Any other matters that do not clearly fall within these guidelines should be reviewed with NERC's General Counsel before being discussed.

III. Activities That Are Permitted

From time to time decisions or actions of NERC (including those of its committees and subgroups) may have a negative impact on particular entities and thus in that sense adversely impact competition. Decisions and actions by NERC (including its committees and subgroups) should only be undertaken for the purpose of promoting and maintaining the reliability and adequacy of the bulk power system. If you do not have a legitimate purpose consistent with this objective for discussing a matter, please refrain from discussing the matter during NERC meetings and in other NERC-related communications.

You should also ensure that NERC procedures, including those set forth in NERC's Certificate of Incorporation, Bylaws, and Rules of Procedure are followed in conducting NERC business.

In addition, all discussions in NERC meetings and other NERC-related communications should be within the scope of the mandate for or assignment to the particular NERC committee or subgroup, as well as within the scope of the published agenda for the meeting.

No decisions should be made nor any actions taken in NERC activities for the purpose of giving an industry participant or group of participants a competitive advantage over other participants. In particular, decisions with respect to setting, revising, or assessing compliance with NERC reliability standards should not be influenced by anti-competitive motivations.

Subject to the foregoing restrictions, participants in NERC activities may discuss:

- Reliability matters relating to the bulk power system, including operation and planning matters such as establishing or revising reliability standards, special operating procedures, operating transfer capabilities, and plans for new facilities.
- Matters relating to the impact of reliability standards for the bulk power system on electricity markets, and the impact of electricity market operations on the reliability of the bulk power system.
- Proposed filings or other communications with state or federal regulatory authorities or other governmental entities.

Matters relating to the internal governance, management and operation of NERC, such as nominations for vacant committee positions, budgeting and assessments, and employment matters; and procedural matters such as planning and scheduling meetings.

Public Announcements

For face-to-face meeting, with dial-in capability:

Participants are reminded that this meeting is public. Notice of the meeting was posted on the NERC website and widely distributed. The notice included the number for dial-in participation. Participants should keep in mind that the audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.

Standards Development Process Participant Conduct Policy

I. General

To ensure that the standards development process is conducted in a responsible, timely and efficient manner, it is essential to maintain a professional and constructive work environment for all participants. Participants include, but are not limited to, members of the standard drafting team and observers.

Consistent with the NERC Rules of Procedure and the NERC Standard Processes Manual, participation in NERC's Reliability Standards development balloting and approval processes is open to all entities materially affected by NERC's Reliability Standards. In order to ensure the standards development process remains open and to facilitate the development of reliability standards in a timely manner, NERC has adopted the following Participant Conduct Policy for all participants in the standards development process.

II. Participant Conduct Policy

All participants in the standards development process must conduct themselves in a professional manner at all times. This policy includes in-person conduct and any communication, electronic or otherwise, made as a participant in the standards development process. Examples of unprofessional conduct include, but are not limited to, verbal altercations, use of abusive language, personal attacks or derogatory statements made against or directed at another participant, and frequent or patterned interruptions that disrupt the efficient conduct of a meeting or teleconference.

III. Reasonable Restrictions in Participation

If a participant does not comply with the Participant Conduct Policy, certain reasonable restrictions on participation in the standards development process may be imposed as described below.

If a NERC Standards Developer determines, by his or her own observation or by complaint of another participant, that a participant's behavior is disruptive to the orderly conduct of a meeting in progress, the NERC Standards Developer may remove the participant from a meeting. Removal by the NERC Standards Developer is limited solely to the meeting in progress and does not extend to any future meeting. Before a participant may be asked to leave the meeting, the NERC Standards Developer must first remind the participant of the obligation to conduct himself or herself in a professional manner and provide an opportunity for the participant to comply. If a participant is requested to leave a meeting by a NERC Standards Developer, the participant must cooperate fully with the request.

Similarly, if a NERC Standards Developer determines, by his or her own observation or by complaint of another participant, that a participant's behavior is disruptive to the orderly conduct of a

teleconference in progress, the NERC Standards Developer may request the participant to leave the teleconference. Removal by the NERC Standards Developer is limited solely to the teleconference in progress and does not extend to any future teleconference. Before a participant may be asked to leave the teleconference, the NERC Standards Developer must first remind the participant of the obligation to conduct himself or herself in a professional manner and provide an opportunity for the participant to comply. If a participant is requested to leave a teleconference by a NERC Standards Developer, the participant must cooperate fully with the request. Alternatively, the NERC Standards Developer may choose to terminate the teleconference.

At any time, the NERC Director of Standards, or a designee, may impose a restriction on a participant from one or more future meetings or teleconferences, a restriction on the use of any NERC-administered list server or other communication list, or such other restriction as may be reasonably necessary to maintain the orderly conduct of the standards development process. Restrictions imposed by the Director of Standards, or a designee, must be approved by the NERC General Counsel, or a designee, prior to implementation to ensure that the restriction is not unreasonable. Once approved, the restriction is binding on the participant. A restricted participant may request removal of the restriction by submitting a request in writing to the Director of Standards. The restriction will be removed at the reasonable discretion of the Director of Standards or a designee.

Any participant who has concerns about NERC's Participant Conduct Policy may contact NERC's General Counsel.

NERC Email List Policy

NERC provides email lists, or “listservs,” to NERC committees, groups, and teams to facilitate sharing information about NERC activities; including balloting, committee, working group, and drafting team work, with interested parties. All emails sent to NERC listserv addresses must be limited to topics that are directly relevant to the listserv group’s assigned scope of work. NERC reserves the right to apply administrative restrictions to any listserv or its participants, without advance notice, to ensure that the resource is used in accordance with this and other NERC policies.

Prohibited activities include using NERC-provided listservs for any price-fixing, division of markets, and/or other anti-competitive behavior.¹ Recipients and participants on NERC listservs may not utilize NERC listservs for their own private purposes. This may include announcements of a personal nature, sharing of files or attachments not directly relevant to the listserv group’s scope of responsibilities, and/or communication of personal views or opinions, unless those views are provided to advance the work of the listserv’s group. Use of NERC’s listservs is further subject to NERC’s Participant Conduct Policy for the Standards Development Process.

- *Updated April 2013*

¹ Please see NERC’s Antitrust Compliance Guidelines for more information about prohibited antitrust and anti-competitive behavior or practices. This policy is available at <http://www.nerc.com/commondocs.php?cd=2>

Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed

1. SAR posted for comment November 20 – December 19, 2013.
2. The Standards Committee authorized this posting on September 30, 2014.

Description of Current Draft

PRC-001-1.1(X)¹ is proposed for approval to align the applicability of PRC-001-1.1a with the revised definition of the Bulk Electric System (BES). Specifically, the Project 2014-01 – Standards Applicability for Dispersed Generation Resources standards drafting team (SDT) has coordinated with the other SDTs currently reviewing this standard and has recommended revisions to Requirement R3.1 to account for the unique characteristics of dispersed power producing resources.² Given the timing of concurrent standards development of PRC, TOP, and IRO projects, PRC-001-1.1a may be retired pursuant to an Implementation Plan of a successor version of PRC-001. If this occurs, PRC-001-1.1(X) will not go into effect. Project 2014-01 does not have in its scope any technical content changes beyond revising the applicability to ensure consistent application of the requirements of this standard to dispersed power producing resources.

Anticipated Actions	Anticipated Date
45-day Additional Formal Comment Period with Additional Ballot (if necessary)	December 2014
Final ballot	January 2015
BOT adoption	February 2015

¹ The standard version number currently includes an (X) to indicate the version numbering will be updated. Some standards are open in current projects and others are pending with governmental authorities. As a result, NERC will assign the appropriate version number prior to adoption by the NERC Board of Trustees.

² The terms “dispersed generation resources” and “dispersed power producing resources” are used interchangeably in Project 2014-01 because the former term was used in the Standards Authorization Request for the project, while the latter term is in line with terminology used in the revised definition of the BES.

When this standard has received ballot approval, the text boxes within the Applicability section of the standard will be moved to the Application Guidelines Section of the standard.

A. Introduction

1. Title: System Protection Coordination

2. Number: PRC-001-1.1(X)

3. Purpose:

To ensure system protection is coordinated among operating entities.

4. Applicability

4.1. Balancing Authorities

4.2. Transmission Operators

4.3. Generator Operators

5. Effective Date:

See the Implementation Plan for this standard.

B. Requirements

R1. Each Transmission Operator, Balancing Authority, and Generator Operator shall be familiar with the purpose and limitations of Protection System schemes applied in its area.

R2. Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:

R2.1. If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.

R2.2. If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.

R3. A Generator Operator or Transmission Operator shall coordinate new protective systems and changes as follows.

R3.1. Each Generator Operator shall coordinate all new protective systems and all protective system changes with its Transmission Operator and Host Balancing Authority.

- Requirement R3.1 is not applicable to the individual generating units of dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition.

Rationale for the Applicability Exclusion in Requirement R3.1
--

Coordination of new or changes to protective systems associated with dispersed power producing resources identified through Inclusion I4 of the BES definition are typically performed on the interconnecting facilities. New or changes to protective systems associated with these facilities should be coordinated with the TOP as these protective systems typically must be closely coordinated with the transmission protective systems to ensure the overall protection systems operates as designed. While the protective systems implemented on the individual generating units of dispersed power producing resources at these dispersed power producing facilities (i.e. individual wind turbines or solar panels/inverters) may in some cases need to be coordinated with other protective systems within the same dispersed power producing facility, new or changes to these protective systems do not need to be coordinated with the transmission protective systems, as this coordination would not provide reliability benefits to the BES.

- R3.2.** Each Transmission Operator shall coordinate all new protective systems and all protective system changes with neighboring Transmission Operators and Balancing Authorities.
- R4.** Each Transmission Operator shall coordinate Protection Systems on major transmission lines and interconnections with neighboring Generator Operators, Transmission Operators, and Balancing Authorities.
- R5.** A Generator Operator or Transmission Operator shall coordinate changes in generation, transmission, load or operating conditions that could require changes in the Protection Systems of others:
 - R5.1.** Each Generator Operator shall notify its Transmission Operator in advance of changes in generation or operating conditions that could require changes in the Transmission Operator's Protection Systems.
 - R5.2.** Each Transmission Operator shall notify neighboring Transmission Operators in advance of changes in generation, transmission, load, or operating conditions that could require changes in the other Transmission Operators' Protection Systems.
- R6.** Each Transmission Operator and Balancing Authority shall monitor the status of each Special Protection System in their area, and shall notify affected Transmission Operators and Balancing Authorities of each change in status.

C. Measures

- M1.** Each Generator Operator and Transmission Operator shall have and provide upon request evidence that could include but is not limited to, revised fault analysis study, letters of agreement on settings, notifications of changes, or other equivalent evidence that will be used to confirm that there was coordination of new protective systems or changes as noted in Requirements 3, 3.1, and 3.2.
- M2.** Each Transmission Operator and Balancing Authority shall have and provide upon request evidence that could include but is not limited to, documentation, electronic

logs, computer printouts, or computer demonstration or other equivalent evidence that will be used to confirm that it monitors the Special Protection Systems in its area. (Requirement 6 Part 1)

- M3.** Each Transmission Operator and Balancing Authority shall have and provide upon request evidence that could include but is not limited to, operator logs, phone records, electronic-notifications or other equivalent evidence that will be used to confirm that it notified affected Transmission Operator and Balancing Authorities of changes in status of one of its Special Protection Systems. (Requirement 6 Part 2)

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Reliability Organizations shall be responsible for compliance monitoring.

1.2. Compliance Monitoring and Reset Time Frame

One or more of the following methods will be used to assess compliance:

- Self-certification (Conducted annually with submission according to schedule.)
- Spot Check Audits (Conducted anytime with up to 30 days notice given to prepare.)
- Periodic Audit (Conducted once every three years according to schedule.)
- Triggered Investigations (Notification of an investigation must be made within 60 days of an event or complaint of noncompliance. The entity will have up to 30 days to prepare for the investigation. An entity may request an extension of the preparation period and the extension will be considered by the Compliance Monitor on a case-by-case basis.)

The Performance-Reset Period shall be 12 months from the last finding of non-compliance.

1.3. Data Retention

Each Generator Operator and Transmission Operator shall have current, in-force documents available as evidence of compliance for Measure 1.

Each Transmission Operator and Balancing Authority shall keep 90 days of historical data (evidence) for Measures 2 and 3.

If an entity is found non-compliant the entity shall keep information related to the noncompliance until found compliant or for two years plus the current year, whichever is longer.

Evidence used as part of a triggered investigation shall be retained by the entity being investigated for one year from the date that the investigation is closed, as determined by the Compliance Monitor,

The Compliance Monitor shall keep the last periodic audit report and all requested and submitted subsequent compliance records.

1.4. Additional Compliance Information

None.

2. Levels of Non-Compliance for Generator Operators:

2.1. Level 1: Not applicable.

2.2. Level 2: Not applicable.

2.3. Level 3: Not applicable.

2.4. Level 4: Failed to provide evidence of coordination when installing new protective systems and all protective system changes with its Transmission Operator and Host Balancing Authority as specified in R3.1.

3. Levels of Non-Compliance for Transmission Operators:

3.1. Level 1: Not applicable.

3.2. Level 2: Not applicable.

3.3. Level 3: Not applicable.

3.4. Level 4: There shall be a separate Level 4 non-compliance, for every one of the following requirements that is in violation:

3.4.1 Failed to provide evidence of coordination when installing new protective systems and all protective system changes with neighboring Transmission Operators and Balancing Authorities as specified in R3.2.

3.4.2 Did not monitor the status of each Special Protection System, or did not notify affected Transmission Operators, Balancing Authorities of changes in special protection status as specified in R6.

4. Levels of Non-Compliance for Balancing Authorities:

4.1. Level 1: Not applicable.

4.2. Level 2: Not applicable.

4.3. Level 3: Not applicable.

4.4. Level 4: Did not monitor the status of each Special Protection System, or did not notify affected Transmission Operators, Balancing Authorities of changes in special protection status as specified in R6.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New

Standard PRC-001-1.1(X) — System Protection Coordination

0	August 8, 2005	Removed “Proposed” from Effective Date	Errata
0	August 25, 2005	Fixed Standard number in Introduction from PRC-001-1 to PRC-001-0	Errata
1	November 1, 2006	Adopted by the NERC Board of Trustees	Revised
1.1	April 11, 2012	Errata adopted by the Standards Committee; (Capitalized “Protection System” in accordance with Implementation Plan for Project 2007-17 approval of revised definition of “Protection System”)	Errata associated with Project 2007-17
1.1	September 9, 2013	Informational filing submitted to reflect the revised definition of Protection System in accordance with the Implementation Plan for the revised term.	
TBD (balloted as 1.1(X))	TBD	Standard revised in Project 2014-01	Applicability revised to clarify application of requirements to BES dispersed power producing resources

Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed

1. SAR posted for comment November 20 – December 19, 2013.
2. The Standards Committee authorized this posting on September 30, 2014.

Description of Current Draft

PRC-001-1.1(X)¹ is proposed for approval to align the applicability of PRC-001-1.1a with the revised definition of the Bulk Electric System (BES). Specifically, the Project 2014-01 – Standards Applicability for Dispersed Generation Resources standards drafting team (SDT) has coordinated with the other SDTs currently reviewing this standard and has recommended revisions to Requirement R3.1 to account for the unique characteristics of dispersed power producing resources.² Given the timing of concurrent standards development of PRC, TOP, and IRO projects, PRC-001-1.1a may be retired pursuant to an Implementation Plan of a successor version of PRC-001. If this occurs, PRC-001-1.1(X) will not go into effect. Project 2014-01 does not have in its scope any technical content changes beyond revising the applicability to ensure consistent application of the requirements of this standard to dispersed power producing resources.

<u>Anticipated Actions</u>	<u>Anticipated Date</u>
<u>45-day Additional Formal Comment Period with Additional Ballot (if necessary)</u>	<u>December 2014</u>
<u>Final ballot</u>	<u>January 2015</u>
<u>BOT adoption</u>	<u>February 2015</u>

¹ The standard version number currently includes an (X) to indicate the version numbering will be updated. Some standards are open in current projects and others are pending with governmental authorities. As a result, NERC will assign the appropriate version number prior to adoption by the NERC Board of Trustees.

² The terms “dispersed generation resources” and “dispersed power producing resources” are used interchangeably in Project 2014-01 because the former term was used in the Standards Authorization Request for the project, while the latter term is in line with terminology used in the revised definition of the BES.

When this standard has received ballot approval, the text boxes within the Applicability section of the standard will be moved to the Application Guidelines Section of the standard.

A. Introduction

1. **Title:** System Protection Coordination

2. **Number:** PRC-001-1.1(X)

3. **Purpose:**

To ensure system protection is coordinated among operating entities.

4. **Applicability**

4.1. Balancing Authorities

4.2. Transmission Operators

4.3. Generator Operators

5. **Effective Date:** January 1, 2007

See the Implementation Plan for this standard.

B. Requirements

R1. Each Transmission Operator, Balancing Authority, and Generator Operator shall be familiar with the purpose and limitations of Protection System schemes applied in its area.

R2. Each Generator Operator and Transmission Operator shall notify reliability entities of relay or equipment failures as follows:

R2.1. If a protective relay or equipment failure reduces system reliability, the Generator Operator shall notify its Transmission Operator and Host Balancing Authority. The Generator Operator shall take corrective action as soon as possible.

R2.2. If a protective relay or equipment failure reduces system reliability, the Transmission Operator shall notify its Reliability Coordinator and affected Transmission Operators and Balancing Authorities. The Transmission Operator shall take corrective action as soon as possible.

R3. A Generator Operator or Transmission Operator shall coordinate new protective systems and changes as follows.

R3.1. Each Generator Operator shall coordinate all new protective systems and all protective system changes with its Transmission Operator and Host Balancing Authority.

- Requirement R3.1 is not applicable to the individual generating units of dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition.

Rationale for the Applicability Exclusion in Requirement R3.1

Coordination of new or changes to protective systems associated with dispersed power producing resources identified through Inclusion I4 of the BES definition are typically performed on the interconnecting facilities. New or changes to protective systems associated with these facilities should be coordinated with the TOP as these protective systems typically must be closely coordinated with the transmission protective systems to ensure the overall protection systems operates as designed. While the protective systems implemented on the individual generating units of dispersed power producing resources at these dispersed power producing facilities (i.e. individual wind turbines or solar panels/inverters) may in some cases need to be coordinated with other protective systems within the same dispersed power producing facility, new or changes to these protective systems do not need to be coordinated with the transmission protective systems, as this coordination would not provide reliability benefits to the BES.

- R3.2.** Each Transmission Operator shall coordinate all new protective systems and all protective system changes with neighboring Transmission Operators and Balancing Authorities.
- R4.** Each Transmission Operator shall coordinate Protection Systems on major transmission lines and interconnections with neighboring Generator Operators, Transmission Operators, and Balancing Authorities.
- R5.** A Generator Operator or Transmission Operator shall coordinate changes in generation, transmission, load or operating conditions that could require changes in the Protection Systems of others:
 - R5.1.** Each Generator Operator shall notify its Transmission Operator in advance of changes in generation or operating conditions that could require changes in the Transmission Operator's Protection Systems.
 - R5.2.** Each Transmission Operator shall notify neighboring Transmission Operators in advance of changes in generation, transmission, load, or operating conditions that could require changes in the other Transmission Operators' Protection Systems.
- R6.** Each Transmission Operator and Balancing Authority shall monitor the status of each Special Protection System in their area, and shall notify affected Transmission Operators and Balancing Authorities of each change in status.

C. Measures

- M1.** Each Generator Operator and Transmission Operator shall have and provide upon request evidence that could include but is not limited to, revised fault analysis study, letters of agreement on settings, notifications of changes, or other equivalent evidence that will be used to confirm that there was coordination of new protective systems or changes as noted in Requirements 3, 3.1, and 3.2.
- M2.** Each Transmission Operator and Balancing Authority shall have and provide upon request evidence that could include but is not limited to, documentation, electronic

logs, computer printouts, or computer demonstration or other equivalent evidence that will be used to confirm that it monitors the Special Protection Systems in its area. (Requirement 6 Part 1)

- M3.** Each Transmission Operator and Balancing Authority shall have and provide upon request evidence that could include but is not limited to, operator logs, phone records, electronic-notifications or other equivalent evidence that will be used to confirm that it notified affected Transmission Operator and Balancing Authorities of changes in status of one of its Special Protection Systems. (Requirement 6 Part 2)

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Reliability Organizations shall be responsible for compliance monitoring.

1.2. Compliance Monitoring and Reset Time Frame

One or more of the following methods will be used to assess compliance:

- Self-certification (Conducted annually with submission according to schedule.)
- Spot Check Audits (Conducted anytime with up to 30 days notice given to prepare.)
- Periodic Audit (Conducted once every three years according to schedule.)
- Triggered Investigations (Notification of an investigation must be made within 60 days of an event or complaint of noncompliance. The entity will have up to 30 days to prepare for the investigation. An entity may request an extension of the preparation period and the extension will be considered by the Compliance Monitor on a case-by-case basis.)

The Performance-Reset Period shall be 12 months from the last finding of non-compliance.

1.3. Data Retention

Each Generator Operator and Transmission Operator shall have current, in-force documents available as evidence of compliance for Measure 1.

Each Transmission Operator and Balancing Authority shall keep 90 days of historical data (evidence) for Measures 2 and 3.

If an entity is found non-compliant the entity shall keep information related to the noncompliance until found compliant or for two years plus the current year, whichever is longer.

Evidence used as part of a triggered investigation shall be retained by the entity being investigated for one year from the date that the investigation is closed, as determined by the Compliance Monitor,

The Compliance Monitor shall keep the last periodic audit report and all requested and submitted subsequent compliance records.

1.4. Additional Compliance Information

None.

2. Levels of Non-Compliance for Generator Operators:

- 2.1. **Level 1:** Not applicable.
- 2.2. **Level 2:** Not applicable.
- 2.3. **Level 3:** Not applicable.
- 2.4. **Level 4:** Failed to provide evidence of coordination when installing new protective systems and all protective system changes with its Transmission Operator and Host Balancing Authority as specified in R3.1.

3. Levels of Non-Compliance for Transmission Operators:

- 3.1. **Level 1:** Not applicable.
- 3.2. **Level 2:** Not applicable.
- 3.3. **Level 3:** Not applicable.
- 3.4. **Level 4:** There shall be a separate Level 4 non-compliance, for every one of the following requirements that is in violation:
 - 3.4.1 Failed to provide evidence of coordination when installing new protective systems and all protective system changes with neighboring Transmission Operators and Balancing Authorities as specified in R3.2.
 - 3.4.2 Did not monitor the status of each Special Protection System, or did not notify affected Transmission Operators, Balancing Authorities of changes in special protection status as specified in R6.

4. Levels of Non-Compliance for Balancing Authorities:

- 4.1. **Level 1:** Not applicable.
- 4.2. **Level 2:** Not applicable.
- 4.3. **Level 3:** Not applicable.
- 4.4. **Level 4:** Did not monitor the status of each Special Protection System, or did not notify affected Transmission Operators, Balancing Authorities of changes in special protection status as specified in R6.

E. Regional Differences

None identified.

Version History

Version	Date	Action	Change Tracking
0	April 1, 2005	Effective Date	New

Standard PRC-001-1.1(X) — System Protection Coordination

0	August 8, 2005	Removed “Proposed” from Effective Date	Errata
0	August 25, 2005	Fixed Standard number in Introduction from PRC-001-1 to PRC-001-0	Errata
1	November 1, 2006	Adopted by <u>the NERC</u> Board of Trustees	Revised
1.1	April 11, 2012	Errata adopted by the Standards Committee; (Capitalized “Protection System” in accordance with Implementation Plan for Project 2007-17 approval of revised definition of “Protection System”)	Errata associated with Project 2007-17
1.1	September 9, 2013	Informational filing submitted to reflect the revised definition of Protection System in accordance with the Implementation Plan for the revised term.	
<u>TBD (balloted as 1.1(X))</u>	<u>TBD</u>	<u>Standard revised in Project 2014-01</u>	<u>Applicability revised to clarify application of requirements to BES dispersed power producing resources</u>

Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed

1. SAR posted for comment November 20 – December 19, 2013.
2. The Standards Committee authorized this posting on September 30, 2014.

Description of Current Draft

PRC-019-2 is proposed for approval to align the applicability section of PRC-019-1 with the revised definition of the Bulk Electric System (BES). Specifically, the Project 2014-01 – Standards Applicability for Dispersed Generation Resources standards drafting team has recommended revisions to the Facilities section to clarify that facilities that solely regulate voltage at the individual generating unit are subject to the requirements. Given the timing of concurrent standards development of PRC projects, PRC-019-1 may be retired pursuant to an Implementation Plan of a successor version of PRC-019. If this occurs, PRC-019-2 will not go into effect. Project 2014-01 does not have in its scope any technical content changes beyond revising the applicability to ensure consistent application of the requirements of this standard to dispersed power producing resources.¹

Anticipated Actions	Anticipated Date
45-day Additional Formal Comment Period with Additional Ballot (if necessary)	December 2014
Final ballot	January 2015
BOT adoption	February 2015

¹ The terms “dispersed generation resources” and “dispersed power producing resources” are used interchangeably in Project 2014-01 because the former term was used in the Standards Authorization Request for the project, while the latter term is in line with terminology used in the revised definition of the BES.

Standard PRC-019-2 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

When this standard has received ballot approval, the text boxes within the Applicability section of the standard will be moved to the Application Guidelines Section of the standard.

A. Introduction

1. **Title:** Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection
2. **Number:** PRC-019-2
3. **Purpose:** To verify coordination of generating unit Facility or synchronous condenser voltage regulating controls, limit functions, equipment capabilities and Protection System settings.

4. **Applicability:**

- 4.1. **Functional Entities**

- 4.1.1 Generator Owner

- 4.1.2 Transmission Owner that owns synchronous condenser(s)

- 4.2. **Facilities**

For the purpose of this standard, the term, “applicable Facility” shall mean any one of the following:

- 4.2.1 Individual generating unit greater than 20 MVA (gross nameplate rating) directly connected to the Bulk Electric System.

- 4.2.2 Individual synchronous condenser greater than 20 MVA (gross nameplate rating) directly connected to the Bulk Electric System.

- 4.2.3 Generating plant/ Facility consisting of one or more units that are connected to the Bulk Electric System at a common bus with total generation greater than 75 MVA (gross aggregate nameplate rating).

- 4.2.3.1 This includes individual dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition where voltage regulating control for the facility is performed solely at the individual resources.

Rationale for Facilities section 4.2.3.1

For those dispersed power producing facilities that only perform voltage regulating control at the individual unit level, the SDT believes that coordination should take place at the individual power producing resource level. These facilities need to consider the Protection Systems at the individual units and their compatibility with the reactive and voltage limitations of the units. Where voltage regulating control is done at an aggregate level, applicability is already included under Facilities section 4.2.3.

4.2.4 Any generator, regardless of size, that is a blackstart unit material to and designated as part of a Transmission Operator's restoration plan.

5. Effective Date:

See the Implementation Plan for this standard.

B. Requirements

R1. At a maximum of every five calendar years, each Generator Owner and Transmission Owner with applicable Facilities shall coordinate the voltage regulating system controls, (including in-service² limiters and protection functions) with the applicable equipment capabilities and settings of the applicable Protection System devices and functions. [*Violation Risk Factor: Medium*] [*Time Horizon: Long-term Planning*]

1.1. Assuming the normal automatic voltage regulator control loop and steady-state system operating conditions, verify the following coordination items for each applicable Facility:

1.1.1. The in-service limiters are set to operate before the Protection System of the applicable Facility in order to avoid disconnecting the generator unnecessarily.

1.1.2. The applicable in-service Protection System devices are set to operate to isolate or de-energize equipment in order to limit the extent of damage when operating conditions exceed equipment capabilities or stability limits.

R2. Within 90 calendar days following the identification or implementation of systems, equipment or setting changes that will affect the coordination described in Requirement R1, each Generator Owner and Transmission Owner with applicable Facilities shall perform the coordination as described in Requirement R1. These possible systems, equipment or settings changes include, but are not limited to the following [*Violation Risk Factor: Medium*] [*Time Horizon: Long-term Planning*]:

- Voltage regulating settings or equipment changes;
- Protection System settings or component changes;
- Generating or synchronous condenser equipment capability changes; or
- Generator or synchronous condenser step-up transformer changes.

C. Measures

M1. Each Generator Owner and Transmission Owner with applicable Facilities will have evidence (such as examples provided in PRC-019 Section G) that it coordinated the voltage regulating system controls, including in-service³ limiters and protection functions, with the applicable equipment capabilities and settings of the applicable

² Limiters or protection functions that are installed and activated on the generator or synchronous condenser.

³ Limiters or protection functions that are installed and activated on the generator or synchronous condenser.

Protection System devices and functions as specified in Requirement R1. This evidence should include dated documentation that demonstrates the coordination was performed.

- M2.** Each Generator Owner and Transmission Owner with applicable Facilities will have evidence of the coordination required by the events listed in Requirement R2. This evidence should include dated documentation that demonstrates the specified intervals in Requirement R2 have been met.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance enforcement authority unless the applicable entity is owned, operated, or controlled by the Regional Entity. In such cases the ERO or a Regional entity approved by FERC or other applicable governmental authority shall serve as the CEA.

1.2. Evidence Retention

The following evidence retention periods identify a period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention specified below is shorter than the time since the last compliance audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The Generator Owner and Transmission Owner shall retain evidence of compliance with Requirements R1 and R2, Measures M1 and M2 for six years.

If a Generator Owner or Transmission Owner is found non-compliant, the entity shall keep information related to the non-compliance until mitigation is complete and approved or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last periodic audit report and all requested and submitted subsequent audit records.

1.3. Compliance Monitoring and Assessment Processes

Compliance Audit

Self-Certification

Spot Checking

Compliance Investigation

Self-Reporting

Standard PRC-019-2 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

Complaint

1.4. Additional Compliance Information

None

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 5 calendar years but less than or equal to 5 calendar years plus 4 months after the previous coordination.	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 5 calendar years plus 4 months but less than or equal to 5 calendar years plus 8 months after the previous coordination.	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 5 calendar years plus 8 months but less than or equal to 5 calendar years plus 12 months after the previous coordination.	The Generator Owner or Transmission Owner failed to coordinate equipment capabilities, limiters, and protection specified in Requirement R1 within 5 calendar years plus 12 months after the previous coordination.
R2	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 90 calendar days but less than or equal to 100 calendar days following the identification or implementation of a change in equipment or settings that affected the coordination.	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 100 calendar days but less than or equal to 110 calendar days following the identification or implementation of a change in equipment or settings that affected the coordination.	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 110 calendar days but less than or equal to 120 calendar days following the identification or implementation of a change in equipment or settings that affected the coordination.	The Generator Owner or Transmission Owner failed to coordinate equipment capabilities, limiters, and protection specified in Requirement R1 within 120 calendar days following the identification or implementation of a change in equipment or settings that affected the coordination.

E. Regional Variances

None.

F. Associated Documents

“Underexcited Operation of Turbo Generators”, AIEE Proceedings T Section 881, Volume 67, 1948, Appendix 1, C. G. Adams and J. B. McClure.

,”Protective Relaying For Power Generation Systems”, Boca Raton, FL, Taylor & Francis, 2006, Reimert, Donald

“Coordination of Generator Protection with Generator Excitation Control and Generator Capability”, a report of Working Group J5 of the IEEE PSRC Rotating Machinery Subcommittee

“IEEE C37.102-2006 IEEE Guide for AC Generator Protection”

“IEEE C50.13-2005 IEEE Standard for Cylindrical-Rotor 50 Hz and 60 Hz Synchronous Generators Rated 10 MVA and Above”

Version History

Version	Date	Action	Change Tracking
1	February 7, 2013	Adopted by NERC Board of Trustees	New
1	March 20, 2014	FERC Order issued approving PRC-019-1. (Order becomes effective on 7/1/16.)	

G. Reference

Examples of Coordination

The evidence of coordination associated with Requirement R1 may be in the form of:

- P-Q Diagram (Example in Attachment 1), or
- R-X Diagram (Example in Attachment 2), or
- Inverse Time Diagram (Example in Attachment 3) or,
- Equivalent tables or other evidence

This evidence should include the equipment capabilities and the operating region for the limiters and protection functions

Equipment limits, types of limiters and protection functions which could be coordinated include (but are not limited to):

Standard PRC-019-2 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

- Field over-excitation limiter and associated protection functions.
- Inverter over current limit and associated protection functions.
- Field under-excitation limiter and associated protection functions.
- Generator or synchronous condenser reactive capabilities.
- Volts per hertz limiter and associated protection functions.
- Stator over-voltage protection system settings.
- Generator and transformer volts per hertz capability.
- Time vs. field current or time vs. stator current.

NOTE: This listing is for reference only. This standard does not require the installation or activation of any of the above limiter or protection functions.

For this example, the Steady State Stability Limit (SSSL) is the limit to synchronous stability in the under-excited region with fixed field current.

On a P-Q diagram using X_d as the direct axis saturated synchronous reactance of the generator, X_s as the equivalent reactance between the generator terminals and the “infinite bus” including the reactance of the generator step-up transformer and V_g as the generator terminal voltage (all values in per-unit), the SSSL can be calculated as an arc with the center on the Q axis with the magnitude of the center and radius described by the following equations

$$C = V_g^2/2*(1/X_s-1/X_d)$$

$$R = V_g^2/2*(1/X_s+1/X_d)$$

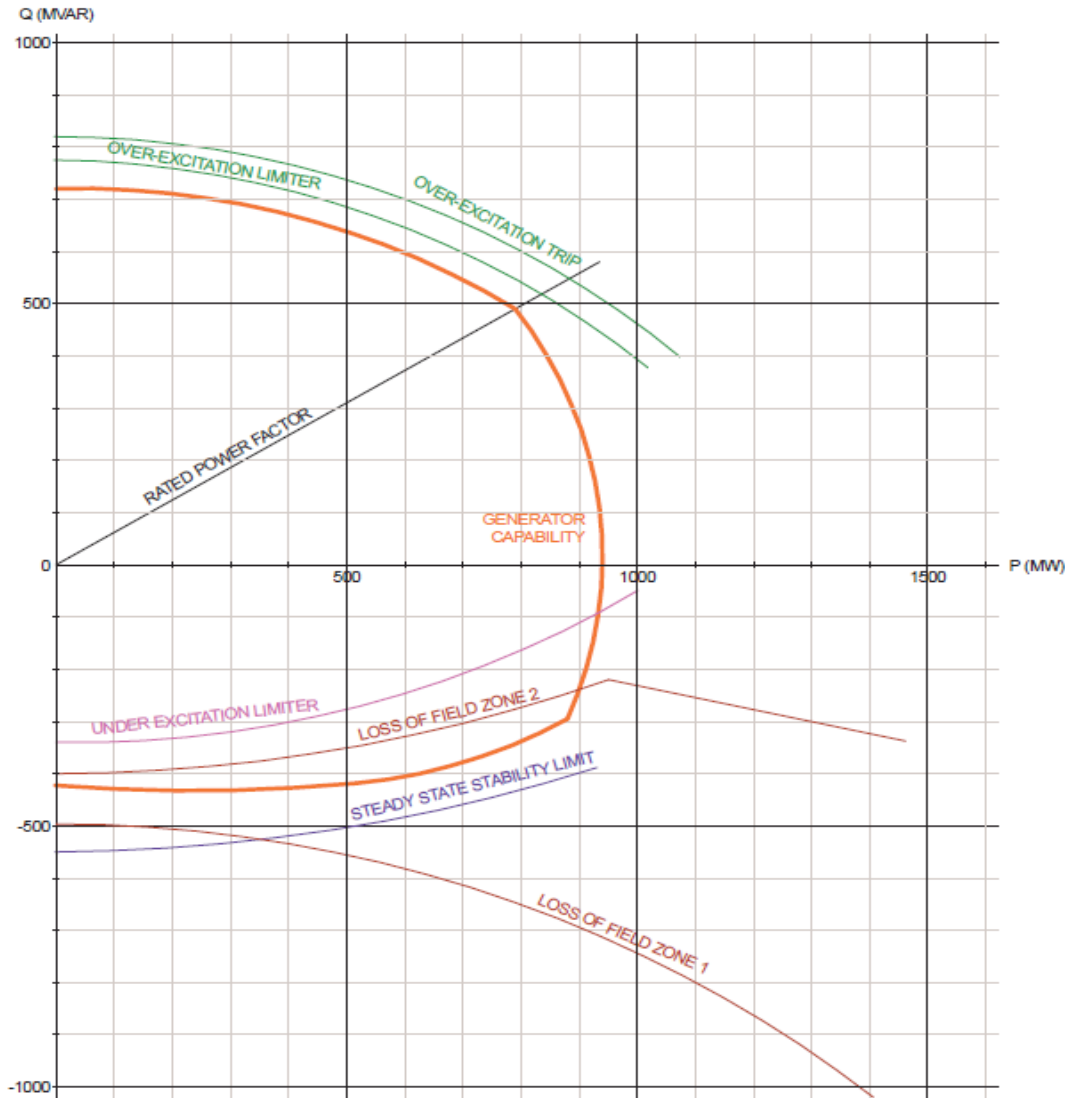
On an R-X diagram using X_d as the direct axis saturated synchronous reactance of the generator, and X_s as the equivalent reactance between the generator terminals and the “infinite bus” including the reactance of the generator step-up transformer the SSSL is an arc with the center on the X axis with the center and radius described by the following equations:

$$C = (X_d-X_s)/2$$

$$R = (X_d+X_s)/2$$

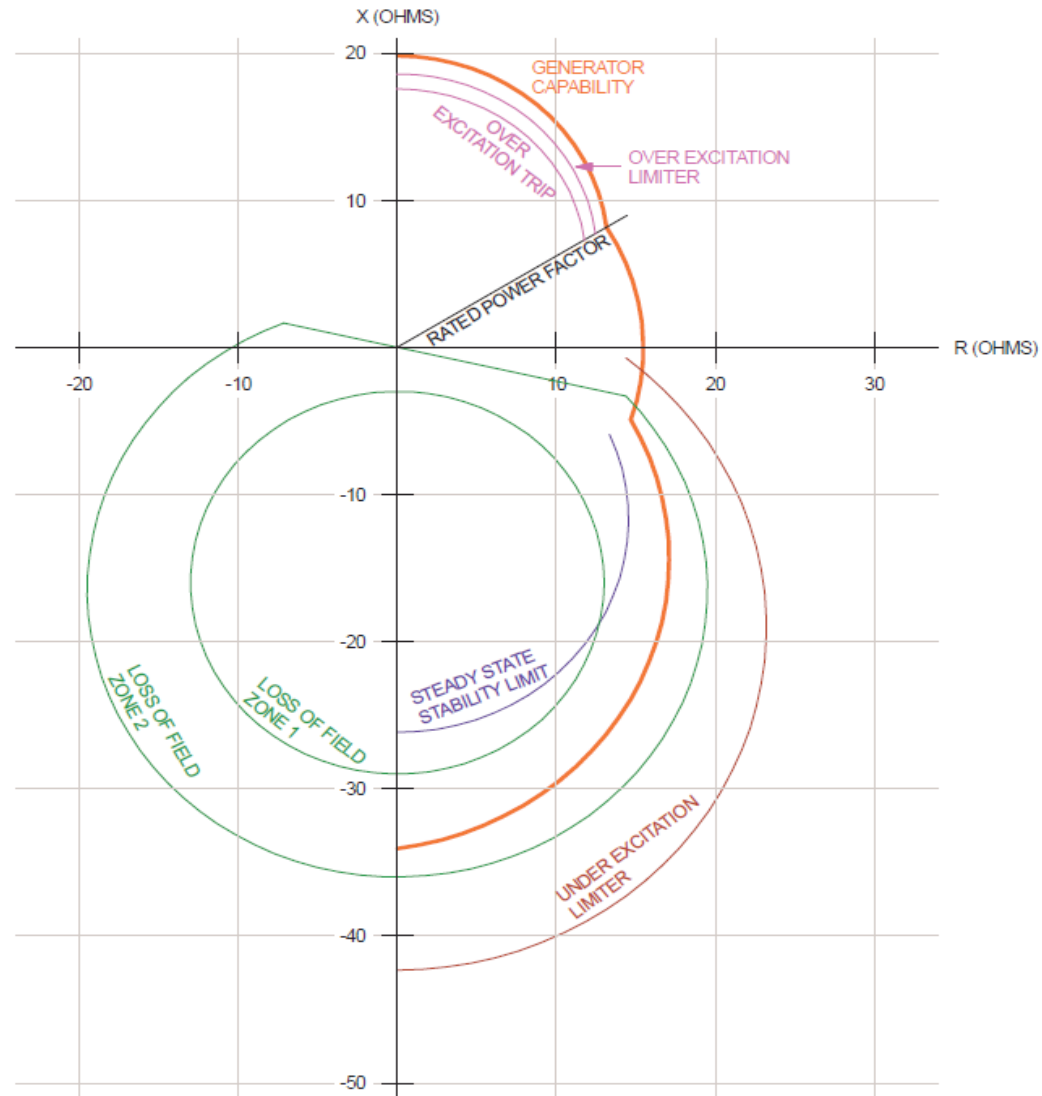
Standard PRC-019-2 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

Section G Attachment 1 – Example of Capabilities, Limiters and Protection on a P-Q Diagram at nominal voltage and frequency



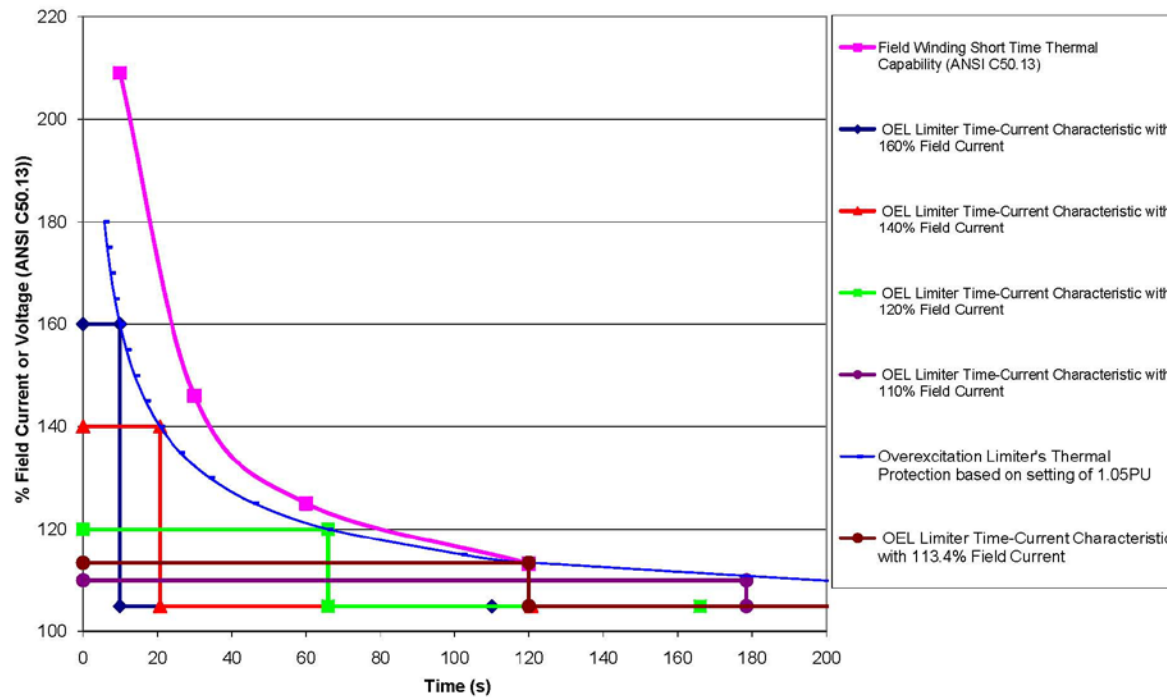
Standard PRC-019-2 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

Section G Attachment 2 – Example of Capabilities, Limiters, and Protection on an R-X Diagram at nominal voltage and frequency



Standard PRC-019-2 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

Section G Attachment 3 - Example of Capabilities, Limiters, and Protection on an Inverse Time Characteristic Plot



Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed

1. SAR posted for comment November 20 – December 19, 2013.
2. The Standards Committee authorized this posting on September 30, 2014.

Description of Current Draft

PRC-019-2 is proposed for approval to align the applicability section of PRC-019-1 with the revised definition of the Bulk Electric System (BES). Specifically, the Project 2014-01 – Standards Applicability for Dispersed Generation Resources standards drafting team has recommended revisions to the Facilities section to clarify that facilities that solely regulate voltage at the individual generating unit are subject to the requirements. Given the timing of concurrent standards development of PRC projects, PRC-019-1 may be retired pursuant to an Implementation Plan of a successor version of PRC-019. If this occurs, PRC-019-2 will not go into effect. Project 2014-01 does not have in its scope any technical content changes beyond revising the applicability to ensure consistent application of the requirements of this standard to dispersed power producing resources.¹

<u>Anticipated Actions</u>	<u>Anticipated Date</u>
<u>45-day Additional Formal Comment Period with Additional Ballot (if necessary)</u>	<u>December 2014</u>
<u>Final ballot</u>	<u>January 2015</u>
<u>BOT adoption</u>	<u>February 2015</u>

¹ The terms “dispersed generation resources” and “dispersed power producing resources” are used interchangeably in Project 2014-01 because the former term was used in the Standards Authorization Request for the project, while the latter term is in line with terminology used in the revised definition of the BES.

When this standard has received ballot approval, the text boxes within the Applicability section of the standard will be moved to the Application Guidelines Section of the standard.

A. Introduction

1. **Title:** Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection
2. **Number:** PRC-019-~~24~~
3. **Purpose:** To verify coordination of generating unit Facility or synchronous condenser voltage regulating controls, limit functions, equipment capabilities and Protection System settings.

4. **Applicability:**

- 4.1. **Functional Entities**

- 4.1.1 Generator Owner

- 4.1.2 Transmission Owner that owns synchronous condenser(s)

- 4.2. **Facilities**

For the purpose of this standard, the term, “applicable Facility” shall mean any one of the following:

- 4.2.1 Individual generating unit greater than 20 MVA (gross nameplate rating) directly connected to the Bulk Electric System.

- 4.2.2 Individual synchronous condenser greater than 20 MVA (gross nameplate rating) directly connected to the Bulk Electric System.

- 4.2.3 Generating plant/ Facility consisting of one or more units that are connected to the Bulk Electric System at a common bus with total generation greater than 75 MVA (gross aggregate nameplate rating).

- 4.2.3.1 This includes individual dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition where voltage regulating control for the facility is performed solely at the individual resources.

Rationale for Facilities section 4.2.3.1

For those dispersed power producing facilities that only perform voltage regulating control at the individual unit level, the SDT believes that coordination should take place at the individual power producing resource level. These facilities need to consider the Protection Systems at the individual units and their compatibility with the reactive and voltage limitations of the units. Where voltage regulating control is done at an aggregate level, applicability is already included under Facilities section 4.2.3.

4.2.4 Any generator, regardless of size, that is a blackstart unit material to and designated as part of a Transmission Operator's restoration plan.

5. Effective Date:

See the Implementation Plan for this standard.

~~5.1. In those jurisdictions where regulatory approval is required:~~

~~5.1.1 By the first day of the first calendar quarter, two calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner and Transmission Owner shall have verified at least 40 percent of its applicable Facilities.~~

~~5.1.2 By the first day of the first calendar quarter, three calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner and Transmission Owner shall have verified at least 60 percent of its applicable Facilities.~~

~~5.1.3 By the first day of the first calendar quarter, four calendar years following applicable regulatory, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, approval each Generator Owner and Transmission Owner shall have verified at least 80 percent of its applicable Facilities.~~

~~5.1.4 By the first day of the first calendar quarter, five calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner and Transmission Owner shall have verified 100 percent of its applicable Facilities.~~

~~5.2. In those jurisdictions where regulatory approval is not required:~~

~~5.2.1 By the first day of the first calendar quarter, two calendar years following Board of Trustees approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner and Transmission Owner shall have verified at least 40 percent of its applicable Facilities.~~

~~5.2.2 By the first day of the first calendar quarter, three calendar years following Board of Trustees approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner and Transmission Owner shall have verified at least 60 percent of its applicable Facilities.~~

~~5.2.3 By the first day of the first calendar quarter, four calendar years following Board of Trustees approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator~~

~~Owner and Transmission Owner shall have verified at least 80 percent of its applicable Facilities.~~

~~5.2.4 By the first day of the first calendar quarter, five calendar years following Board of Trustees approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner and Transmission Owner shall have verified 100 percent of its applicable Facilities.~~

B. Requirements

R1. At a maximum of every five calendar years, each Generator Owner and Transmission Owner with applicable Facilities shall coordinate the voltage regulating system controls, (including in-service² limiters and protection functions) with the applicable equipment capabilities and settings of the applicable Protection System devices and functions. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

1.1. Assuming the normal automatic voltage regulator control loop and steady-state system operating conditions, verify the following coordination items for each applicable Facility:

1.1.1. The in-service limiters are set to operate before the Protection System of the applicable Facility in order to avoid disconnecting the generator unnecessarily.

1.1.2. The applicable in-service Protection System devices are set to operate to isolate or de-energize equipment in order to limit the extent of damage when operating conditions exceed equipment capabilities or stability limits.

R2. Within 90 calendar days following the identification or implementation of systems, equipment or setting changes that will affect the coordination described in Requirement R1, each Generator Owner and Transmission Owner with applicable Facilities shall perform the coordination as described in Requirement R1. These possible systems, equipment or settings changes include, but are not limited to the following *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*:

- Voltage regulating settings or equipment changes;
- Protection System settings or component changes;
- Generating or synchronous condenser equipment capability changes; or
- Generator or synchronous condenser step-up transformer changes.

C. Measures

² Limiters or protection functions that are installed and activated on the generator or synchronous condenser.

- M1.** Each Generator Owner and Transmission Owner with applicable Facilities will have evidence (such as examples provided in PRC-019 Section G) that it coordinated the voltage regulating system controls, including in-service³ limiters and protection functions, with the applicable equipment capabilities and settings of the applicable Protection System devices and functions as specified in Requirement R1. This evidence should include dated documentation that demonstrates the coordination was performed.
- M2.** Each Generator Owner and Transmission Owner with applicable Facilities will have evidence of the coordination required by the events listed in Requirement R2. This evidence should include dated documentation that demonstrates the specified intervals in Requirement R2 have been met.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance enforcement authority unless the applicable entity is owned, operated, or controlled by the Regional Entity. In such cases the ERO or a Regional entity approved by FERC or other applicable governmental authority shall serve as the CEA.

1.2. Evidence Retention

The following evidence retention periods identify a period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention specified below is shorter than the time since the last compliance audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The Generator Owner and Transmission Owner shall retain evidence of compliance with Requirements R1 and R2, Measures M1 and M2 for six years.

If a Generator Owner or Transmission Owner is found non-compliant, the entity shall keep information related to the non-compliance until mitigation is complete and approved or for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last periodic audit report and all requested and submitted subsequent audit records.

³ Limiters or protection functions that are installed and activated on the generator or synchronous condenser.

1.3. Compliance Monitoring and Assessment Processes

- Compliance Audit
- Self-Certification
- Spot Checking
- Compliance Investigation
- Self-Reporting
- Complaint

1.4. Additional Compliance Information

None

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 5 calendar years but less than or equal to 5 calendar years plus 4 months after the previous coordination.	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 5 calendar years plus 4 months but less than or equal to 5 calendar years plus 8 months after the previous coordination.	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 5 calendar years plus 8 months but less than or equal to 5 calendar years plus 12 months after the previous coordination.	The Generator Owner or Transmission Owner failed to coordinate equipment capabilities, limiters, and protection specified in Requirement R1 within 5 calendar years plus 12 months after the previous coordination.
R2	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 90 calendar days but less than or equal to 100 calendar days following the identification or implementation of a change in equipment	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 100 calendar days but less than or equal to 110 calendar days following the identification or implementation of a change in equipment	The Generator Owner or Transmission Owner coordinated equipment capabilities, limiters, and protection specified in Requirement R1 more than 110 calendar days but less than or equal to 120 calendar days following the identification or implementation of a change in equipment	The Generator Owner or Transmission Owner failed to coordinate equipment capabilities, limiters, and protection specified in Requirement R1 within 120 calendar days following the identification or implementation of a change in equipment or settings that

Standard PRC-019-21 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

	or settings that affected the coordination.	or settings that affected the coordination.	or settings that affected the coordination.	affected the coordination.
--	---	---	---	----------------------------

E. Regional Variances

None.

F. Associated Documents

“Underexcited Operation of Turbo Generators”, AIEE Proceedings T Section 881, Volume 67, 1948, Appendix 1, C. G. Adams and J. B. McClure.

,”Protective Relaying For Power Generation Systems”, Boca Raton, FL, Taylor & Francis, 2006, Reimert, Donald

“Coordination of Generator Protection with Generator Excitation Control and Generator Capability”, a report of Working Group J5 of the IEEE PSRC Rotating Machinery Subcommittee

“IEEE C37.102-2006 IEEE Guide for AC Generator Protection”

“IEEE C50.13-2005 IEEE Standard for Cylindrical-Rotor 50 Hz and 60 Hz Synchronous Generators Rated 10 MVA and Above”

Version History

Version	Date	Action	Change Tracking
1	February 7, 2013	Adopted by NERC Board of Trustees	New
1	March 20, 2014	FERC Order issued approving PRC-019-1. (Order becomes effective on 7/1/16.)	

G. Reference

Examples of Coordination

The evidence of coordination associated with Requirement R1 may be in the form of:

- P-Q Diagram (Example in Attachment 1), or
- R-X Diagram (Example in Attachment 2), or

DRAFT 1 | Project 2014-01 | September 10, 2014

Standard PRC-019-24 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

- Inverse Time Diagram (Example in Attachment 3) or,
- Equivalent tables or other evidence

This evidence should include the equipment capabilities and the operating region for the limiters and protection functions

Equipment limits, types of limiters and protection functions which could be coordinated include (but are not limited to):

- Field over-excitation limiter and associated protection functions.
- Inverter over current limit and associated protection functions.
- Field under-excitation limiter and associated protection functions.
- Generator or synchronous condenser reactive capabilities.
- Volts per hertz limiter and associated protection functions.
- Stator over-voltage protection system settings.
- Generator and transformer volts per hertz capability.
- Time vs. field current or time vs. stator current.

NOTE: This listing is for reference only. This standard does not require the installation or activation of any of the above limiter or protection functions.

For this example, the Steady State Stability Limit (SSSL) is the limit to synchronous stability in the under-excited region with fixed field current.

On a P-Q diagram using X_d as the direct axis saturated synchronous reactance of the generator, X_s as the equivalent reactance between the generator terminals and the “infinite bus” including the reactance of the generator step-up transformer and V_g as the generator terminal voltage (all values in per-unit), the SSSL can be calculated as an arc with the center on the Q axis with the magnitude of the center and radius described by the following equations

$$C = V_g^2/2*(1/X_s-1/X_d)$$

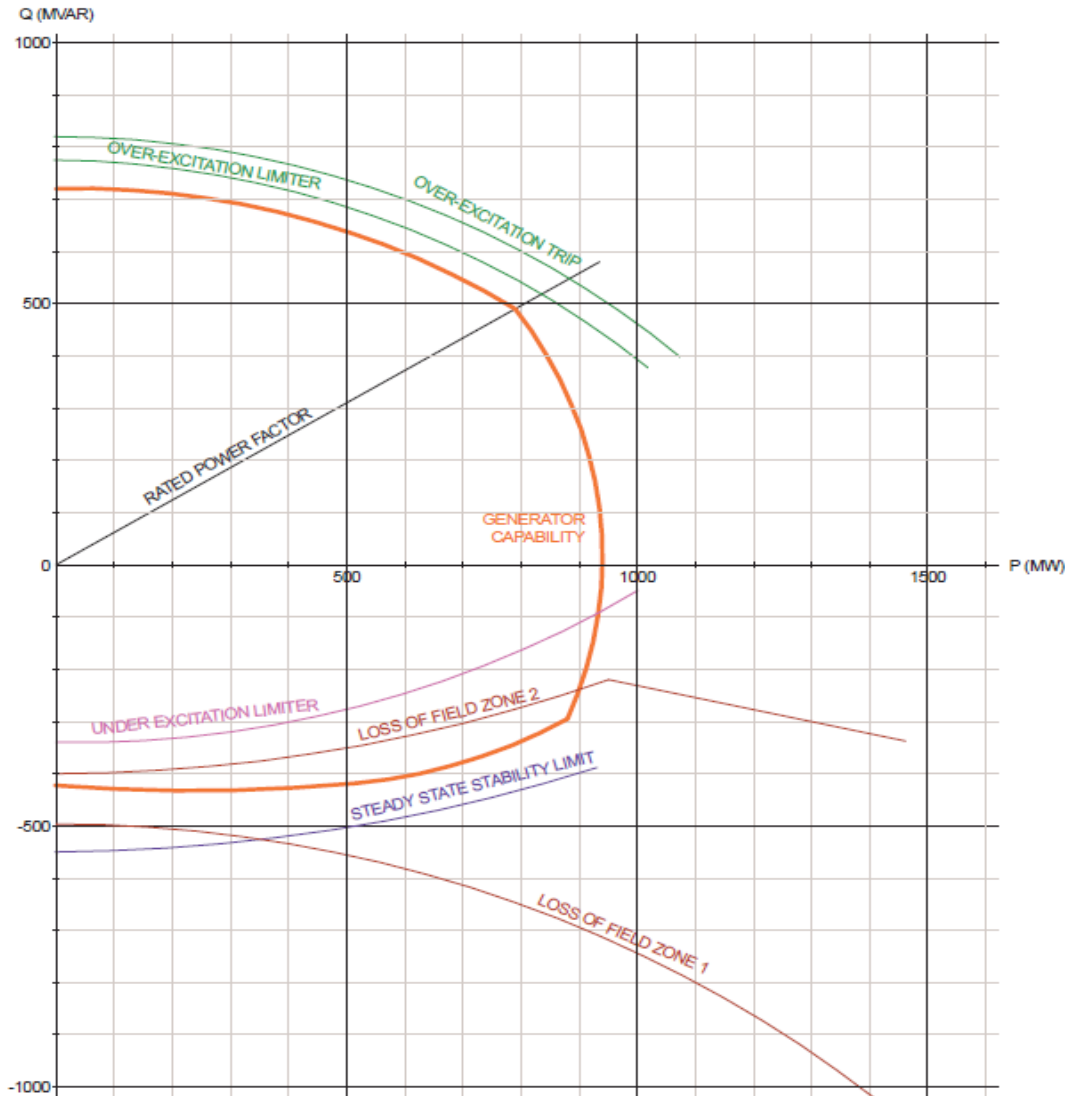
$$R = V_g^2/2*(1/X_s+1/X_d)$$

On an R-X diagram using X_d as the direct axis saturated synchronous reactance of the generator, and X_s as the equivalent reactance between the generator terminals and the “infinite bus” including the reactance of the generator step-up transformer the SSSL is an arc with the center on the X axis with the center and radius described by the following equations:

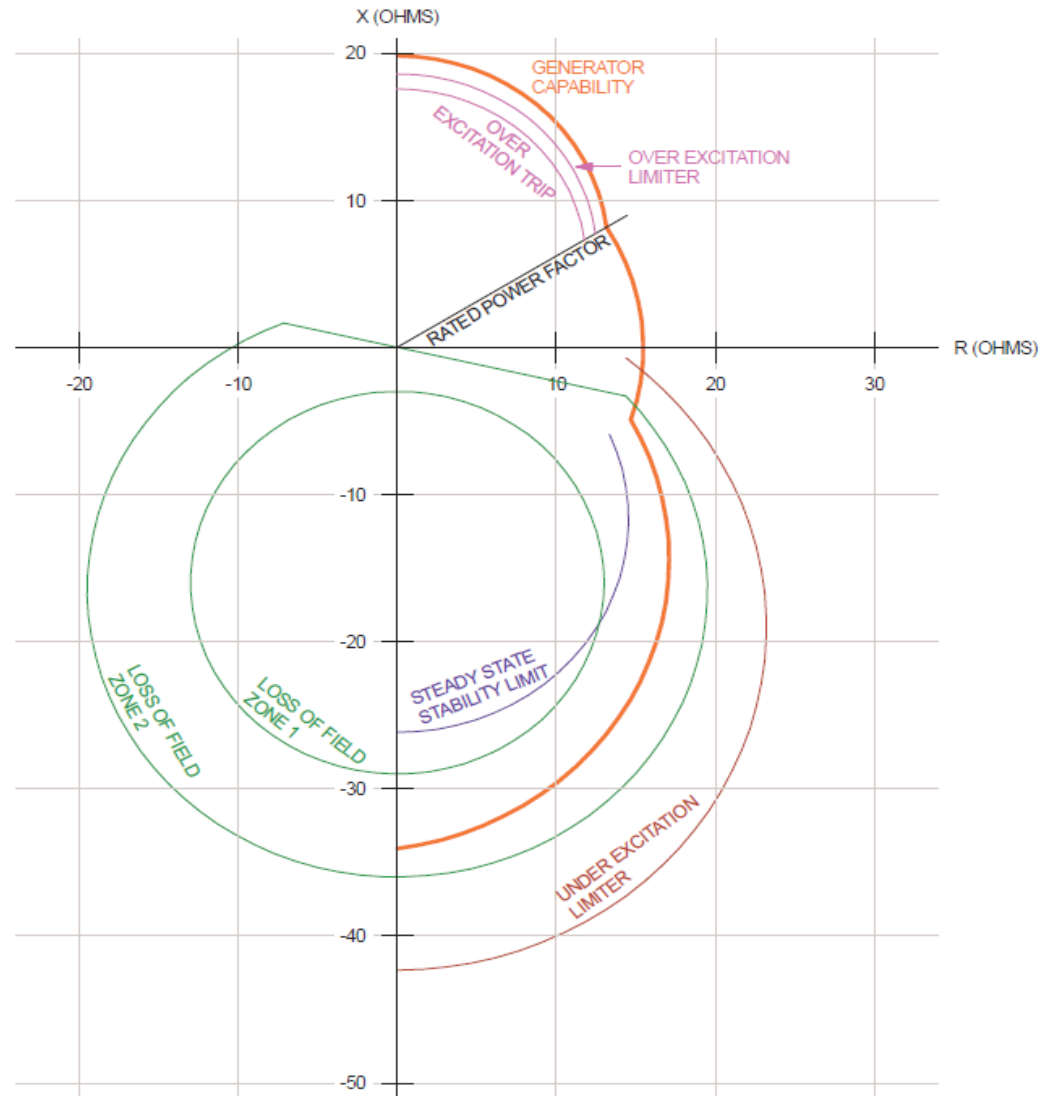
$$C = (X_d - X_s)/2$$

$$R = (X_d + X_s)/2$$

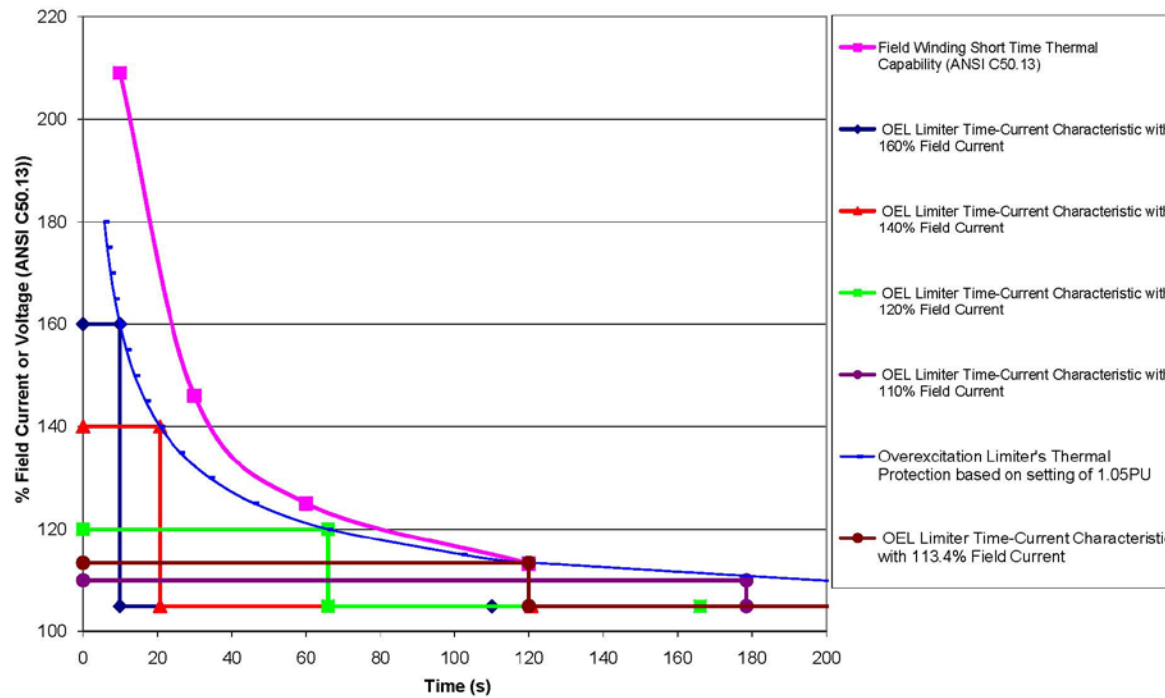
Section G Attachment 1 – Example of Capabilities, Limiters and Protection on a P-Q Diagram at nominal voltage and frequency



Section G Attachment 2 – Example of Capabilities, Limiters, and Protection on an R-X Diagram at nominal voltage and frequency



Section G Attachment 3 - Example of Capabilities, Limiters, and Protection on an Inverse Time Characteristic Plot



Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed

1. SAR posted for comment November 20 – December 19, 2013.
2. The Standards Committee authorized this posting on September 30, 2014.

Description of Current Draft

PRC-024-1(X)¹ is proposed for approval to align the applicability section of PRC-024-1 with the revised definition of the Bulk Electric System (BES). Specifically, the Project 2014-01 –Standards Applicability for Dispersed Generation Resources standards drafting team recommended changes to the requirements addressing the scope of applicability and also recommended changes to the Reliability Standard Audit Worksheet to address documentation options. Given the timing of concurrent standards development of PRC projects, PRC-024-1 may be retired pursuant to an Implementation Plan of a successor version of PRC-024. If this occurs, PRC-024-1(X) will not go into effect. Project 2014-01 does not have in its scope any technical content changes beyond revising the applicability to ensure consistent application of the requirements of this standard to dispersed power producing resources.²

Anticipated Actions	Anticipated Date
45-day Additional Formal Comment Period with Additional Ballot (if necessary)	December 2014
Final ballot	January 2015
BOT adoption	February 2015

¹ The standard version number currently includes an (X) to indicate the version numbering will be updated. Some standards are open in current projects and others are pending with governmental authorities. As a result, NERC will assign the appropriate version number prior to adoption by the NERC Board of Trustees.

² The terms “dispersed generation resources” and “dispersed power producing resources” are used interchangeably in Project 2014-01 because the former term was used in the Standards Authorization Request for the project, while the latter term is in line with terminology used in the revised definition of the BES.

When this standard has received ballot approval, the text boxes within the Applicability section of the standard will be moved to the Application Guidelines Section of the standard.

A. Introduction

1. **Title:** Generator Frequency and Voltage Protective Relay Settings
2. **Number:** PRC-024-1(X)
3. **Purpose:** Ensure Generator Owners set their generator protective relays such that generating units remain connected during defined frequency and voltage excursions.
4. **Applicability:**
 - 4.1. Generator Owner
5. **Effective Date:**

See the Implementation Plan for this standard.

B. Requirements

- R1.** Each Generator Owner that has generator frequency protective relaying³ activated to trip its applicable generating unit(s) shall set its protective relaying such that the generator frequency protective relaying does not trip the applicable generating unit(s) within the “no trip zone” of PRC-024 Attachment 1, subject to the following exceptions:⁴ [*Violation Risk Factor: Medium*] [*Time Horizon: Long-term Planning*]
- Generating unit(s) may trip if the protective functions (such as out-of-step functions or loss-of-field functions) operate due to an impending or actual loss of synchronism or, for asynchronous generating units, due to instability in power conversion control equipment.
 - Generating unit(s) may trip if clearing a system fault necessitates disconnecting (a) generating unit(s).
 - Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 1 for documented and communicated regulatory or equipment limitations in accordance with Requirement R3.

³ Each Generator Owner is not required to have frequency or voltage protective relaying (including but not limited to frequency and voltage protective functions for discrete relays, volts per hertz relays evaluated at nominal frequency, multi-function protective devices or protective functions within control systems that directly trip or provide tripping signals to the generator based on frequency or voltage inputs) installed or activated on its unit.

⁴ For frequency protective relays associated with dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition, this requirement applies to frequency protective relays applied on the individual power producing resources, as well as frequency protective relays applied on equipment from the individual power producing resource up to the point of interconnection.

Rationale for Footnotes 2 and 4

The SDT has determined it is appropriate to require that protective relay settings applied on both the individual generating units and aggregating equipment (including any non-Bulk Electric System collection system equipment) are set within the “no-trip zone” referenced in the requirements to maintain reliability of the BES. If any of the protective relay settings applied on these elements of the facility were to be excluded from this standard, the potential would exist for portions of or the entire generating capacity of the dispersed power producing facility to be lost during a voltage or frequency excursion.

- R2.** Each Generator Owner that has generator voltage protective relaying³ activated to trip its applicable generating unit(s) shall set its protective relaying such that the generator voltage protective relaying does not trip the applicable generating unit(s) as a result of a voltage excursion (at the point of interconnection⁵) caused by an event on the transmission system external to the generating plant that remains within the “no trip zone” of PRC-024 Attachment 2.⁶ If the Transmission Planner allows less stringent voltage relay settings than those required to meet PRC-024 Attachment 2, then the Generator Owner shall set its protective relaying within the voltage recovery characteristics of a location-specific Transmission Planner’s study. Requirement R2 is subject to the following exceptions: [*Violation Risk Factor: Medium*] [*Time Horizon: Long-term Planning*]
- Generating unit(s) may trip in accordance with a Special Protection System (SPS) or Remedial Action Scheme (RAS).
 - Generating unit(s) may trip if clearing a system fault necessitates disconnecting (a) generating unit(s).
 - Generating unit(s) may trip by action of protective functions (such as out-of-step functions or loss-of-field functions) that operate due to an impending or actual loss of synchronism or, for asynchronous generating units, due to instability in power conversion control equipment.
 - Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 2 for documented and communicated regulatory or equipment limitations in accordance with Requirement R3.

⁵ For the purposes of this standard, point of interconnection means the transmission (high voltage) side of the generator step-up or collector transformer.

⁶ For voltage protective relays associated with dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition, this requirement applies to voltage protective relays applied on the individual power producing resources, as well as voltage protective relays applied on equipment from the individual power producing resource up to the point of interconnection.

- R3.** Each Generator Owner shall document each known regulatory or equipment limitation⁷ that prevents an applicable generating unit with generator frequency or voltage protective relays from meeting the relay setting criteria in Requirements R1 or R2 including (but not limited to) study results, experience from an actual event, or manufacturer’s advice.
[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]
- 3.1.** The Generator Owner shall communicate the documented regulatory or equipment limitation, or the removal of a previously documented regulatory or equipment limitation, to its Planning Coordinator and Transmission Planner within 30 calendar days of any of the following:
- Identification of a regulatory or equipment limitation.
 - Repair of the equipment causing the limitation that removes the limitation.
 - Replacement of the equipment causing the limitation with equipment that removes the limitation.
 - Creation or adjustment of an equipment limitation caused by consumption of the cumulative turbine life-time frequency excursion allowance.
- R4.** Each Generator Owner shall provide its applicable generator protection trip settings associated with Requirements R1 and R2 to the Planning Coordinator or Transmission Planner that models the associated unit within 60 calendar days of receipt of a written request for the data and within 60 calendar days of any change to those previously requested trip settings unless directed by the requesting Planning Coordinator or Transmission Planner that the reporting of relay setting changes is not required.
[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]

C. Measures

- M1.** Each Generator Owner shall have evidence that generator frequency protective relays have been set in accordance with Requirement R1 such as dated setting sheets, calibration sheets or other documentation.
- M2.** Each Generator Owner shall have evidence that generator voltage protective relays have been set in accordance with Requirement R2 such as dated setting sheets, voltage-time curves, calibration sheets, coordination plots, dynamic simulation studies or other documentation.
- M3.** Each Generator Owner shall have evidence that it has documented and communicated any known regulatory or equipment limitations (excluding limitations noted in footnote 3) that resulted in an exception to Requirements R1 or R2 in accordance with Requirement R3 such as a dated email or letter that contains such documentation as study results, experience from an actual event, or manufacturer’s advice.

⁷ Excludes limitations that are caused by the setting capability of the generator frequency and voltage protective relays themselves but does not exclude limitations originating in the equipment that they protect.

- M4.** Each Generator Owner shall have evidence that it communicated applicable generator protective relay trip settings in accordance with Requirement R4, such as dated e-mails, correspondence or other evidence and copies of any requests it has received for that information.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance Enforcement Authority (CEA) unless the applicable entity is owned, operated, or controlled by the Regional Entity. In such cases, the ERO or a Regional Entity approved by FERC or other applicable governmental authority shall serve as the CEA.

1.2. Data Retention

The following evidence retention periods identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The Generator Owner shall retain evidence of compliance with Requirement R1 through R4; for 3 years or until the next audit, whichever is longer.

If a Generator Owner is found non-compliant, the Generator Owner shall keep information related to the non-compliance until mitigation is complete and approved for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.

1.3. Compliance Monitoring and Assessment Processes

Compliance Audit

Self-Certification

Spot Checking

Compliance Investigation

Self-Reporting

Complaint

1.4. Additional Compliance Information

None

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	N/A	N/A	N/A	The Generator Owner that has frequency protection activated to trip a generating unit, failed to set its generator frequency protective relaying so that it does not trip within the criteria listed in Requirement R1 unless there is a documented and communicated regulatory or equipment limitation per Requirement R3.
R2	N/A	N/A	N/A	The Generator Owner with voltage protective relaying activated to trip a generating unit, failed to set its voltage protective relaying so that it does not trip as a result of a voltage excursion at the point of interconnection, caused by an event external to the plant per the criteria specified in Requirement R2 unless there is a documented and communicated regulatory or equipment limitation per Requirement R3.
R3	The Generator Owner documented the known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2 and communicated the documented	The Generator Owner documented the known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2 and communicated the documented	The Generator Owner documented the known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2 and communicated the documented	The Generator Owner failed to document any known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2.

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
	limitation to its Planning Coordinator and Transmission Planner more than 30 calendar days but less than or equal to 60 calendar days of identifying the limitation.	limitation to its Planning Coordinator and Transmission Planner more than 60 calendar days but less than or equal to 90 calendar days of identifying the limitation.	limitation to its Planning Coordinator and Transmission Planner more than 90 calendar days but less than or equal to 120 calendar days of identifying the limitation.	OR The Generator Owner failed to communicate the documented limitation to its Planning Coordinator and Transmission Planner within 120 calendar days of identifying the limitation.
R4	The Generator Owner provided its generator protection trip settings more than 60 calendar days but less than or equal to 90 calendar days of any change to those trip settings. OR The Generator Owner provided trip settings more than 60 calendar days but less than or equal to 90 calendar days of a written request.	The Generator Owner provided its generator protection trip settings more than 90 calendar days but less than or equal to 120 calendar days of any change to those trip settings. OR The Generator Owner provided trip settings more than 90 calendar days but less than or equal to 120 calendar days of a written request.	The Generator Owner provided its generator protection trip settings more than 120 calendar days but less than or equal to 150 calendar days of any change to those trip settings. OR The Generator Owner provided trip settings more than 120 calendar days but less than or equal to 150 calendar days of a written request.	The Generator Owner failed to provide its generator protection trip settings within 150 calendar days of any change to those trip settings. OR The Generator Owner failed to provide trip settings within 150 calendar days of a written request.

E. Regional Variances

None

F. Associated Documents

None

Version History

Version	Date	Action	Change Tracking
1	May 9, 2013	Adopted by the NERC Board of Trustees	

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

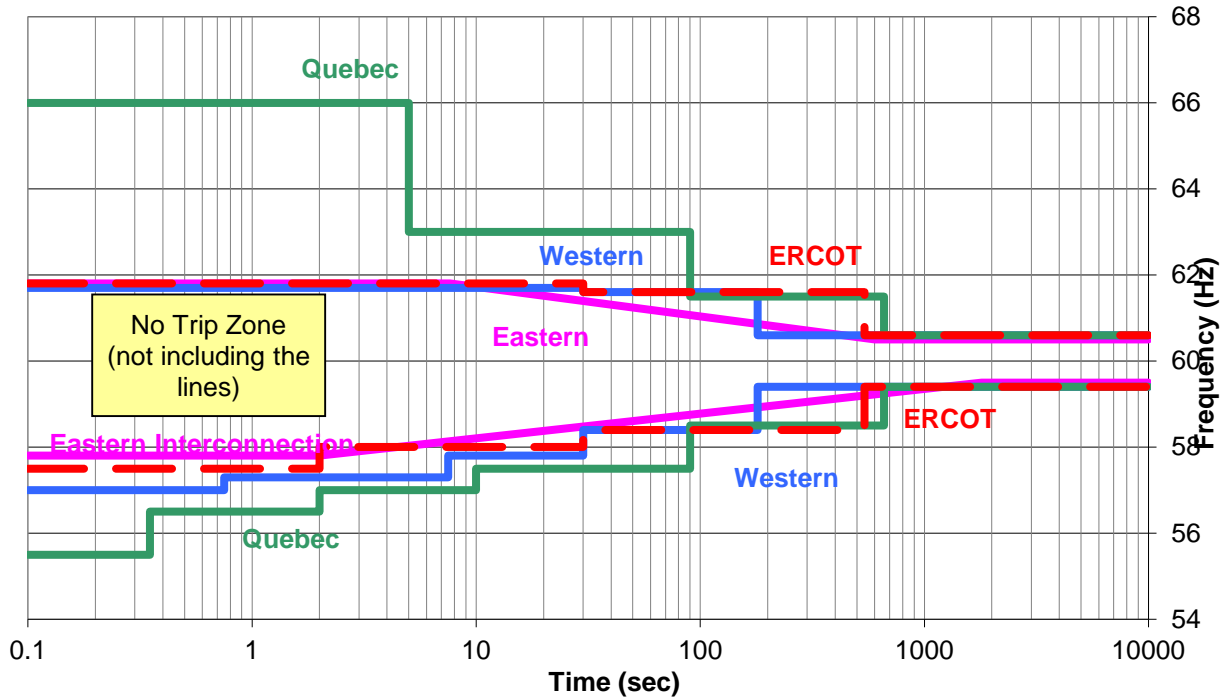
1	March 20, 2014	FERC Order issued approving PRC-024-1. (Order becomes effective on 7/1/16.)	
---	----------------	---	--

G. References

1. “The Technical Justification for the New WECC Voltage Ride-Through (VRT) Standard, A White Paper Developed by the Wind Generation Task Force (WGTF),” dated June 13, 2007, a guideline approved by WECC Technical Studies Subcommittee.

PRC-024 — Attachment 1

OFF NOMINAL FREQUENCY CAPABILITY CURVE



Curve Data Points:

Eastern Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (sec)
≥61.8	Instantaneous trip	≤57.8	Instantaneous trip
≥60.5	$10^{(90.935-1.45713*f)}$	≤59.5	$10^{(1.7373*f-100.116)}$
<60.5	Continuous operation	> 59.5	Continuous operation

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

Western Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (sec)
≥61.7	Instantaneous trip	≤57.0	Instantaneous trip
≥61.6	30	≤57.3	0.75
≥60.6	180	≤57.8	7.5
<60.6	Continuous operation	≤58.4	30
		≤59.4	180
		>59.4	Continuous operation

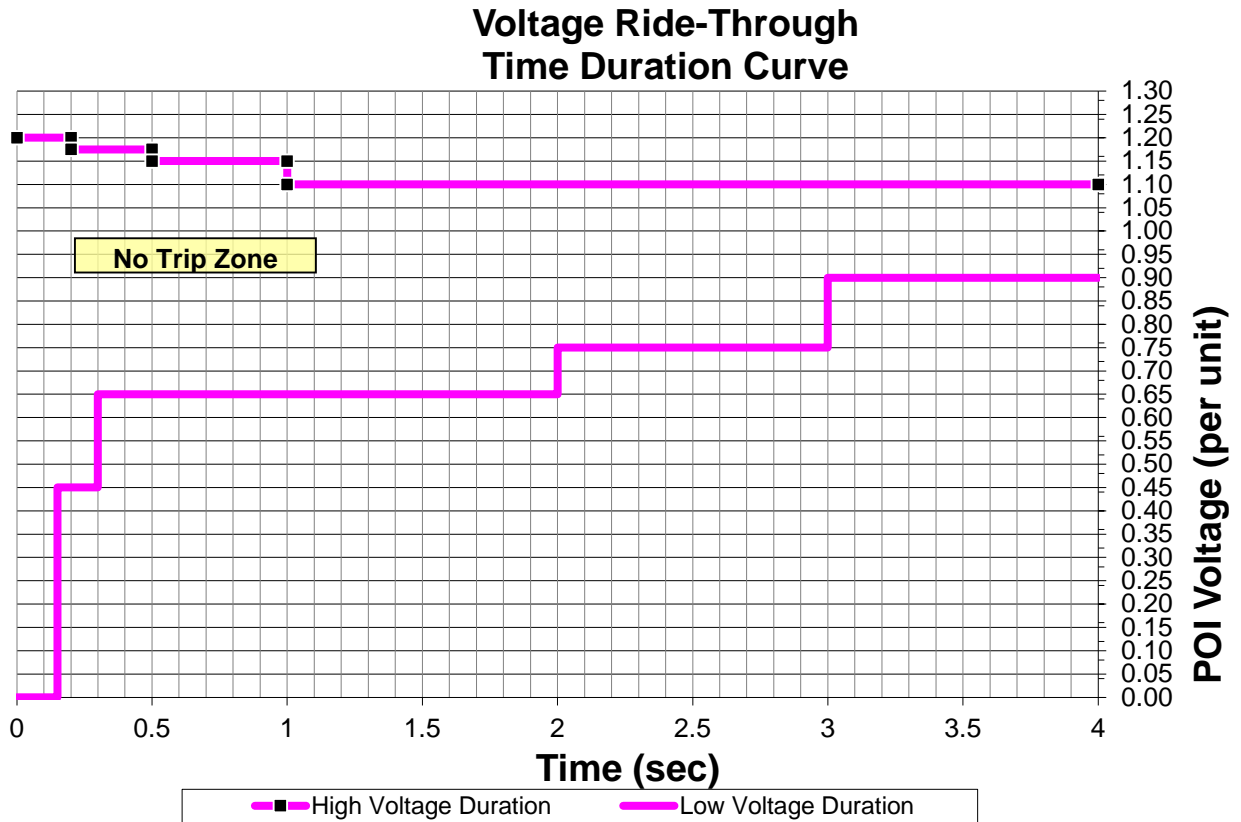
Quebec Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (Sec)
>66.0	Instantaneous trip	<55.5	Instantaneous trip
≥63.0	5	≤56.5	0.35
≥61.5	90	≤57.0	2
≥60.6	660	≤57.5	10
<60.6	Continuous operation	≤58.5	90
		≤59.4	660
		>59.4	Continuous operation

ERCOT Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (sec)
≥61.8	Instantaneous trip	≤57.5	Instantaneous trip
≥61.6	30	≤58.0	2
≥60.6	540	≤58.4	30
<60.6	Continuous operation	≤59.4	540
		>59.4	Continuous operation

PRC-024— Attachment 2



Ride Through Duration:

High Voltage Ride Through Duration		Low Voltage Ride Through Duration	
Voltage (pu)	Time (sec)	Voltage (pu)	Time (sec)
≥1.200	Instantaneous trip	<0.45	0.15
≥1.175	0.20	<0.65	0.30
≥1.15	0.50	<0.75	2.00
≥1.10	1.00	<0.90	3.00

Voltage Ride-Through Curve Clarifications

Curve Details:

1. The per unit voltage base for these curves is the nominal operating voltage specified by the Transmission Planner in the analysis of the reliability of the Interconnected Transmission Systems at the point of interconnection to the Bulk Electric System (BES).
2. The curves depicted were derived based on three-phase transmission system zone 1 faults with Normal Clearing not exceeding 9 cycles. The curves apply to voltage excursions regardless of the type of initiating event.
3. The envelope within the curves represents the cumulative voltage duration at the point of interconnection with the BES. For example, if the voltage first exceeds 1.15 pu at 0.3 seconds after a fault, does not exceed 1.2 pu voltage, and returns below 1.15 pu at 0.4 seconds, then the cumulative time the voltage is above 1.15 pu voltage is 0.1 seconds and is within the no trip zone of the curve.
4. The curves depicted assume system frequency is 60 Hertz. When evaluating Volts/Hertz protection, you may adjust the magnitude of the high voltage curve in proportion to deviations of frequency below 60 Hz.
5. Voltages in the curve assume minimum fundamental frequency phase-to-ground or phase-to-phase voltage for the low voltage duration curve and the greater of maximum RMS or crest phase-to-phase voltage for the high voltage duration curve.

Evaluating Protective Relay Settings:

1. Use either the following assumptions or loading conditions that are believed to be the most probable for the unit under study to evaluate voltage protection relay setting calculations on the static case for steady state initial conditions:
 - a. All of the units connected to the same transformer are online and operating.
 - b. All of the units are at full nameplate real-power output.
 - c. Power factor is 0.95 lagging (i.e. supplying reactive power to the system) as measured at the generator terminals.
 - d. The automatic voltage regulator is in automatic voltage control mode.
2. Evaluate voltage protection relay settings assuming that additional installed generating plant reactive support equipment (such as static VAr compensators, synchronous condensers, or capacitors) is available and operating normally.
3. Evaluate voltage protection relay settings accounting for the actual tap settings of transformers between the generator terminals and the point of interconnection.

Standard Development Timeline

This section is maintained by the drafting team during the development of the standard and will be removed when the standard becomes effective.

Development Steps Completed

1. SAR posted for comment November 20 – December 19, 2013.
2. The Standards Committee authorized this posting on September 30, 2014.

Description of Current Draft

PRC-024-1(X)¹ is proposed for approval to align the applicability section of PRC-024-1 with the revised definition of the Bulk Electric System (BES). Specifically, the Project 2014-01 –Standards Applicability for Dispersed Generation Resources standards drafting team recommended changes to the requirements addressing the scope of applicability and also recommended changes to the Reliability Standard Audit Worksheet to address documentation options. Given the timing of concurrent standards development of PRC projects, PRC-024-1 may be retired pursuant to an Implementation Plan of a successor version of PRC-024. If this occurs, PRC-024-1(X) will not go into effect. Project 2014-01 does not have in its scope any technical content changes beyond revising the applicability to ensure consistent application of the requirements of this standard to dispersed power producing resources.²

<u>Anticipated Actions</u>	<u>Anticipated Date</u>
<u>45-day Additional Formal Comment Period with Additional Ballot (if necessary)</u>	<u>December 2014</u>
<u>Final ballot</u>	<u>January 2015</u>
<u>BOT adoption</u>	<u>February 2015</u>

¹ The standard version number currently includes an (X) to indicate the version numbering will be updated. Some standards are open in current projects and others are pending with governmental authorities. As a result, NERC will assign the appropriate version number prior to adoption by the NERC Board of Trustees.

² The terms “dispersed generation resources” and “dispersed power producing resources” are used interchangeably in Project 2014-01 because the former term was used in the Standards Authorization Request for the project, while the latter term is in line with terminology used in the revised definition of the BES.

When this standard has received ballot approval, the text boxes within the Applicability section of the standard will be moved to the Application Guidelines Section of the standard.

A. Introduction

1. **Title:** Generator Frequency and Voltage Protective Relay Settings
2. **Number:** PRC-024-1(X)
3. **Purpose:** Ensure Generator Owners set their generator protective relays such that generating units remain connected during defined frequency and voltage excursions.
4. **Applicability:**
 - 4.1. Generator Owner
5. **Effective Date:**

See the Implementation Plan for this standard.

~~In those jurisdictions where regulatory approval is required:~~

~~By the first day of the first calendar quarter, two calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner shall have verified at least 40 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

~~By the first day of the first calendar quarter, three calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner shall have verified at least 60 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

~~By the first day of the first calendar quarter, four calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner shall have verified at least 80 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

~~By the first day of the first calendar quarter, five calendar years following applicable regulatory approval, or as otherwise made effective pursuant to the laws applicable to such ERO governmental authorities, each Generator Owner shall have verified 100 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

~~In those jurisdictions where regulatory approval is not required:~~

~~By the first day of the first calendar quarter, two calendar years following Board of Trustees approval, each Generator Owner shall have verified at least 40 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

~~By the first day of the first calendar quarter, three calendar years following Board of Trustees approval, each Generator Owner shall have verified at least 60 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

Standard PRC-024-1(X) — Generator Frequency and Voltage Protective Relay Settings

~~By the first day of the first calendar quarter, four calendar years following Board of Trustees approval, each Generator Owner shall have verified at least 80 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

~~By the first day of the first calendar quarter, five calendar years following Board of Trustees approval, each Generator Owner shall have verified 100 percent of its Facilities are fully compliant with Requirements R1, R2, R3, and R4.~~

B. Requirements

- R1. Each Generator Owner that has generator frequency protective relaying³ activated to trip its applicable generating unit(s) shall set its protective relaying such that the generator frequency protective relaying does not trip the applicable generating unit(s) within the “no trip zone” of PRC-024 Attachment 1, subject to the following exceptions:⁴ [*Violation Risk Factor: Medium*] [*Time Horizon: Long-term Planning*]
- Generating unit(s) may trip if the protective functions (such as out-of-step functions or loss-of-field functions) operate due to an impending or actual loss of synchronism or, for asynchronous generating units, due to instability in power conversion control equipment.
 - Generating unit(s) may trip if clearing a system fault necessitates disconnecting (a) generating unit(s).
 - Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 1 for documented and communicated regulatory or equipment limitations in accordance with Requirement R3.

Rationale for Footnotes 2 and 4

The SDT has determined it is appropriate to require that protective relay settings applied on both the individual generating units and aggregating equipment (including any non-Bulk Electric System collection system equipment) are set within the “no-trip zone” referenced in the requirements to maintain reliability of the BES. If any of the protective relay settings applied on these elements of the facility were to be excluded from this standard, the potential would exist for portions of or the entire generating capacity of the dispersed power producing facility to be lost during a voltage or frequency excursion.

- R2. Each Generator Owner that has generator voltage protective relaying³ activated to trip its applicable generating unit(s) shall set its protective relaying such that the generator voltage protective relaying does not trip the applicable generating unit(s) as a result of a voltage excursion (at the point of interconnection⁵) caused by an event on the

³ Each Generator Owner is not required to have frequency or voltage protective relaying (including but not limited to frequency and voltage protective functions for discrete relays, volts per hertz relays evaluated at nominal frequency, multi-function protective devices or protective functions within control systems that directly trip or provide tripping signals to the generator based on frequency or voltage inputs) installed or activated on its unit.

⁴ For frequency protective relays associated with dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition, this requirement applies to frequency protective relays applied on the individual power producing resources, as well as frequency protective relays applied on equipment from the individual power producing resource up to the point of interconnection.

⁵ For the purposes of this standard, point of interconnection means the transmission (high voltage) side of the generator step-up or collector transformer.

transmission system external to the generating plant that remains within the “no trip zone” of PRC-024 Attachment 2.⁶ If the Transmission Planner allows less stringent voltage relay settings than those required to meet PRC-024 Attachment 2, then the Generator Owner shall set its protective relaying within the voltage recovery characteristics of a location-specific Transmission Planner’s study. Requirement R2 is subject to the following exceptions: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

- Generating unit(s) may trip in accordance with a Special Protection System (SPS) or Remedial Action Scheme (RAS).
- Generating unit(s) may trip if clearing a system fault necessitates disconnecting (a) generating unit(s).
- Generating unit(s) may trip by action of protective functions (such as out-of-step functions or loss-of-field functions) that operate due to an impending or actual loss of synchronism or, for asynchronous generating units, due to instability in power conversion control equipment.
- Generating unit(s) may trip within a portion of the “no trip zone” of PRC-024 Attachment 2 for documented and communicated regulatory or equipment limitations in accordance with Requirement R3.

R3. Each Generator Owner shall document each known regulatory or equipment limitation⁷ that prevents an applicable generating unit with generator frequency or voltage protective relays from meeting the relay setting criteria in Requirements R1 or R2 including (but not limited to) study results, experience from an actual event, or manufacturer’s advice. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

3.1. The Generator Owner shall communicate the documented regulatory or equipment limitation, or the removal of a previously documented regulatory or equipment limitation, to its Planning Coordinator and Transmission Planner within 30 calendar days of any of the following:

- Identification of a regulatory or equipment limitation.
- Repair of the equipment causing the limitation that removes the limitation.
- Replacement of the equipment causing the limitation with equipment that removes the limitation.
- Creation or adjustment of an equipment limitation caused by consumption of the cumulative turbine life-time frequency excursion allowance.

⁶ For voltage protective relays associated with dispersed power producing resources identified through Inclusion I4 of the Bulk Electric System definition, this requirement applies to voltage protective relays applied on the individual power producing resources, as well as voltage protective relays applied on equipment from the individual power producing resource up to the point of interconnection.

⁷ Excludes limitations that are caused by the setting capability of the generator frequency and voltage protective relays themselves but does not exclude limitations originating in the equipment that they protect.

- R4.** Each Generator Owner shall provide its applicable generator protection trip settings associated with Requirements R1 and R2 to the Planning Coordinator or Transmission Planner that models the associated unit within 60 calendar days of receipt of a written request for the data and within 60 calendar days of any change to those previously requested trip settings unless directed by the requesting Planning Coordinator or Transmission Planner that the reporting of relay setting changes is not required.
[Violation Risk Factor: Lower] [Time Horizon: Operations Planning]

C. Measures

- M1.** Each Generator Owner shall have evidence that generator frequency protective relays have been set in accordance with Requirement R1 such as dated setting sheets, calibration sheets or other documentation.
- M2.** Each Generator Owner shall have evidence that generator voltage protective relays have been set in accordance with Requirement R2 such as dated setting sheets, voltage-time curves, calibration sheets, coordination plots, dynamic simulation studies or other documentation.
- M3.** Each Generator Owner shall have evidence that it has documented and communicated any known regulatory or equipment limitations (excluding limitations noted in footnote 3) that resulted in an exception to Requirements R1 or R2 in accordance with Requirement R3 such as a dated email or letter that contains such documentation as study results, experience from an actual event, or manufacturer's advice.
- M4.** Each Generator Owner shall have evidence that it communicated applicable generator protective relay trip settings in accordance with Requirement R4, such as dated e-mails, correspondence or other evidence and copies of any requests it has received for that information.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Enforcement Authority

The Regional Entity shall serve as the Compliance Enforcement Authority (CEA) unless the applicable entity is owned, operated, or controlled by the Regional Entity. In such cases, the ERO or a Regional Entity approved by FERC or other applicable governmental authority shall serve as the CEA.

1.2. Data Retention

The following evidence retention periods identify the period of time an entity is required to retain specific evidence to demonstrate compliance. For instances where the evidence retention period specified below is shorter than the time since the last audit, the Compliance Enforcement Authority may ask an entity to provide other evidence to show that it was compliant for the full time period since the last audit.

The Generator Owner shall retain evidence of compliance with Requirement R1 through R4; for 3 years or until the next audit, whichever is longer.

If a Generator Owner is found non-compliant, the Generator Owner shall keep information related to the non-compliance until mitigation is complete and approved for the time period specified above, whichever is longer.

The Compliance Enforcement Authority shall keep the last audit records and all requested and submitted subsequent audit records.

1.3. Compliance Monitoring and Assessment Processes

Compliance Audit

Self-Certification

Spot Checking

Compliance Investigation

Self-Reporting

Complaint

1.4. Additional Compliance Information

None

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

2. Violation Severity Levels

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
R1	N/A	N/A	N/A	The Generator Owner that has frequency protection activated to trip a generating unit, failed to set its generator frequency protective relaying so that it does not trip within the criteria listed in Requirement R1 unless there is a documented and communicated regulatory or equipment limitation per Requirement R3.
R2	N/A	N/A	N/A	The Generator Owner with voltage protective relaying activated to trip a generating unit, failed to set its voltage protective relaying so that it does not trip as a result of a voltage excursion at the point of interconnection, caused by an event external to the plant per the criteria specified in Requirement R2 unless there is a documented and communicated regulatory or equipment limitation per Requirement R3.
R3	The Generator Owner documented the known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2 and communicated the documented	The Generator Owner documented the known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2 and communicated the documented	The Generator Owner documented the known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2 and communicated the documented	The Generator Owner failed to document any known non-protection system equipment limitation that prevented it from meeting the criteria in Requirement R1 or R2.

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

R #	Lower VSL	Moderate VSL	High VSL	Severe VSL
	limitation to its Planning Coordinator and Transmission Planner more than 30 calendar days but less than or equal to 60 calendar days of identifying the limitation.	limitation to its Planning Coordinator and Transmission Planner more than 60 calendar days but less than or equal to 90 calendar days of identifying the limitation.	limitation to its Planning Coordinator and Transmission Planner more than 90 calendar days but less than or equal to 120 calendar days of identifying the limitation.	OR The Generator Owner failed to communicate the documented limitation to its Planning Coordinator and Transmission Planner within 120 calendar days of identifying the limitation.
R4	The Generator Owner provided its generator protection trip settings more than 60 calendar days but less than or equal to 90 calendar days of any change to those trip settings. OR The Generator Owner provided trip settings more than 60 calendar days but less than or equal to 90 calendar days of a written request.	The Generator Owner provided its generator protection trip settings more than 90 calendar days but less than or equal to 120 calendar days of any change to those trip settings. OR The Generator Owner provided trip settings more than 90 calendar days but less than or equal to 120 calendar days of a written request.	The Generator Owner provided its generator protection trip settings more than 120 calendar days but less than or equal to 150 calendar days of any change to those trip settings. OR The Generator Owner provided trip settings more than 120 calendar days but less than or equal to 150 calendar days of a written request.	The Generator Owner failed to provide its generator protection trip settings within 150 calendar days of any change to those trip settings. OR The Generator Owner failed to provide trip settings within 150 calendar days of a written request.

E. Regional Variances

None

F. Associated Documents

None

Version History

Version	Date	Action	Change Tracking
1	May 9, 2013	Adopted by the NERC Board of Trustees	

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

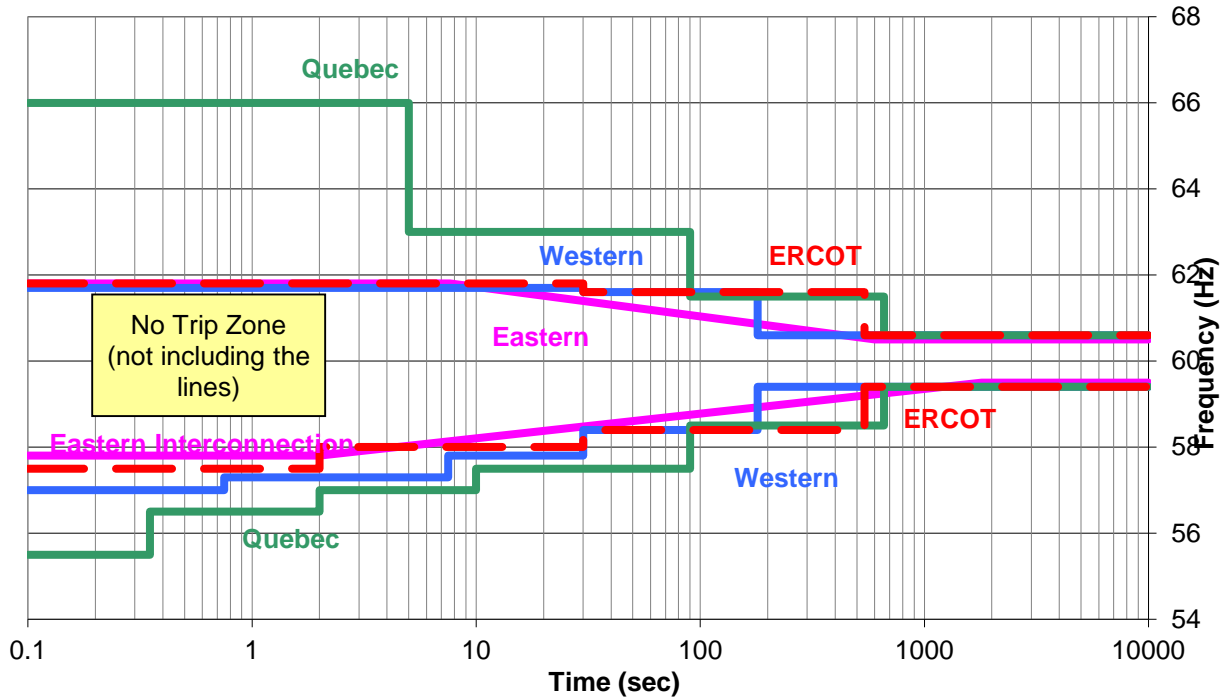
1	March 20, 2014	FERC Order issued approving PRC-024-1. (Order becomes effective on 7/1/16.)	
---	----------------	---	--

G. References

1. “The Technical Justification for the New WECC Voltage Ride-Through (VRT) Standard, A White Paper Developed by the Wind Generation Task Force (WGTF),” dated June 13, 2007, a guideline approved by WECC Technical Studies Subcommittee.

PRC-024 — Attachment 1

OFF NOMINAL FREQUENCY CAPABILITY CURVE



Curve Data Points:

Eastern Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (sec)
≥61.8	Instantaneous trip	≤57.8	Instantaneous trip
≥60.5	$10^{(90.935-1.45713*f)}$	≤59.5	$10^{(1.7373*f-100.116)}$
<60.5	Continuous operation	> 59.5	Continuous operation

Standard PRC-024-1 — Generator Frequency and Voltage Protective Relay Settings

Western Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (sec)
≥61.7	Instantaneous trip	≤57.0	Instantaneous trip
≥61.6	30	≤57.3	0.75
≥60.6	180	≤57.8	7.5
<60.6	Continuous operation	≤58.4	30
		≤59.4	180
		>59.4	Continuous operation

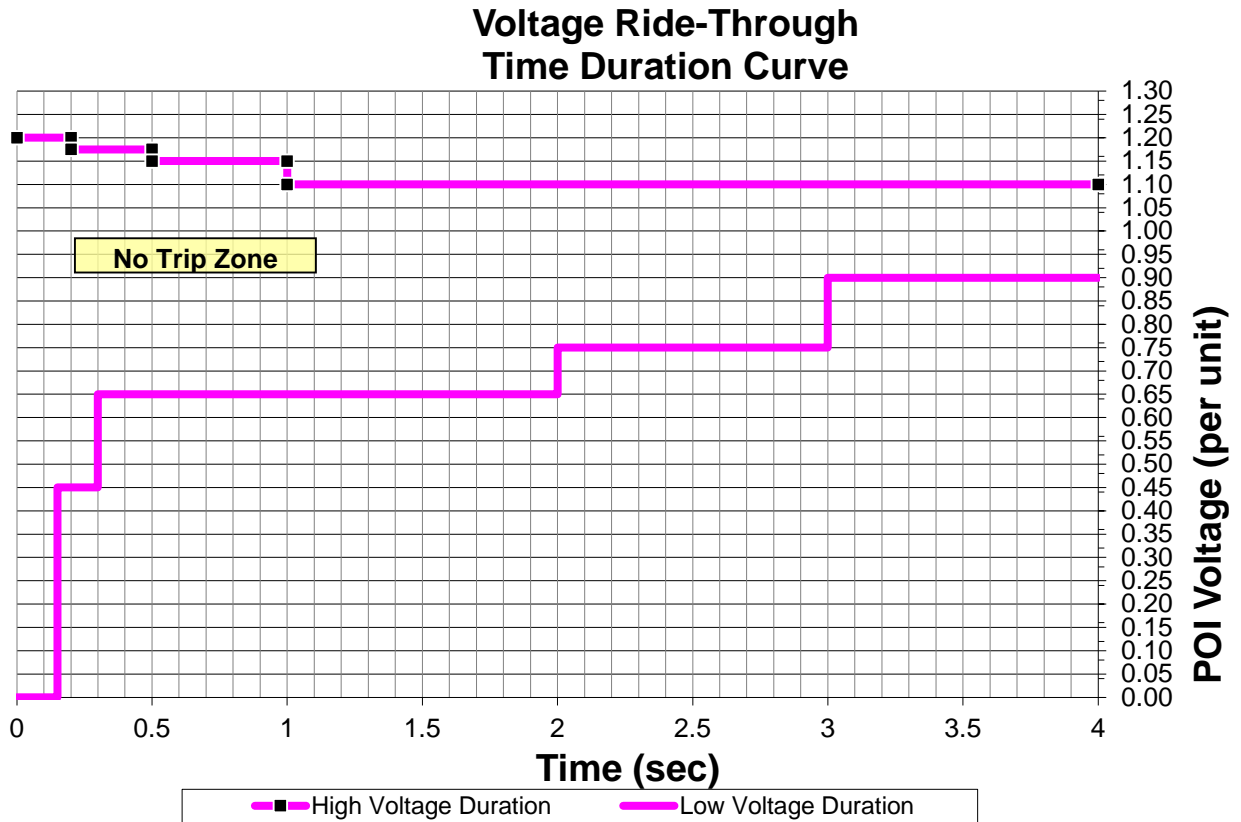
Quebec Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (Sec)
>66.0	Instantaneous trip	<55.5	Instantaneous trip
≥63.0	5	≤56.5	0.35
≥61.5	90	≤57.0	2
≥60.6	660	≤57.5	10
<60.6	Continuous operation	≤58.5	90
		≤59.4	660
		>59.4	Continuous operation

ERCOT Interconnection

High Frequency Duration		Low Frequency Duration	
Frequency (Hz)	Time (Sec)	Frequency (Hz)	Time (sec)
≥61.8	Instantaneous trip	≤57.5	Instantaneous trip
≥61.6	30	≤58.0	2
≥60.6	540	≤58.4	30
<60.6	Continuous operation	≤59.4	540
		>59.4	Continuous operation

PRC-024— Attachment 2



Ride Through Duration:

High Voltage Ride Through Duration		Low Voltage Ride Through Duration	
Voltage (pu)	Time (sec)	Voltage (pu)	Time (sec)
≥1.200	Instantaneous trip	<0.45	0.15
≥1.175	0.20	<0.65	0.30
≥1.15	0.50	<0.75	2.00
≥1.10	1.00	<0.90	3.00

Voltage Ride-Through Curve Clarifications

Curve Details:

1. The per unit voltage base for these curves is the nominal operating voltage specified by the Transmission Planner in the analysis of the reliability of the Interconnected Transmission Systems at the point of interconnection to the Bulk Electric System (BES).
2. The curves depicted were derived based on three-phase transmission system zone 1 faults with Normal Clearing not exceeding 9 cycles. The curves apply to voltage excursions regardless of the type of initiating event.
3. The envelope within the curves represents the cumulative voltage duration at the point of interconnection with the BES. For example, if the voltage first exceeds 1.15 pu at 0.3 seconds after a fault, does not exceed 1.2 pu voltage, and returns below 1.15 pu at 0.4 seconds, then the cumulative time the voltage is above 1.15 pu voltage is 0.1 seconds and is within the no trip zone of the curve.
4. The curves depicted assume system frequency is 60 Hertz. When evaluating Volts/Hertz protection, you may adjust the magnitude of the high voltage curve in proportion to deviations of frequency below 60 Hz.
5. Voltages in the curve assume minimum fundamental frequency phase-to-ground or phase-to-phase voltage for the low voltage duration curve and the greater of maximum RMS or crest phase-to-phase voltage for the high voltage duration curve.

Evaluating Protective Relay Settings:

1. Use either the following assumptions or loading conditions that are believed to be the most probable for the unit under study to evaluate voltage protection relay setting calculations on the static case for steady state initial conditions:
 - a. All of the units connected to the same transformer are online and operating.
 - b. All of the units are at full nameplate real-power output.
 - c. Power factor is 0.95 lagging (i.e. supplying reactive power to the system) as measured at the generator terminals.
 - d. The automatic voltage regulator is in automatic voltage control mode.
2. Evaluate voltage protection relay settings assuming that additional installed generating plant reactive support equipment (such as static VAr compensators, synchronous condensers, or capacitors) is available and operating normally.
3. Evaluate voltage protection relay settings accounting for the actual tap settings of transformers between the generator terminals and the point of interconnection.

Draft White Paper

Proposed Revisions to the Applicability of NERC Reliability Standards NERC Standards Applicability to Dispersed Generation Resources

**Project 2014-01 Standards Applicability for Dispersed
Generation Resources Standard Drafting Team**

December 11, 2014

Table of Contents

1	EXECUTIVE SUMMARY	3
2	PURPOSE	5
3	BACKGROUND	6
3.1	BES DEFINITION	6
3.2	DISPERSED GENERATION RESOURCES	7
3.3	DRAFTING TEAM EFFORTS	8
4	TECHNICAL DISCUSSION	11
4.1	BAL	11
4.2	COM	11
4.3	EOP	11
4.4	FAC	12
4.5	INT	13
4.6	IRO.....	13
4.7	MOD	14
4.8	NUC	16
4.9	PER	16
4.10	PRC	16
4.11	TOP	22
4.12	TPL.....	27
4.13	VAR.....	28
4.14	CIP	29
	APPENDIX A: LIST OF STANDARDS	32
	APPENDIX B: LIST OF STANDARDS RECOMMENDED FOR FURTHER REVIEW	33

1 Executive Summary

The purpose of this White Paper is to provide background and technical rationale for proposed revisions to the applicability of several North American Electric Reliability Corporation (NERC) Reliability Standards, and in some cases the standard requirements. The goal of the NERC Project 2014-01 Standards Applicability for Dispersed Generation Resources¹ standard drafting team (SDT) is to ensure that the Generator Owners (GOs) and Generator Operators (GOPs) of dispersed power producing resources are appropriately assigned responsibility for requirements that impact the reliability of the Bulk Power System (BPS), as the characteristics of operating dispersed power producing resources can be unique. In light of the revised Bulk Electric System (BES) definition approved by the Federal Energy Regulatory Authority (FERC) in 2014², the intent of this effort is generally to maintain the status quo for applicability of the standards as they have been applied over time with respect to dispersed power producing resources where the status quo does not create a reliability gap.

The SDT reviewed all standards that apply to GOs and GOPs³ and determined how each standard requirement should be appropriately applied to dispersed power producing resources, categorized as follows:

- The existing standard language was appropriate when applied to dispersed power producing resources and does not need to be addressed;
- The existing standard language was appropriate when applied to dispersed power producing resources but additional NERC guidance documentation is needed to clarify how to implement the requirements for dispersed power producing resources; and
- The existing standard language needs to be modified in order to account for the unique characteristics of dispersed power producing resources. This could be accomplished through the Applicability Section of the standard in most cases or, if required, through narrowly-tailored changes to the individual requirements.

From this review, the SDT determined that three (3) Reliability Standards required immediate attention to clarify the applicability of the Reliability Standards to dispersed power producing resources for the benefit of industry stakeholders. These standards are:

- PRC-004 (relevant versions)⁴;
- PRC-005 (relevant versions)⁵; and
- VAR-002 (relevant versions).

The SDT recognized that many other standards⁶ required further review to determine the necessity and the type of clarification or guidance for the applicability to dispersed power producing resources. This

¹ Although the BES definition uses the term “dispersed power producing resources,” the SAR and the SDT also use the term “dispersed generation resources.” For the purposes of this paper, these terms are interchangeable.

² Glossary of Terms Used in NERC Reliability Standards, updated March 12, 2014.

³ See Appendix A.

⁴ Reliability Standard PRC-004 was revised as part of Project 2010-05.1 Protection Systems: Misoperations.

⁵ Reliability Standard PRC-005 was revised as part of Project 2007-17.3 – Protection System Maintenance and Testing – Phase 3.

⁶ See Appendix B.

necessity is based on how each standard requirement, as written, would apply to dispersed power producing resources and the individual generating units at these facilities, considering the now currently-enforced BES definition. The proposed resolutions target the applicability of the standard or target specific individual requirements. There are additional methods to ensure consistent applicability throughout the Regions, including having guidance issued by NERC through Reliability Standard Audit Worksheet (RSAW) language revisions. These tools, among others, have been considered and employed by the SDT throughout the drafting effort.

The White Paper includes: 1) description of the history of standards applicability to dispersed power producing resources; 2) identification of circumstances and practices that are unique to dispersed power producing resources; and 3) determination of the priority to address standards, supported by corresponding technical justification.

It is the intent of the SDT to modify this document over the course of this project to document the SDT's rationale and technical justification for each standard until the work of the SDT is complete. The SDT considers the sections of the White Paper that address the high-priority standards to be in final draft form. The SDT may provide further revisions to the remainder of the White Paper.

2 Purpose

The purpose of this White Paper is to provide background and technical rationale for proposed revisions to the applicability of several Reliability Standards⁷ or requirements that apply to GOs and/or GOPs. The goal of the proposed applicability changes is to provide the GOs and GOPs of dispersed generation resources with clarity regarding their responsibility for requirements that impact the reliability of the BPS, as the characteristics of operating dispersed generation can be unique. The SDT seeks to provide clarity through the method most appropriate for each standard, such as by: (1) revising applicability language in the standard; (2) revising language in the requirements to address changes to applicability; (3) recommending changes to the RSAW associated with the standard; or (4) recommending a reliability guideline or reference document.

This document describes the design, operational characteristics, and unique features of dispersed power producing resources. The recommendations identified in this document consider the Purpose and Time Horizon of the standards and requirements, as well as the avoidance of applying requirements in a manner that has no significant effect on reliability.⁸ This document provides justification of, and proposes revisions to, the applicability of the Reliability Standards and requirements, both existing and in development, and should be considered guidance for future standard development efforts. However, please note that the recommendations provided in this paper are subject to further review and revision.

Note that while this White Paper may provide examples of dispersed power producing resources, the concepts presented are not specific to any one technology. The SDT in general has referenced the BES Reference Document, which also refers to “dispersed power producing resources.” Although the BES definition uses the term “dispersed power producing resources,” the Standard Authorization Request (SAR) and the SDT also use the term “dispersed generation resources.” For the purposes of this paper, these terms are interchangeable.

⁷ Note that “Reliability Standard” is defined in the NERC Glossary as “approved by FERC,” but that the SDT reviewed approved standards, as well as revisions to standards proposed in other projects.

⁸ *North American Electric Reliability Corporation*, 138 FERC ¶ 61,193 at P 81 (2012).

3 Background

Industry stakeholders submitted a SAR to the NERC Standards Committee, requesting that the applicability of Reliability Standards or the requirements of Reliability Standards be revised to ensure that the Reliability Standards are not imposing requirements on dispersed generation resource components that are unnecessary or counterproductive to the reliability of the BPS. The SDT's focus has been to ensure that Reliability Standards are applied to dispersed power producing resources to support an effective defense-in-depth strategy and an adequate level of reliability for the interconnected BPS.

For purposes of this effort, dispersed power producing resources are those individual resources that aggregate to a total capacity greater than 75 MVA gross nameplate rating, and that are connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage of 100 kV or above. This request is related to the approved definition of the BES from Project 2010-17,⁹ which resulted in the inclusion of distinct components of dispersed generation resources.

3.1 BES Definition

The BES definition¹⁰ includes the following inclusion criterion addressing dispersed generation resources:

I4. Dispersed power producing resources that aggregate to a total capacity greater than 75 MVA (gross nameplate rating), and that are connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage of 100 kV or above. Thus, the facilities designated as BES are:

- a) The individual resources, and*
- b) The system designed primarily for delivering capacity from the point where those resources aggregate to greater than 75 MVA to a common point of connection at a voltage of 100 kV or above.*

The *BES Definition Reference Document*¹¹ includes a description of what constitutes dispersed generation resource:

“Dispersed power producing resources are small-scale power generation technologies using a system designed primarily for aggregating capacity providing an alternative to, or an enhancement of, the traditional electric power system. Examples could include but are not limited to: solar, geothermal, energy storage, flywheels, wind, micro-turbines, and fuel cells.”

⁹ http://www.nerc.com/pa/Stand/Pages/Project2010-17_BES.aspx

¹⁰ Glossary of Terms Used in NERC Reliability Standards, updated March 12, 2014.
http://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf

¹¹ Bulk Electric System Definition Reference Document, Version 2, April 2014.
http://www.nerc.com/pa/Stand/Project%20201017%20Proposed%20Definition%20of%20Bulk%20Electri/bes_phas_e2_reference_document_20140325_final_clean.pdf.

3.2 Dispersed Power Producing Resources

Dispersed power producing resources are often considered to be variable energy resources such as wind and solar. This description is not explicitly stated in the BES definition; however, NERC and FERC characterize variable generation in this manner regarding the purpose of Inclusion I4 of the definition.¹² Therefore, the SDT is considering the reliability impacts of variable generation that depends on a primary fuel source which varies over time and cannot be stored.¹³ Reliably integrating high levels of variable resources – wind, solar, ocean, and some forms of hydro – into the BPS require significant changes to traditional methods used for system planning and operation.¹⁴ While these resources provide challenges to system operation, these resources are instrumental in meeting government-established renewable portfolio standards and requirements that are based on vital public interests.¹⁵

3.2.1 Design Characteristics

For dispersed power producing resources to be economically viable, it is necessary for the equipment to be geographically dispersed. The generating capacity of individual generating modules can be as small as a few hundred watts to as large as several megawatts. Factors leading to this dispersion requirement include:

- Practical maximum size for wind generators to be transported and installed at a height above ground to optimally utilize the available wind resource;
- Spacing of wind generators geographically to avoid interference between units;
- Solar panel conversion efficiency and solar resource concentration to obtain usable output; and
- Cost-effective transformation and transmission of electricity.

The utilization of small generating units results in a large number of units (e.g., several hundred wind generators or several million solar panels) installed collectively as a single facility that is connected to the Transmission system.

Dispersed power producing resources interconnected to the transmission system typically have a control system at the group level that controls voltage and power output of the Facility. The control system is capable of recognizing the capability of each individual unit or inverter to appropriately distribute the contribution required of the Facility across the available units or inverters. The variable generation control system must also recognize and account for the variation of uncontrollable factors such as wind speed and solar irradiance levels. Thus, for some standards discussed in this paper it is appropriate to apply requirements at the plant level rather than the individual generating unit.

¹² NERC December 13, 2013 filing, page 15 (FERC Docket No. RD14-2); NERC December 13, 2013 filing, page 17 (FERC Docket No. RD14-2); NERC January 25, 2012 filing, page 18 (FERC Docket No. RD14-2), FERC Order Approving Revised Definition, Docket No. RD14-2-000, Issued March 20, 2014.

¹³ “*Electricity Markets and Variable Generation Integration*,” WECC, January 6, 2011.

¹⁴ “*Accommodating High Levels of Variable Generation*,” NERC, April, 2009. http://www.nerc.com/files/ivgtf_report_041609.pdf

¹⁵ See *Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards*, Order No. 672, FERC Stats. & Regs. ¶ 31,204, at P 335, *order on reh’g*, Order No. 672-A, FERC Stats. & Regs. ¶ 31,212 (2006).

3.2.2 Operational Characteristics

Dispersed power producing resources often rely on a variable energy source (wind, for example) that is not able to be stored. Because of this, a Facility operator cannot provide a precise forecast of the expected output to a Balancing Authority (BA), Transmission Operator (TOP) or Reliability Coordinator (RC); however, short-term forecasting capability is improving and thus reducing uncertainty.¹⁶ The forecasting and variable operating conditions are well understood by BAs, TOPs, and RCs as evidenced by the successful operation of these generating resources over the years. Dispersed generation resources by their nature result in each individual generating unit potentially experiencing varied power system parameters (e.g. voltage, frequency, etc.) due to varied impedances and other variations in the aggregating facilities design.

Many older dispersed power producing resources are limited in their ability to provide essential reliability services. However, due to technological improvements, newer dispersed generation resources are capable of providing system support for voltage and frequency. For efficiency, the facilities are designed to provide the system requirements at the point of interconnection to the transmission system.

3.2.3 Reliability Impact

A dispersed power producing resource is typically made up of many individual generating units. In most cases, the individual generating units are similar in design and from one manufacturer. The aggregated capability of the Facility may in some cases contribute significantly to the reliability of the BPS. As such, there can be reliability benefits from ensuring the equipment utilized to aggregate the individual units to a common point of connection are operated and maintained as required in certain applicable NERC standards. When evaluated individually, however, the individual generating units often do not provide a significant impact to BPS reliability, as the unavailability or failure of any one individual generating resource may have a negligible impact on the aggregated capability of the Facility. The SDT acknowledges that FERC addressed the question of whether individual resources should be included in the BES definition in Order Nos. 773 and 773-A and concluded that individual wind turbine generators should be included as part of the BES. The SDT is not challenging this conclusion, but rather is addressing the applicability of standards on a requirement-by-requirement basis as necessary to account for the unique characteristics of dispersed generation. Thus, the applicability of requirements to individual generating units may be unnecessary except in cases where a common mode issue exists that could lead to a loss of a significant number of units or the entire Facility in response to a transmission system event.

3.3 Drafting Team Efforts

The SDT approached this project in multiple phases. First, after a thorough discussion of the new definition of the BES, the SDT reviewed each standard, as shown in Appendix A, at a high level to recommend changes that would promote consistent applicability for dispersed power producing resources through the entire set of Reliability Standards. This review provided the type of changes proposed, the justification for the changes, and the priority of the changes. The SDT documented its review in this

¹⁶ “*Electricity Markets and Variable Generation Integration*,” WECC, January 6, 2011. <https://www.wecc.biz/committees/StandingCommittees/JGC/VGS/MWG/ActivityM1/WECC%20Whitepaper%20-%20Electricity%20Markets%20and%20Variable%20Generation%20Integration.pdf>

White Paper, which will continue to be updated throughout the SDT efforts. The second phase, currently in progress, includes revising standards where necessary and supporting the balloting and commenting process.

3.3.1 Scope of Standards Reviewed

Initially, the focus of the standards review was on standards and requirements applicable to GOs and GOPs. However, during discussions, a question was raised to the SDT whether consideration is necessary for other requirements that affect the interaction of a Balancing Authority (BA), Transmission Operator (TOP), or Reliability Coordinator (RC) with individual BES Elements. For example, a requirement that states “an RC shall monitor BES Elements” may unintentionally affect the RC operator due to the revised BES definition. As such, the SDT took a high-level look at all standards adopted by the NERC Board of Trustees (Board) or approved by FERC to ensure this issue was not significant.

All standards that were reviewed are listed in Appendix A along with the status of the standards as of December 11, 2014. The fields in Appendix A include the following:

- List of standards (grouped by approval status);
- Approval status of the standards which include
 - Subject to Enforcement
 - Subject to Future Enforcement
 - Filed and Pending Regulatory Approval
 - Pending Regulatory Filing
 - Designated for Retirement (2 standards – MOD-024-1 and MOD-025-1 – officially listed as Filed and Pending Regulatory Approval but will be superseded by MOD-025-2)
 - In concurrent active development; and
- Indication of change or additional review necessary.

The SDT also reviewed, at a high-level, any approved regional standards. In cases where a change is recommended to a regional standard, the SDT will notify the affected Region. In addition, the SDT is prepared to provide recommendations to other active NERC standard development efforts, where appropriate.

Status	Number of Standards	Number of Standards to be Addressed (Standard, RSAW, Guidance or Further Review)
NERC Standards	166	27
Subject to Enforcement	101	12
Subject to Future Enforcement	20	5
Pending Regulatory Approval	28	4
Pending Regulatory Filing	7	0
Designated for Retirement	2	0
Proposed for Remand	8	6
Region-specific Standards (*Out of Scope)	17	4
Subject to Enforcement	15	3
Subject to Future Enforcement	2	1
Pending Regulatory Approval	0	0
Grand Total	183	31

3.3.2 Reliability Objectives

The SDT used the following Reliability Objectives to review the standards:

- Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards;
- The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand;
- Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably;
- Plans for Emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained, and implemented;
- Facilities for communication, monitoring, and control shall be provided, used, and maintained for the reliability of interconnected bulk power systems;
- Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions;
- The reliability of the interconnected bulk power systems shall be assessed, monitored, and maintained on a wide-area basis; and
- Bulk power systems shall be protected from malicious physical or cyber attacks.

3.3.3 Prioritization Methodology

The SDT established a prioritization to review and modify applicability changes recommended to NERC standards and requirements. The SDT evaluated each requirement to identify the appropriate applicability to support reliability of the BPS. In general, any standard or requirement the SDT determined required modification was assigned a high, medium, or low priority. The standards and requirements priorities were established as follows:

- High priority was assigned so that standard or requirement changes would be made quickly enough to avoid an entity having to expend inordinate resources prematurely to comply with a standard or requirement that, after appropriate modification, would not be applicable to that entity;
- Medium priority was assigned if significant effort and resources with no appreciable reliability benefit would be required by an entity to be compliant; and
- Low priority was assigned to other changes that may need to be made to further ensure requirements add to reliability, but are not perceived as a significant compliance burden.

The prioritization of each recommendation is identified in Appendix B.

- List of standards (grouped by priority);
- Approval status of the standards (same designations as used in Appendix A);
- Recommendation of changing the Applicability Section of the standard or by changing the applicability for specific requirements; and
- Recommendation of which applicability options should apply.

4 Technical Discussion

This section provides a review of each group of standards, focusing on the impact of the BES definition on reliability and compliance efforts. This discussion proposes a resolution for each standard, whether it is a change in the Applicability Section or in a specific requirement, clarification in a guidance document, or no action needed.

4.1 BAL

The group of BAL standards focuses primarily on ensuring the Balancing Authority (BA) has the awareness, ability, and authority to maintain the frequency and operating conditions within its BA Area. Only two standards in this group affect GO and/or GOP, and no BAL standard reviewed affected the interaction of a host BA, TOP, or RC with individual BES Elements.

4.1.1 BAL-005 — Automatic Generation Control

The purpose of this standard, as it applies to GOPs, is to ensure that all facilities electrically synchronized to the Interconnection are included within the metered boundary of a BA Area so that balancing of resources and demand can be achieved. Ensuring the Facility as a whole is within a BA Area ensures the individual units are included. *Therefore, the applicability of the BAL-005 standard does not need to be changed for dispersed power producing resources.*

4.1.2 BAL-001-TRE-1 — Primary Frequency Response in the ERCOT Region

The purpose of BAL-001-TRE-1 standard is to maintain Interconnection steady-state frequency within defined limits. This standard should be modified to clarify the applicability for dispersed power producing resources to the total plant level to ensure coordinated performance. However, this is a regional standard and not part of the SDT scope. *The SDT will communicate this recommendation to the relevant Region.*

4.2 COM

The COM standards focus on communication between the RC, BAs, TOPs, and GOPs. The only requirements in any of the current or future enforceable standards that apply to the GOP are clearly intended to apply to the individual GOP registered functional entity (i.e., requires communication between GOPs, TOPs, BAs, and RCs), not the constituent Elements it operates. Consequently, there is no need to differentiate the GOPs obligation for dispersed power producing resources from any other resources. *Therefore, the applicability of the COM-001-2, COM-002-2a, and COM-002-4 standards that were reviewed do not need to be changed for dispersed power producing resources.*

4.3 EOP

The EOP standards focus on emergency operations and reporting. The standards that apply to GO and/or GOP entities are EOP-004 and EOP-005. No EOP standard reviewed affects the interaction of a host BA, TOP, or RC with individual BES Elements.

4.3.1 EOP-004 — Event Reporting

The purpose of this standard is to improve the reliability of the BES by requiring the reporting of events by Responsible Entities. The requirements of this standard that apply to the GO and GOP appear to apply

to the individual GO and GOP registered functional entity, not the constituent elements. *The SDT has considered whether there is a need to differentiate dispersed power producing resources from any other GO and/or GOP resource and determined that no changes are required to the standard.*

4.3.2 EOP-005 — System Restoration from Blackstart Resources

EOP-005 ensures plans are in place to restore the grid from a de-energized state. The requirements that apply to a GOP are primarily for individual generation facilities designated as Blackstart Resources, with one requirement to participate in restoration exercises or simulations as requested by the RC. The inclusion of Blackstart Resources is already identified in the BES definition through Inclusion I3. The expectation is that all registered GOPs will participate in restoration exercises as requested by its RC. *Therefore, the applicability of EOP-005 does not need to be changed for dispersed power producing resources.*

4.4 FAC

The FAC standards focus on establishing ratings and limits of the Facility and interconnection requirements to the BES. Several standards apply to GOs and/or GOPs. No FAC standard reviewed affects the interaction of a host BA, TOP, or RC with individual BES Elements.

4.4.1 FAC-001 — Facility Connection Requirements

Requirements R2 and R3 of this standard apply to any GO that has an external party applying for interconnection to the GO's existing Facility in order to connect to the transmission system. This scenario is uncommon and there is no precedent for applicability of this standard to dispersed *power producing* resources known to the SDT. Current practice primarily includes the GO stating that they will comply with the standard if this scenario is ever realized. This standard allows the GO to specify the conditions that must be met for the interconnection of the third-party, thus providing inherent flexibility to tailor the requirements specifically for the unique needs of the Facility. *Therefore, the applicability of FAC-001 does not need to be changed for dispersed power producing resources.*

4.4.2 FAC-002 — Coordination of Plans for New Facilities

The purpose of FAC-002 is to ensure coordinated assessments of new facilities. The requirement applicable to GOs requires coordination and cooperation on assessments to demonstrate the impact of new facilities on the interconnected system and to demonstrate compliance with NERC standards and other applicable requirements. The methods used to demonstrate compliance are independent of the type of generation and are typically completed at the point of interconnection. *Therefore, the applicability of FAC-002 does not need to be changed for dispersed power producing resources.*

4.4.3 FAC-003 — Transmission Vegetation Management

The purpose of this standard is to ensure programs and efforts are in place to prevent vegetation-related outages. This standard applies equally to dispersed generation facilities and traditional Facilities in both applicability and current practices, as it pertains to overhead transmission lines of applicable generation interconnection Facilities. *Therefore, the applicability of FAC-003 does not need to be changed for dispersed power producing resources.*

4.4.4 FAC-008 — Facility Ratings

FAC-008 ensures Facility ratings used in the planning and operation of the BES are established and communicated. The Facility ratings requirement has historically been applicable to dispersed power producing resources and current practices associated with compliance are similar to traditional generation facilities. There is inherent flexibility in the standard requirements for the GO to determine the methodology utilized in determining the Facility ratings.

To identify the Facility rating of a dispersed power producing resource the analysis of the entire suite of Facility components is necessary to adequately identify the minimum and maximum Facility Rating and System Operating Limits, and thus there would be no differentiation between the compliance obligations between dispersed power producing resources and traditional generation. *The SDT believes the industry and Regions would benefit from additional guidance on FAC-008 in the form of changes to add a technical guidance section to the standard, or other guidance.*

4.5 INT

The INT standards provide BAs the authority to monitor power interchange between BA Areas. No INT standard is applicable to the GO or GOP, or affects the interaction of a host BA, TOP, or RC with individual BES Elements. *Therefore, the applicability of the INT standards do not need to be changed for dispersed power producing resources.*

4.6 IRO

The IRO standards provide RCs their authority. There are three IRO Standards that apply directly to GO and/or GOP entities. There are three standards that apply to the interaction of the RC with individual BES Elements. No other IRO standard reviewed affected the interaction of a host BA, TOP, or RC with GOs and/or GOPs.

4.6.1 IRO-001 — Reliability Coordination — Responsibilities and Authorities¹⁷

The purpose of these standards and their requirements as applicable to a GOP is to ensure RC directives are complied with so long as they do not violate safety, equipment, or regulatory or statutory requirements, or cannot be physically implemented. If a GOP is unable to follow a RC directive they are to inform the RC immediately of such.

Directives from RCs have been traditionally applied to the dispersed power producing resource at the aggregate Facility level when they are related to either active power or voltage, such as an output reduction or the provision of voltage support. When such directives are not specific to any one Element within the Facility, it is up to the GOP to determine the appropriate method to achieve the desired result of the directive consistent with other applicable NERC Reliability Standards. When an RC directive specifies a particular Element or Elements at the GOP's Facility, it is the expectation and requirement that the GOP will act as directed, so long as doing so does not violate safety, equipment, or regulatory or statutory requirements or cannot be physically implemented. For example, a directive could specify

¹⁷ Note that IRO-001-3, which is adopted by the Board, was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3 – Revisions to TOP and IRO Standards.

operation of a particular circuit breaker at a GOP Facility. *For these reasons, the applicability of IRO-001 does not need to be changed for dispersed power producing resources.*

4.6.2 IRO-005 — Reliability Coordination — Current Day Operations¹⁸

The purpose of this standard and its requirements as it relates to GOPs is to ensure when there is a difference in derived limits the BES is operated to the most limiting parameter. A difference in derived limits can occur on any Element and therefore any limitation of the applicability of this standard may create a reliability gap. There is no need to differentiate applicability to dispersed generation resources from any other GOP resources. *Therefore, the applicability of IRO-005 does not need to be changed for dispersed power producing resources.*

4.6.3 IRO-010 — Reliability Coordinator Data Specification and Collection

The purpose of this standard and its requirement(s) as it relates to GOs and GOPs is to ensure data and information specified by the RC is provided. As each RC area is different in nature, up to and including the tools used to ensure the reliability of the BPS, a ‘one size fits all’ approach is not appropriate. This Reliability Standard allows for the RC to specify the data and information required from the GO and/or the GOP, based on what is required to support the reliability of the BPS. *Therefore, the applicability of IRO-010 does not need to be changed for dispersed power producing resources.*

4.7 MOD

The MOD group of standards ensures consistent modeling data requirements and reporting procedures. The MOD standards provide a path for Transmission Planners (TPs) and Planning Coordinators (PCs) to reach out to entities for specific modeling information, if required. The SDT believes the existing and proposed modeling standards are sufficient for modeling dispersed power producing resources. However, due to the unique nature of dispersed power producing resources and an effort to bring consistency to the models, *the SDT believes additional guidance on the MOD standards would be beneficial and will communicate its determination to the NERC Planning Committee.*

4.7.1 MOD-010 — Steady-State Data for Transmission System Modeling and Simulation

This standard is anticipated to be retired in the near future. There is no need to differentiate dispersed generation resources from any other GOP resources as discussed in 5.7.8 regarding MOD-032. *Therefore, the applicability of MOD-010 does not need to be changed for dispersed generation resources.*

4.7.2 MOD-012 — Dynamics Data for Transmission System Modeling and Simulation

This standard is anticipated to be retired in the near future. There is no need to differentiate dispersed generation resources from any other GOP resources as discussed in 5.7.8 regarding MOD-032. *Therefore, the applicability of MOD-012 does not need to be changed for dispersed generation resources.*

¹⁸ Note that applicability to GOPs has been removed in IRO-005-4, which is adopted by the Board. However, this standard was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3 – Revisions to TOP and IRO Standards.

4.7.3 MOD-024-1 — Verification of Generator Gross and Net Real Power Capability

This standard was established to ensure accurate information on generator gross and net Real Power capability is available for steady-state models used to assess BES reliability. This standard will be superseded by MOD-025-2.¹⁹ *Therefore, the applicability of MOD-024-1 does not need to be changed for dispersed generation resources.*

4.7.4 MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

This standard was established to ensure accurate information on generator gross and net Reactive Power capability is available for steady-state models used to assess BES reliability. This standard will be superseded by MOD-025-2. *Therefore, the applicability of MOD-025-1 does not need to be changed for dispersed generation resources.*

4.7.5 MOD-025-2 — Verification and Data Reporting of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability

The purpose of MOD-025-2 is to ensure that accurate information on generator gross and net Real and Reactive Power capability is available for planning models used to assess BES reliability. This standard is appropriate for and includes specific provisions for dispersed generation resources to ensure changes in capabilities are reported. *Therefore, the SDT is further evaluating whether to revise the applicability of the standard to align the language with the revised BES definition.*

4.7.6 MOD-026 — Verification of Models and Data for Generator Excitation Control System or Plant Volt/VAR Control Functions

This standard provides for verification of models and data for voltage control functions. This standard is appropriate for dispersed generation resources. *Originally, the DGR SDT considered clarifying the applicability of the Facilities section, however, upon further review, the DGR SDT recommends no change.*

4.7.7 MOD-027 — Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions

This standard was established to verify that the turbine/governor and frequency control model accurately represent generator unit Real Power response to system frequency variations. This standard is appropriate for dispersed generation resources. *Originally, the DGR SDT considered clarifying the applicability of the Facilities section, however, upon further review, the DGR SDT recommends no change.*

4.7.8 MOD-032 — Data for Power System Modeling and Analysis

The MOD-032 standard was established to ensure consistent modeling data requirements and reporting procedures for the planning horizon cases. The nature of dispersed generation resources is a challenge in modeling the steady-state and dynamic electrical properties of the individual components (e.g. individual units, collector system, interconnection components, etc.).

¹⁹ MOD-024-1 and MOD-025-1 are Board Adopted but not subject to enforcement. They are commonly followed as good utility practice.

Models for dispersed power producing resources are typically proprietary and unique for each Facility. Generic models exist for dynamic analysis that may provide sufficient accuracy in lieu of a Facility-specific model. Some sections of the MOD-032 Attachment 1 pertain to modeling individual units, which may not be feasible. Guidance should be provided to show how to best model dispersed power producing resources. Such guidance should require modeling requirements for each type of dispersed power producing resource within a Facility and aggregate model for each reasonable aggregation point. *The applicability of MOD-032 does not need to be changed for dispersed power producing resources.*

4.8 NUC

The requirements in standard NUC-001 — *Nuclear Plant Interface Coordination* individually define the applicability to Registered Entities, not to the Elements the entities own or operate. While it is unlikely any Elements that are part of a dispersed power producing resource would be subject to an agreement required by this standard, limiting the applicability of this standard could create a reliability gap and thus, there is no need to differentiate applicability to dispersed generation resources. *Therefore, the applicability of the NUC standard does not need to be changed for dispersed power producing resources.*

4.9 PER

The PER standards focus on operator personnel training. The only requirements in any of the current or future enforceable standards that apply to the GOP is requirement R6 in PER-005-2 – *Operations Personnel Training*, and it is clearly intended to apply to the individual GOP registered functional entity that controls a fleet of generating facilities, not the constituent Elements it operates. As such, there is no need to differentiate dispersed power producing resources from any other GOP resources. *Therefore, the applicability of the PER standards do not need to be changed for dispersed power producing resources.*

4.10 PRC

The PRC standards establish guidance to ensure appropriate protection is established to protect the BES.

4.10.1 PRC-001-1.1 — System Protection Coordination

Requirement R1 requires GOPs to be familiar with the purpose and limitations of Protection System schemes applied in their area. The recently approved changes to the BES definition extend the applicability of this requirement. Often this familiarity is provided to GOP personnel through training on the basic concepts of relay protection and how it is utilized. The basic relaying concepts utilized in protection on the aggregating equipment at a dispersed generation site typically will not vary significantly from the concepts used in Protection Systems on individual generating units.

Requirement R2 requires that GOPs report protective relay or equipment failures that reduce system reliability. Protective System failures occurring within a single individual generating unit at a dispersed power producing resource will not have any impact on overall system reliability and thus it should not be necessary for GOPs to report these failures to their TOP and host BA. Only failures of Protection Systems on aggregating equipment have the potential to impact BPS reliability and may require notification. When interpreted as stated above, no related changes should be required to the existing PRC-001-1 standard, as the BES definition changes do not have an impact on these requirements.

Requirement R3 requires GOPs to coordinate new protective systems. Coordinating new and changes to existing protective relay schemes should be applied to aggregating equipment protection only if a lack of coordination could cause unintended operation or non-operation of an interconnected entity's protection, thus potentially having an adverse impact to the BPS. Existing industry practice is to share/coordinate the protective relay settings on the point of interconnect (e.g. generator leads, radial generator tie-line, etc.) and potentially the main step-up transformer, but not operating (collection) buses, collection feeder, or individual generator protection schemes, as these Protection Systems do not directly coordinate with an interconnected utility's own Protection Systems. Relay protection functions such as under and overfrequency and under and overvoltage changes are independent of the interconnected utility's protective relay settings and the setting criteria are defined in PRC-024.

Requirement R5 requires GOPs to coordinate changes in generation, transmission, load, or operating conditions that could require changes in the Protection Systems of others. A GOP of a dispersed generation resource should be required to notify its TOP of changes to generation, transmission, load, or operating conditions on an aggregate Facility level.

Project 2007-06 – System Protection Coordination and Project 2014-03 – Revisions to TOP and IRO Standards are presently revising various aspects of this standard or addressing certain requirements in other standards.

For these reasons, the DGR SDT coordinated with the other SDTs currently reviewing this standard and recommended revisions to Requirement R3.1 to indicate that coordination by a GOP with their TOP and host BA of new or changes to protection systems on individual generating units of dispersed power producing resources is not required.

4.10.2 PRC-001-2 — System Protection Coordination

The concerns addressed with PRC-001-1.1b are removed in PRC-001-2, which is adopted by the Board. However, this standard was included in the proposed remand by FERC and is subject to revision as part of Project 2014-03 – Revisions to TOP and IRO Standards. This Standard version is not in effect and was withdrawn as the proposed versions of the TOP and IRO Reliability Standards included in Project 2014-3 effectively replace PRC-001-2 and other TOP standards. *For this reason, no changes are required.*

4.10.3 PRC-002-NPCC-01— Disturbance Monitoring PRC-018-1 — Disturbance Monitoring Equipment Installation and Data Reporting

Requirements related to installation of Fault/Disturbance monitoring and/or sequence of events (SOE) recording capabilities on generating units and substation equipment which meet regional specific criteria may require installation of these capabilities on the aggregating equipment at a dispersed power producing resource Facility, and also requires maintenance and periodic reporting requirements to their RRO. However, these requirements have been previously applicable to the aggregating equipment at these dispersed power producing resources, and these capabilities are not required to be installed on the individual generating units. The BES definition changes have no direct impact on applicability of these

standards to dispersed power producing resources. *Therefore, the applicability of these standards do not need to be changed for dispersed power producing resources.*²⁰

4.10.4 PRC-004-2.1a – Analysis and Mitigation of Transmission and Generation Protection System Misoperations

PRC-004-3 — Protection System Misoperation Identification and Correction

Misoperation reporting per PRC-004 is currently a requirement applied on the aggregating equipment at applicable dispersed power producing resource sites meeting BPS criteria. The continuation of this analysis and reporting on the aggregating equipment by dispersed generation resource owners can provide value to BPS reliability and should remain in place. However, based on the experience of the SDT, there is minimal impact to BPS reliability for analyzing, reporting and developing Corrective Action Plans for each individual generating unit that trips at a dispersed power producing resource site, as the tripping of one or a small number of these units has no material impact to the BPS reliability.

Additionally, reporting of Misoperations on each individual generating unit may result in substantial and unnecessary burdens on both the dispersed generation resource owner and the Regional Entities that review and track the resulting reports and Corrective Action Plan implementations. The SDT recognizes that many turbine technologies do not have the design capability of providing sufficient data for an entity to evaluate whether a Misoperation has occurred. Furthermore, dispersed power producing resources by their nature result in each individual generating unit potentially experiencing varied power system parameters (e.g., voltage, frequency, etc.) due to varied impedances and other variations in the aggregating facilities design. This limits the ability to determine whether an individual unit correctly responded to a system disturbance.

However, the SDT maintains that Misoperations occurring on the Protection Systems of individual generation resources identified under Inclusion I4 of the BES definition do not have a material impact on BES reliability when considered individually; however, the aggregate capability of these resources may impact BES reliability if a large number of the individual generation resources (aggregate nameplate rating of greater than 75 MVA) incorrectly operated or failed to operate as designed during a system event. As such, if a trip aggregating to greater than 75 MVA occurs in response to a system disturbance, the SDT proposed requiring analysis and reporting of Misoperations of individual generating units for which the root cause of the Protection System operation(s) affected an aggregate rating of greater than 75 MVA of BES Facilities. Note that the SDT selected the 75 MVA nameplate threshold for consistency and to prevent confusion.

The SDT was also concerned with the applicability of events where one or more individual units tripped and the root cause of the operations was identified as a setting error. In this case, the requirements of PRC-004 would be applicable for any individual units where identical settings were applied on the Protection Systems of like individual generation resources identified under Inclusion I4 of the BES definition.

The SDT concluded that it is not necessary under PRC-004 to analyze each individual Protection System Misoperation affecting individual generating units of a dispersed power producing resource. *The SDT*

²⁰ See NPCC CGS-005.

recommended changes to the applicability of this standard to require misoperation analysis on individual generating units at a dispersed power producing resource site, only for events affecting greater than 75MVA aggregate nameplate; the SDT determined that this will ensure that common mode failure scenarios and their potential impact on BPS reliability are appropriately addressed. The SDT's recommended changes passed industry ballot on November 6, 2014, and were approved by the Board on November 13, 2014, and are currently pending regulatory approval.

4.10.5 PRC-004-WECC-1 — Protection System and Remedial Action Scheme Misoperation

Dispersed power producing resource sites typically would not be associated with a WECC Major Transfer Path or Remedial Action Scheme (RAS), and thus would not be affected by PRC-004-WECC-1. If a site were to be involved with one of these paths or schemes, it is likely that associated protection or RAS equipment would be located on the aggregating equipment rather than the individual generating units. As such, the BES definition changes may have an impact on applicability of this standard to dispersed power producing resources. This standard should be modified to clarify the applicability for dispersed generation resources; however, this is a regional standard and not part of the SDT's scope. *Therefore, the SDT recommends that the relevant Region evaluate the standard for modification.*

4.10.6 PRC-005-1.1b — Transmission and Generation Protection System Maintenance and Testing

The SDT recognizes that PRC-005-1.1b will be phased out beginning in early 2015. Therefore, the SDT recommends only guidance on PRC-005-1.1b rather than suggesting language changes to the standard. *Therefore, the SDT does not recommend revising the applicability of this standard for dispersed generation resources, rather, the SDT provided recommendations for revisions to the applicable RSAW to NERC staff, which NERC has implemented after consultation with the Regions.*

4.10.7 PRC-005-2 — Protection System Maintenance PRC-005-3 — Protection System and Automatic Reclosing Maintenance PRC-005-4 — Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance

The aggregated capability of the individual generating units may in some cases contribute to the reliability of the BPS; as such, there can be reliability benefit from ensuring certain BES equipment utilized to aggregate the individual units to a common point of connection are operated and maintained as required in PRC-005. When evaluated individually, however, the generating units themselves do not have the same impact on BPS reliability as the system used to aggregate the units. The unavailability or failure of any one individual generating unit would have a negligible impact on the aggregated capability of the Facility; this would be irrespective to whether the dispersed generation resource became unavailable due to occurrence of a legitimate fault condition or due to a failure of a control system, protective element, dc supply, etc.

The protection typically utilized in these generating units includes elements which would automatically remove the individual unit from service for certain internal or external conditions, including an internal fault in the unit. These units typically are designed to provide generation output at low voltage levels, (i.e., less than 1000 V). Should these protection elements fail to remove the generating unit for this scenario, the impacts would be limited to the loss the individual generating unit and potentially the next

device upstream in the collection system of the dispersed power producing resource. However, this would still only result in the loss of a portion of the aggregated capability of the Facility, which would be equally likely to occur due to a scenario in which a fault occurs on the collection system.

Internal faults on the low voltage system of these generating units would not be discernible on the interconnected transmission systems, as this is similar to a fault occurring on a typical utility distribution system fed from a substation designed to serve customer load. It is important to note that the collection system equipment (e.g., breakers, relays, etc.) used to aggregate the individual units may be relied upon to clear the fault condition in both of the above scenarios, which further justifies ensuring portions of the BES collection equipment is maintained appropriately.

**4.10.8 For this reason, activities such as Protection System maintenance on each individual generating unit at a dispersed generation Facility would not provide any additional reliability benefits to the BPS, but Protection System maintenance on facilities where generation aggregates to 75 MVA or more would. The SDT proposes that the scope of PRC-005 be limited to include only the protection systems that operate at a point of aggregation above 75 MVA nameplate rating. If the aggregation point occurs at a component in the collection system, then the protection systems associated with this component would be in scope. *The SDT has recommended changes to the Applicability Section (Facilities) of PRC-005-2, -3, and -4 to indicate that maintenance activities should only apply on the aggregating equipment at or above the point where the aggregation exceeds 75 MVA. The SDT's recommended applicability changes to PRC-005-2 and PRC-005-3 were approved by the Board on November 13, 2014. The SDT's recommended applicability changes to PRC-005-4 were posted for an initial ballot period that ends on January 22, 2014.* PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding
PRC-006-SERC -1 — Automatic Underfrequency Load Shedding Requirements**

The regional specific PRC-006 standards deviate from the PRC-006-1 standard in that they have specific requirements for GOs. In particular, the NPCC version requires that GOs set their underfrequency tripping to meet certain criteria to ensure reliability of the BPS. Typically a dispersed generation resource site may have underfrequency protection on both the aggregating equipment (i.e., collection buses or feeders) as well as the individual generating units. Were this standard only to apply to aggregating equipment, the net impact to the BPS should a system disturbance occur may still result in a loss of significant generating capacity should each of the individual generating units trip for the event. Therefore it may be appropriate to include the individual generating units at a dispersed generation resource site as subject to this standard. The standard could be interpreted this way as written, but further clarification in the standard language may be considered. While this standard may need to be modified to clarify the applicability for dispersed generation resources, this is a regional standard and not part of the SDT's scope. *Therefore, the SDT recommends that the relevant Region evaluate the standard for modification.*

The SERC version of PRC-006 requires GOs to provide, upon request, certain under and overfrequency related set points and other related capabilities of the site relative to system disturbances. It may be appropriate to include the capabilities of the individual generating units at a dispersed generation resource site when providing this information; however, it may be sufficient to provide only the capabilities of a

single sample unit within a site as these units are typically set identically. This would be in addition to any related capabilities or limitations of the aggregating equipment as well. This may be accomplished by providing clarifications in the requirements sections. While this standard may need to be modified to clarify the applicability for dispersed power producing resources, this is a regional standard and not part of the SDT's scope. *Therefore, the SDT recommends that the relevant Region evaluate the standard for modification.*

4.10.9 PRC-015 — Special Protection System Data and Documentation
PRC-016 — Special Protection System Misoperations
PRC-017 — Special Protection System Maintenance and Testing

Relatively few dispersed power producing resources own or operate Special Protection Systems (SPSs); however, they do exist and therefore need to be evaluated for applicability based on the revised BES definition. The vast majority of these SPSs involve the aggregating equipment (transformers, collection breakers, etc.) and not the individual generating units. The SPSs are installed to protect the reliability of the BPS, and as such the aggregated response of the site (e.g., reduction in output, complete disconnection from the BES, etc.) is critical, not the response of individual generating units. *Therefore, the applicability of these standards does not need to be changed for dispersed power producing resources.*

4.10.10 PRC-019-1 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

Dispersed power producing resources typically utilize a site level voltage control scheme that directs the individual generating units to adjust their output to meet the voltage requirements at an aggregate Facility level. In these cases the individual generating units will simply no longer respond once they are “maxed out” in providing voltage or reactive changes, but also need to be properly coordinated with protection trip settings on the aggregating equipment to mitigate risk of tripping in this scenario. For those facilities that solely regulate voltage at the individual unit, these facilities also need to consider the Protection Systems at the individual units and their compatibility with the reactive and voltage limitations of the units. The applicability in PRC-019-1 (section 4.2.3) includes a “Generating plant/Facility consisting of one or more units that are connected to the Bulk Electric System at a common bus with total generation greater than 75 MVA (gross aggregate nameplate rating).” *Therefore, the DGR SDT revised the Facilities section of the standard to clarify that facilities which solely regulate voltage at the individual generating unit are subject to this standard's requirements. The SDT's recommended applicability changes to PRC-019-1 were posted for an initial comment and ballot period scheduled to close December 22, 2014.*

4.10.11 PRC-023— Transmission Relay Loadability

Dispersed power producing resources in some cases contain facilities and Protection Systems that meet the criteria described in the Applicability Section (e.g., load responsive phase Protection System on transmission lines operated at 200 kV or above); however, in the majority of cases these lines are radially connected to the remainder of the BES and are excluded from the standard requirements of PRC-023-3. While certain entities with dispersed power producing resources are required to meet the requirements of PRC-023 on components of their aggregating equipment (e.g., main step-up transformers, interconnecting transmission lines) the standard is not applicable to the individual generating units, as the individual generating units are addressed in PRC-025. The BES definition changes have no direct impact on the

applicability of this standard to dispersed power producing resources. *Therefore, the applicability of this standard does not need to be changed for dispersed power producing resources.*

4.10.12 PRC-024— Generator Frequency and Voltage Protective Relay Settings

If the individual generating units at a dispersed power producing resource were excluded from this requirement, it is possible large portions or perhaps the entire output of a dispersed power producing resource site may be lost during certain system disturbances, negatively impacting BES reliability. The SDT has determined it is appropriate to require that Protection System settings applied on both the individual generating units and aggregating equipment (including any Protection Systems applied on non-BES portions of the aggregating equipment), are set within the “no-trip zone” referenced in the requirements to maintain reliability of the BES. However, for the purpose of compliance evidence, the SDT believes it should be sufficient for an entity to provide evidence for a single sample generating unit within a site rather than providing documentation for each individual unit, providing the entity used that methodology to set its protection systems for all the units, rather than providing documentation for each individual unit. This would be in addition to any Protection System settings evidence for the aggregating equipment. *The SDT therefore recommended changes to the standard requirements to ensure these requirements are applied to the individual power producing resources as well as all equipment, potentially including non-BES equipment, from the individual power producing resource up to the point of interconnection and communicated compliance evidence requirement considerations to NERC staff for RSAW development. The SDT’s recommended applicability changes to PRC-024 were posted for an initial comment and ballot period scheduled to close December 22, 2014.*

4.10.13 PRC-025— Generator Relay Loadability

The Protection System utilized on individual generating units at a dispersed power producing Facility may include load-responsive protective relays and thus would be subject to the settings requirements listed in this standard. Were this standard only to apply to aggregating equipment, the net impact to the BPS should a system disturbance occur, may be a loss of significant generating capacity should each of the individual generating units trip for the event. The SDT has determined it is appropriate to require that Protection System settings applied on both the individual generating units at a dispersed power producing resource site as applicable to this standard. However, for the purpose of compliance evidence, the SDT believes it should be sufficient for an entity to provide evidence for a single sample generating unit within a site rather than providing documentation for each individual unit, providing the entity used that methodology to set its protection systems for all the units, rather than providing documentation for each individual unit. This would be in addition to any Protection System settings evidence for the aggregating equipment. As such the SDT recommends the RSAW be modified as stated above. *The SDT recommended no changes to the standard; however, the DGR SDT communicated compliance evidence requirement considerations to NERC staff for RSAW development.*

4.11 TOP

The TOP standards provide TOPs their authority. There are four TOP standards that apply directly to GO and GOP entities. The TOP standards as they relate to GOs/GOPs ensure RCs and TOPs can issue directives to the GOP, and the GOP follows such directives. They also ensure GOPs render all available

emergency assistance as requested. Finally, they require GO/GOPs to coordinate their operations and outages and provide data and information to the BA and TOP. No TOP standard refers to the interaction of a host BA, TOP, or RC with individual BES Elements.

4.11.1 TOP-001-1a — Reliability Responsibilities and Authorities

This standard as it applies to GOPs is reviewed at the requirement level, with only one change recommended.

4.11.1.1 Requirement R3

The purpose of requirement R3 as it relates to GOPs is to ensure the RC and TOP reliability directives are complied with so long as they do not violate safety, equipment, or regulatory or statutory requirements. If a GOP is unable to follow a RC or TOP reliability directive they are to inform the RC or TOP immediately of such. The requirement is applicable to the registered functional entity, not the constituent Elements it operates. *Therefore, there is no need to differentiate applicability to dispersed power producing resources from any other GOP resources, and no change to this requirement is needed.*

4.11.1.2 Requirement R6

The purpose of requirement R6 as it relates to GOPs is to ensure all available emergency assistance to others as requested, unless such actions would violate safety, equipment, or regulatory or statutory requirements. The requirement is applicable to the registered functional entity, not the constituent Elements it operates. *Therefore, there is no need to differentiate applicability to dispersed power producing resources from any other GOP resources, and no change to this requirement is needed.*

4.11.1.3 Requirement R7

The purpose of requirement R7 as it relates to GOPs is to ensure BES facilities are not removed from service without proper notification and coordination with the TOP and, when time does not permit such prior notification and coordination, notification and coordination shall occur as soon as reasonably possible. This is required to avoid burdens on neighboring systems. It should be noted that the purpose of this standard is to keep the TOP informed of all generating Facility capabilities in case of an emergency. It is assumed that required notification and coordination from the GOP to the TOP would be done in real-time and through verbal communication media. The concern here is how to apply this to a dispersed power producing resource Facility. The SDT recommends that the GOP report at the aggregate Facility level to the TOP any generator outage above 20 MVA for dispersed power producing resource facilities. The justification is based on the following:

- This is consistent with Inclusion I2 of the revised BES definition, which addresses only generating units greater than 20 MVA.
- TOP-002-2.1b Requirement R14 requires real-time notification of changes in Real Power capabilities, planned and unplanned. Setting the threshold at 20 MVA would address routine maintenance on a small portion of the Facility (e.g., 2% of the generators are out of service on any given day) and individual generating units going into a failure. Otherwise, coordinating each individual generating unit outage would burden the TOP without providing an increase in reliability to the interconnected BPS.

Dispersed power producing resource outages should be reported as X MW out of Y MW are available. *Therefore, the SDT recommends that a modification to the applicability of this requirement is necessary for dispersed power producing resources for generator outages greater than 20 MVA.*

4.11.2 TOP-001-3— Transmission Operations²¹

The purpose of this standard as it relates to GOPs is to ensure TOP directives are complied with so long as they do not violate safety, equipment, or regulatory or statutory requirements. If a GOP is unable to follow a TOP directive they are to inform the TOP immediately of such. It directs the TOP to issue directives and as such the TOP may provide special requirements for dispersed power producing resources for its unique capabilities. *The SDT recommends that Project 2014-3 provide direction for a dispersed power producing resource to be only reported at the aggregate facility level. If TOP-001-1a R7 is reintroduced, then the recommendation provided above should be included in their efforts.*

4.11.3 TOP-002-2.1b — Normal Operations Planning²²

This TOP standard has five requirements applied to GOPs. Several modifications are recommended below, and the SDT recommends that the most effective and efficient way to accomplish this is through modification of the Applicability Section of this standard.

4.11.3.1 Requirement R3

The purpose of requirement R3 as it relates to GOPs is to ensure a GOP's current day, next-day and seasonal operations are coordinated with its host BAs and TSP. This requirement relates to planned operations at a generator and does not include unplanned operations such as forced or emergency operations. The SDT recommends that this requirement be applied at the aggregate Facility level for dispersed power producing resources. For example, forecasting available MW at the aggregated Facility level is currently one method used. The SDT does not see any reliability gap in that would prompt this team to apply R3 to any point less than the dispersed power resource aggregated Facility level. *The SDT has not found or been made aware of a reliability gap that would prompt this team to apply R3 to any point less than the dispersed power resource aggregated Facility level and recommends such modification to the applicability of this requirement.*

4.11.3.2 Requirement R13

The purpose of requirement R13 as it relates to GOPs is to ensure Real Power and Reactive Power capabilities are verified as requested by the BA and TOP. The SDT believes a modification to the applicability of this requirement is necessary for dispersed power producing resources. The SDT is recommending that this requirement be applied at the aggregate Facility level for dispersed power producing resources for the following reasons:

- Due to the nature, amount of individual generators at a dispersed power producing resource, internal Real Power losses, and natural inductance and capacitance of dispersed power resource

²¹ Note that TOP-001-2 was adopted by the Board and remanded by FERC. TOP-001-2 is currently under revision as part of Project 2014-03 – Revisions to TOP and IRO Standards, and was posted for additional ballot period that is scheduled to close January 7, 2015 as TOP-001-3.

²² The GOP applicability is removed in TOP-002-3, which was adopted by the Board. However, TOP-002-3 was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3 – Revisions to TOP and IRO Standards.

system connected in series, verification of real and reactive capabilities should be conducted at the dispersed power producing resource aggregate Facility level. Performing verification in this manner will provide an actual net real and reactive capability, which would be seen by both the BA and TOP. In addition, performing verification in this manner is also consistent with operating agreements such as an interconnection agreement, which the dispersed power resource has with the TOP and BA.

- MOD-025-2 also provides that verification for any generator <20MVA may be completed on an individual unit basis or as a “group.” Reporting capability at the aggregated Facility level is consistent with the MOD-025-2 provision for group verification.

The SDT recommends a modification to the applicability of this requirement at the aggregated Facility level for dispersed power producing resources.

4.11.3.3 Requirement R14

The purpose of requirement R14 as it relates to GOPs is to ensure BAs and TOPs are notified of changes in real output capabilities without any intentional time delay. It should be noted that the purpose of this requirement is to address unplanned changes in real output capabilities. It is assumed the required notification and coordination from the GOP to the BA and TOP would be done in real-time and through verbal communication media. The concern here is how to apply this to dispersed power producing resources. The SDT recommends that the GOP notify at the aggregate Facility level to the TOP any unplanned changes in real output capabilities above 20 MVA. The justification is based on the following:

- This is consistent with Inclusion I2 of the revised BES definition which includes generating units greater than 20MVA; and
- TOP-002-2.1b R14 requires real-time notification of changes in Real Power capabilities, planned and unplanned. Setting the threshold at 20 MVA would address routine maintenance on a small portion of the Facility (e.g. 2% of the generators are out of service on any given day) and individual generating units going into a failure. Otherwise, coordinating each individual generating unit outage would burden the TOP without providing an increase in reliability to the interconnected BPS.

Dispersed generation resources changes in real output capabilities should be reported as X MW out of Y MW are available. *The SDT recommends that a modification to the applicability of this requirement is necessary for dispersed power producing resources for unplanned outages greater than 20 MVA.*

4.11.3.4 Requirement R15

The purpose of requirement R15 as it relates to GOPs is to ensure BAs and TOPs are provided a forecast (e.g., seven day) of expected Real Power. The SDT believes this requirement as requested by the BA or TOP is being applied at the aggregate Facility level for dispersed power producing resources.

Based on the SDT’s experience, expected Real Power forecasts (e.g. 5 or 7 forecast) for a dispersed power producing resource has been traditionally coordinated with the BA and TOP at the aggregate Facility level for dispersed power producing resources. *Therefore, the SDT recommends that R15 be applied at the aggregate Facility level for dispersed power resources and as such, modification to the applicability of this requirement is necessary.*

4.11.3.5 Requirement R18

The purpose of requirement R18 as it relates to a GOP is to ensure uniform line identifiers are used when referring to transmission facilities of an interconnected network. The standard applies to transmission facilities of an interconnected network, which would not apply to any Elements within the dispersed generation Facility. There is no need to differentiate applicability to dispersed generation resources from any other GOP resources. *Therefore, the applicability of this requirement does not need to be changed for dispersed generation resources.*

4.11.4 TOP-003-1— Planned Outage Coordination

This TOP Standard has three requirements applied to GOPs. Modification to one of these requirements is recommended.

4.11.4.1 Requirement R1

The purpose of requirement R1 as it relates to GOPs is to ensure TOPs are provided planned outage information on a daily basis for any scheduled generator outage >50MW for the next day. *Therefore, the applicability of this requirement does not need to be changed for dispersed generation resources.*

4.11.4.2 Requirement R2

The purpose of requirement R2 as it relates to GOPs is to ensure all voltage regulating equipment scheduled outages are planned and coordinated with affected BAs and TOPs. A modification to the applicability of this requirement is necessary for dispersed power producing resources. The SDT recommends that this requirement be applied at the aggregate Facility level for dispersed power producing resources.

Based on the SDT's experience, scheduled outages of voltage regulating equipment at a dispersed power producing resource has been traditionally provided to the BA and TOP at the aggregate Facility level for dispersed power producing resources. Outages of voltage regulating equipment at a dispersed power producing resource are coordinated typically as a reduction in Reactive Power capabilities, specifying whether it is inductive, capacitive or both. Additionally, automatic voltage regulators that do not necessarily provide Reactive Power, but direct the actions of equipment that do supply Reactive Power, are typically coordinated at the aggregate Facility level as they usually are the master controller for all voltage regulating equipment at the Facility. A key aspect of the SDT project is to maintain the status quo, if it is determined not to cause a reliability gap. *The SDT has not found or been made aware of a reliability gap, which would prompt this team to apply R2 to any point less than the dispersed power producing resource aggregated Facility level and as such, determined a modification to the applicability of this requirement is necessary for dispersed power producing resources.*

4.11.4.3 Requirement R3

The purpose of requirement R3 as it relates to GOPs is to ensure scheduled outages of telemetering and control equipment and associated communication channels are planned and coordinated among BAs and TOPs. Based on the SDT technical expertise, scheduled outages of telemetering and control equipment and associated communication channels at a dispersed power producing resource have been traditionally provided to the BA and TOP at the aggregate Facility level for dispersed power producing resources. In addition, only scheduled outages of telemetering and control equipment and associated communication

channels that can affect the BA and TOP are coordinated with the BA and TOP. *Therefore, the applicability of this requirement does not need to be changed for dispersed power producing resources.*

4.11.5 TOP-006 — Monitoring System Conditions

The purpose of this standard as it relates to GOPs is to ensure BAs and TOPs know the status of all generation resources available for use as informed by the GOP. It should also be noted that the purpose of this standard is to ensure critical reliability parameters are monitored in real-time. It then can be extrapolated that the requirement, “GOP shall inform...,” is done by sending dispersed power producing resource telemetry in real-time and through a digital communication medium, such as an ICCP link or RTU. The SDT feels a modification to the applicability of this requirement is necessary for dispersed power producing resources. The SDT is recommending that this requirement be applied at the aggregate Facility level for dispersed power producing resources for the following reasons:

- This is consistent with Inclusion I2 of the revised BES definition, which includes generating units greater than 20MVA. If removing <20MVA would cause a burden to the BPS, then the threshold for inclusion in the BES would have been less than 20MVA;
- Routine maintenance is frequently completed on a small portion of the entire Facility (e.g. 2% of the generators are out of service on any given day) such as to not have a significant impact to the output capability of the Facility. Additionally, it is not uncommon to have individual generating units at a dispersed power producing resource to go into a failure mode due to internal factors of the equipment, such as hydraulic fluid pressure tolerances, gearbox bearing thermal tolerances, etc. As such, coordinating each individual generating unit outage would burden the TOP without providing an increase in reliability to the interconnected BPS; and
- As this standard requires real-time monitoring, this is most likely completed through a digital medium such as an ICCP link or RTU. The data that a dispersed power resource provides to the BA and TOP in real-time should include the aggregate active power output of the Facility, among other telemetry points. These data specifications are usually outlined in interconnection agreements among the parties.

Based on the SDT technical expertise, BAs and TOPs are informed by the GOP of all generation resources available at the dispersed power producing resource at the aggregate Facility level. Traditionally the dispersed power producing resources are providing the BA and TOP, at minimum, the following telemetry points in real-time: aggregate Real Power, aggregate Reactive Power and main high-side circuit breaker status. A key aspect of the SDT project is to maintain the status quo, if it is determined not to cause a reliability gap. *The SDT has not found or been made aware of a reliability gap, which would prompt this team to apply these requirement to any point less than where the dispersed power producing resource aggregates and as in such, recommends a modification to the applicability of this requirement is necessary for dispersed power producing resources.*

4.12 TPL

At the time of this paper, these standards do not affect GOs or GOPs directly. Input from GO or GOP entities is provided to transmission planning entities through the MOD standards. *Therefore, the applicability of the TPL standards does not need to be changed for dispersed power producing resources.*

4.13 VAR

The VAR standards exist to ensure that voltage levels, reactive flows, and reactive resources are monitored, controlled, and maintained. There are two VAR Standards that apply to GOs and/or GOPs. The voltage and/or reactive schedule provided by TOPs is specified to be at the point of interconnection or the point specified in the interconnection agreement.

4.13.1 VAR-001 — Voltage and Reactive Control (WECC Regional Variance)

The purpose of this standard as it relates to GOPs in WECC is to ensure a generator voltage schedule is issued that is appropriate for the type of generator(s) at a specific Facility. Additionally, it requires GOPs to have a methodology for how the voltage schedule is met taking into account the type of equipment used to maintain the voltage schedule. Based on the SDT technical expertise, voltage control and voltage schedule adherence for dispersed power producing resource occurs at the aggregate Facility level. There is no need to differentiate dispersed generation resources from any other GOP resources. *Therefore, the applicability of VAR-001 does not need to be changed for dispersed generation resources.*

4.13.2 VAR-002-2b — Generator Operation for Maintaining Network Voltage Schedules VAR-002-3 — Generator Operation for Maintaining Network Voltage Schedules

The purpose of these standards as they relate to GOs and GOPs is to ensure generators operate in automatic voltage control mode as required by the TOP voltage or reactive power schedule provided to ensure voltage levels, reactive flows, and reactive resources are maintained within applicable Facility Ratings to protect equipment and reliability of the Interconnection. Based on the SDT technical expertise, voltage control and voltage schedule adherence for dispersed power producing resource occurs at the aggregate Facility level and such guidance should be provided.

In addition, the voltage-controlling equipment and the methodology to ensure the Facility has an automatic and dynamic response to ensure the TOP's instructions are maintained can be very different for each Facility. It is implied in VAR-001-3 that each TOP should understand capabilities of the generation Facility and the requirements of the transmission system to ensure a mutually agreeable solution/schedule is used.

**4.13.3 VAR-002-2b — Requirement R3.1
VAR-002-3 — Requirement R4**

**4.13.4 The purpose of these requirements is to ensure that a GOP notifies the TOP, within 30 minutes, any status and capability changes of any generator Reactive Power resource, including automatic voltage regulator, power system stabilizer or alternative voltage controlling device. Based on the experience of the SDT, status and capability changes is traditionally coordinated at the aggregate Facility level point of interconnection. Therefore, the SDT has recommended changes to the standard to clarify the applicability of VAR-002-2b R3.1 and VAR-002-3 R4 for dispersed power producing resources. These changes were successfully balloted in VAR-002-4 on November 6, 2014, and approved by the Board on November 13, 2014. VAR-002-2b — Requirement R4
VAR-002-3 — Requirement R5**

The purpose of these requirements is to ensure that Transmission Operators and Transmission Planners have appropriate information and provide guidance to the GOP in regards to Generator Operator's transformers to ensure voltage levels, reactive flows, and reactive resources are maintained within applicable Facility Ratings to protect equipment and reliability of the Interconnection. Based on the experience of the SDT dispersed power producing resources individual generator transformers have traditionally been excluded from the requirements of VAR-002-2b R4 and VAR-002-3 R5, as they are not used to improve voltage performance on the Interconnection. As such, applicability should be limited to transformers with at least one winding at a voltage of 100kV or above. *Therefore, the SDT has recommended changes to the standard to clarify the applicability of VAR-002-2b R4 and VAR-002-3 R5 for dispersed generation resources. These changes were successfully balloted in VAR-002-4 on November 6, 2014, and approved by the Board on November 13, 2014.*

4.14 CIP

4.14.1 CIP v5

The CIP standards are still under revision in Project 2014-02. The DGR SDT and the CIP SDT continue to coordinate revisions to the CIP standards, and will update this section to reflect the outcome of that effort at the appropriate time.

The CIP standards ensure physical and cyber security for BES Cyber Assets and BES Cyber Systems critical to the reliability and security of the BES. CIP-002 identifies critical assets or systems of a Facility, while CIP-003 to CIP-011 depend on the outcome of the CIP-002 assessment to determine applicability.

During the Project 2014-02 CIP Version 5 Revisions SDT first comment period, it received comments to modify CIP-003-6 in the Applicability Section. The CIP SDT made drastic modifications to the second posting of CIP-003-6 to take into accounts all of the comments received, which was posted for an additional 45-day comment and ballot period on September 3, 2014.

At its September meeting, the DGR SDT had a focused discussion with the CIP SDT surrounding the technical nature of the dispersed power producing resources and how it relates to the CIP standards. The coordinating effort resulted in discussions of the revised CIP-003-6. As for that posted revised standard,

the CIP SDT took the approach of including an Attachment 1 for Responsible Entities. The Attachment 1 requires elements to be developed in Responsible Entities' cyber security plan(s) for assets containing low impact BES Cyber Systems. The elements in CIP-003-6, Attachment 1 allow flexibility for the controls to be established for each of the main four elements below. The CIP SDT encourages observers of the DGR SDT to review the Attachment 1 in detail. Here is some information regarding the attachment.

Element 1: Security Awareness

The intent of the security awareness program is for entities to reinforce good cyber security practices with their personnel at least once every 15 calendar months. It is up to the entity as to the topics and how it schedules these topics. The Responsible Entity should be able to produce the awareness material that was delivered and the delivery method(s) (posters, emails, topics at staff meetings, etc.) that were used. The SDT does not intend that the Responsible Entity must maintain lists of recipients and track the reception of the awareness material by personnel.

Element 2: Physical Security

The Responsible Entity has flexibility in the controls used to restrict physical access to low impact BES Cyber Systems at a BES asset using one or a combination of access controls, monitoring controls, or other operational, procedural, or technical physical security controls. Entities may utilize perimeter controls (e.g., fences with locked gates, guards, site access policies, etc.) and/or more granular areas of physical access control in areas where low impact BES Cyber Systems are located, such as control rooms or control houses. User authorization programs and lists of authorized users are not required.

Element 3: Electronic Access Controls

Where Low Impact External Routable Connectivity (LERC) or Dial-up Connectivity exists, the Responsible Entity must document and implement controls that include the LERC and Dial-up Connectivity to the BES asset such that the low impact BES Cyber Systems located at the BES asset are protected. Two glossary terms are included in order to help clarify and simplify the language in Attachment 1. The SDT's intent in creating these terms is to avoid confusion with the similar concepts and requirements (ESP, EAP, ERC, EACMS) needed for high and medium impact BES Cyber Systems by utilizing separate terms that apply only to assets containing low impact BES Cyber Systems.

Element 4: Cyber Security Incident Response

The entity should have one or more documented cyber security incident response plans that include each of the topics listed. For assets that do not have LERC, it is not the intent to increase their risk by increasing the level of connectivity in order to have real-time monitoring. The intent is if in the normal course of business suspicious activities are noted at an asset containing low impact BES Cyber Systems, there is a cyber security incident response plan that will guide the entity through responding to the incident and reporting the incident if it rises to the level of a Reportable Cyber Security Incident.

Therefore, the DGR SDT recommends that no changes be made to proposed CIP-003-6. CIP-002-5.1 needs to remain as is because entities must go through the process for identifying and categorizing its BES Cyber Systems and their associated BES Cyber Assets. The controls put in place for proposed CIP-003-6, Attachment 1, are not burdensome, are realistic and achievable, and does not express undue

compliance burden. In conclusion, the DGR SDT states that the reliability objective of these controls are adequate and the applicability of CIP-003-6 should not be modified.

The SDT states that the CIP Version 5 Revisions SDT should consider developing guidance documentation around the following areas:

- Low Impact BES Cyber Systems that must comply with a limited number of requirements, all located in CIP-003-5. The only technical requirement is R2, which will be modified during the current drafting activity to add clarity to the requirement. The SDT notes that the CIP Version 5 Revisions SDT should consider developing guidance around how this requirement relates to dispersed generation;
- Any programmable logic device that has the capability to shut down the plant within 15 minutes; and
- Remote access from third party entities into the SCADA systems that control the aggregate capacity of a Facility should be assessed to determine if there is a need of any additional cyber security policies.

The SDT intends to recommend guidance for those companies that only operate their turbines from one central location. Individual Elements lumped into a BES Cyber System should be addressed. When operations are on a turbine-by-turbine basis, the SDT believes there should not be rigid controls in place. The inability to “swim upstream” should be addressed as well. Further, the guidance intends to address when manufacturers operate or have control of the SCADA environment to conduct troubleshooting and other tasks, and ensure that proper security is in place.

NERC staff has committed to facilitate communication between the SDT and the CIP Version 5 Revisions SDT as appropriate to ensure alignment and to develop language for guidance, coordinated between the two SDTs. *Therefore, the applicability of CIP standards does not need to be changed for dispersed generation resources.*

Appendix A: List of Standards

Appendix B: List of Standards Recommended for Further Review

Draft White Paper

Proposed Revisions to the Applicability of NERC Reliability Standards NERC Standards Applicability to Dispersed Generation Resources

Project 2014-01 Standards Applicability for Dispersed
Generation Resources Standard Drafting Team

~~October 5~~December 11, 2014

Table of Contents

1	EXECUTIVE SUMMARY	3
2	PURPOSE	5
3	BACKGROUND	6
3.1	BES DEFINITION	6
3.2	DISPERSED GENERATION RESOURCES	7
3.3	DRAFTING TEAM EFFORTS	9
4	TECHNICAL DISCUSSION	11
4.1	BAL	11
4.2	COM	12
4.3	EOP	12
4.4	FAC	12
4.5	INT	18
4.6	IRO	19
4.7	MOD	20
4.8	NUC	21
4.9	PER	22
4.10	PRC	22
4.11	TOP	28
4.12	TPL	34
4.13	VAR	34
4.14	CIP	35
	APPENDIX A: LIST OF STANDARDS	38
	APPENDIX B: LIST OF STANDARDS RECOMMENDED FOR FURTHER REVIEW	39

1 Executive Summary

The purpose of this ~~white~~ ~~White paper~~ ~~Paper~~ is to provide background and technical rationale for proposed revisions to the applicability of several North American Electric Reliability Corporation (NERC) Reliability Standards, and in some cases the standard requirements. The goal of the NERC Project 2014-01 Standards Applicability for Dispersed ~~Power Producing~~ ~~Generation~~ Resources¹ standard drafting team (SDT) is to ensure that the Generator Owners (GOs) and Generator Operators (GOPs) of dispersed power producing resources are appropriately assigned responsibility for requirements that impact the reliability of the Bulk Power System (BPS), as the characteristics of operating dispersed power producing resources can be unique. In light of the revised Bulk Electric System (BES) definition approved by the Federal Energy Regulatory Authority (FERC) in 2014², the intent of this effort is generally to maintain the status quo for applicability of the standards as they have been applied over time with respect to dispersed power producing resources where the status quo does not create a reliability gap.

The SDT reviewed all standards that apply to GOs and GOPs³ and determined how each standard requirement should be appropriately applied to dispersed power producing resources, categorized as follows:

- The existing standard language was appropriate when applied to dispersed power producing resources and does not need to be addressed;
- The existing standard language was appropriate when applied to dispersed power producing resources but additional NERC guidance documentation is needed to clarify how to implement the requirements for dispersed power producing resources; and
- The existing standard language needs to be modified in order to account for the unique characteristics of dispersed power producing resources. This could be accomplished through the ~~applicability~~ ~~Applicability section~~ ~~Section~~ of the standard in most cases or, if required, through narrowly ~~tailored~~ changes to the individual requirements.

From this review, ~~the SDT determined that there are~~ three (3) ~~Reliability S~~ ~~standards-~~ ~~required in which the~~ ~~SDT feels~~ immediate attention ~~is required to~~ ~~clarify the applicability of the Reliability Standards to~~ ~~dispersed power producing resources for the benefit~~ ~~provide direction of to~~ industry stakeholders ~~as soon as feasible regarding how to appropriately direct compliance related preparations~~. These standards ~~include~~ ~~are~~:

- PRC-004 (relevant versions)⁴;
- PRC-005 (relevant versions)⁵; and

¹ Although the BES definition uses the term “dispersed power producing resources,” the SAR and the SDT also use the term “dispersed generation resources.” For the purposes of this paper, these terms are interchangeable.

² Glossary of Terms Used in NERC Reliability Standards, updated March 12, 2014.

³ See Appendix A.

⁴ Reliability Standard PRC-004 ~~is currently being~~ ~~was~~ revised as part of Project 2010-05.1 Protection Systems: Misoperations.

⁵ Reliability Standard PRC-005 ~~is currently being~~ ~~was~~ revised as part of Project 2007-17.3 – Protection System Maintenance and Testing – Phase 3.

- VAR-002 (relevant versions)⁶.

However, ~~the~~ SDT ~~has~~ recognized that many other standards⁷ required further review ~~by the SDT~~ to determine the necessity and the type of clarification or guidance for the applicability to dispersed power producing resources. This necessity is based on how each standard requirement, as written, would apply to dispersed power producing resources and the individual generating units at these facilities, considering the ~~recently approved~~ now currently-enforced BES definition. The proposed resolutions target the applicability of the standard ~~noted in the language of the applicability section~~ or ~~specifically~~ target specific individual requirements. There are additional methods to ensure consistent applicability throughout the Regions, including having guidance issued by NERC through Reliability Standard Audit Worksheet (RSAW) language revisions. These tools, among others, have been be considered and employed by the SDT throughout the work-drafting effort.

The ~~technical section of this White Paper~~ ~~includes insight from the SDT review~~; includes: ing 1) description of the history of standards applicability to dispersed power producing resources; 2) identification of ~~any unique~~ circumstances and practices that are unique to ~~for~~ dispersed power producing resources ~~and current practices~~; and 3) as well as the SDT's categorization and determination of the priority to address standards, supported by corresponding technical justification.

~~This white paper is a living document.~~ It is the intent of the SDT to modify this document over the course of this project to document the SDT's rationale and technical justification for each standard until the work of the SDT is complete. The SDT considers the sections of the ~~w~~White ~~p~~Paper that address the high-priority standards to be in final draft form. The SDT may provide further revisions to the remainder of the ~~w~~White ~~p~~Paper.

⁶ Reliability Standard VAR-002 was ~~is~~ currently being revised as part of Project 2013-04 – Voltage and Reactive Control.

⁷ See Appendix B.

2 Purpose

The purpose of this ~~white paper~~ White Paper is to provide background and technical rationale for proposed revisions to the applicability of several Reliability Standards⁸ or requirements that apply to GOs and/or GOPs. The goal of the proposed applicability changes is to ~~ensure that~~ provide the GOs and GOPs of dispersed generation resources ~~with~~ have clarity ~~regarding~~ as to their responsibility for requirements that impact the reliability of the BPS, as the characteristics of operating dispersed generation can be unique. The SDT seeks to provide is clarity through the method most appropriate for each standard, such as will be accomplished through revised by: (1) revising applicability language in the standard;s; (2) revising language in the requirements to address changes to applicability; (3) recommendin~~ged~~ changes to the RSAW associated with the standard; or (4) recommendin~~gations for~~ a reliability guideline or reference document.

This document ~~describes~~ lays out a common understanding of the design, ~~and~~ operational characteristics, ~~and unique features~~ of dispersed ~~power producing generation~~ resources, ~~highlighting the unique features of dispersed generation resources~~. The recommendations identified in this document consider the ~~purpose~~ Purpose and ~~time~~ Time horizon ~~Horizon~~ of the standards and requirements, as well as the avoidance of applying requirements in a manner that has no significant effect on reliability.⁹ This document provides justification of, and proposes revisions to, the applicability of the Reliability Standards and requirements, both existing and in development, and should be considered guidance for future standard development efforts. However, please note that the recommendations provided in this paper are subject to ~~comment~~ and further review and revision.

Note that while this ~~paper~~ White Paper may provide examples of dispersed power producing generation resources, the concepts presented are not specific to any one technology. The ~~Dispersed Generation Resources~~ SDT in general has referenced the BES Reference Document, which also refers to “dispersed power producing resources.” Although the BES definition uses the term “dispersed power producing resources,” the Standard Authorization Request (SAR) and the SDT also use the term “dispersed generation resources.” For the purposes of this paper, these terms are interchangeable.

⁸ Note that “Reliability Standard” is defined in the NERC Glossary as “approved by FERC,” but that the ~~Dispersed Generation Resources~~ SDT reviewed approved ~~and unapproved~~ standards, as well as revisions to standards proposed in other projects.

⁹ *North American Electric Reliability Corporation*, 138 FERC ¶ 61,193 at P 81 (2012).

3 Background

~~By submitting Industry stakeholders submitted~~ a SAR to the NERC Standards Committee, ~~industry stakeholders requestinged~~ that the applicability of Reliability Standards or the requirements of Reliability Standards be revised to ensure that the Reliability Standards are not imposing requirements on dispersed generation resource components that are unnecessary or counterproductive to the reliability of the BPS. The SDT's focus has been to ensure that Reliability Standards are applied to dispersed power producing resources to support an effective defense-in-depth strategy and ~~an aA~~adequate ~~l~~Level of ~~r~~Reliability for the ~~reliability of the~~ interconnected BPS.

For purposes of this effort, dispersed ~~generation power producing~~ resources are those individual resources that aggregate to a total capacity greater than 75 MVA gross nameplate rating, and that are connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage of 100 kV or above. This request is related to the approved definition of the BES from Project 2010-17,¹⁰ which resulted in the inclusion of distinct components of dispersed generation resources.

3.1 BES Definition

The BES definition¹¹ includes the following inclusion criterion addressing dispersed generation resources:

14. Dispersed power producing resources that aggregate to a total capacity greater than 75 MVA (gross nameplate rating), and that are connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage of 100 kV or above. Thus, the facilities designated as BES are:

- a) The individual resources, and*
- b) The system designed primarily for delivering capacity from the point where those resources aggregate to greater than 75 MVA to a common point of connection at a voltage of 100 kV or above.*

~~Upon implementation of Inclusion 14, NERC standards and requirements applicable to Generator Owners and Generator Operators will apply to owners and operators of all of the components included in the definition, notably each individual generator of a dispersed generation resource facility in those requirements, except in certain standards that explicitly identify the applicable facilities or provide specific guidance on applicability to dispersed generation resources.~~

The *BES Definition Reference Document*¹² includes a description of what constitutes dispersed generation resource:

“Dispersed power producing resources are small-scale power generation technologies using a system designed primarily for aggregating capacity

¹⁰ http://www.nerc.com/pa/Stand/Pages/Project2010-17_BES.aspx

¹¹ Glossary of Terms Used in NERC Reliability Standards, updated March 12, 2014. http://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf

¹² Bulk Electric System Definition Reference Document, Version 2, April 2014. http://www.nerc.com/pa/Stand/Project%20201017%20Proposed%20Definition%20of%20Bulk%20Electri/bes_phase2_reference_document_20140325_final_clean.pdf.

providing an alternative to, or an enhancement of, the traditional electric power system. Examples could include but are not limited to: solar, geothermal, energy storage, flywheels, wind, micro-turbines, and fuel cells.”

3.2 Dispersed Power Producing Resources

Dispersed power producing resources are often considered to be variable energy resources such as wind and solar. This description is not explicitly stated in the BES definition; however, NERC and FERC characterize variable generation in this manner regarding the purpose of Inclusion I4 of the definition.¹³ Therefore, the SDT is considering the reliability impacts of variable generation that depends on a primary fuel source which varies over time and cannot be stored.¹⁴ Reliably integrating high levels of variable resources – wind, solar, ocean, and some forms of hydro – into the BPS require significant changes to traditional methods used for system planning and operation.¹⁵ While these resources provide challenges to system operation, these resources are instrumental in meeting government-established renewable portfolio standards and requirements that are based on vital public interests.¹⁶

3.2.1 Design Characteristics

For dispersed power producing resources to be economically viable, it is necessary for the equipment to be geographically dispersed. The generating capacity of individual generating modules can be as small as a few hundred watts to as large as several megawatts. Factors leading to this dispersion requirement include:

- Practical maximum size for wind generators to be transported and installed at a height above ground to optimally utilize the available wind resource;
- Spacing of wind generators geographically to avoid interference between units;
- Solar panel conversion efficiency and solar resource concentration to obtain usable output; and
- Cost-effective transformation and transmission of electricity.

The utilization of ~~these~~ small generating units results in a large number of units (e.g., several hundred wind generators or several million solar panels) installed collectively as a single facility that is connected to the ~~transmission~~ Transmission system.

Dispersed ~~generation power producing~~ resources interconnected to the transmission system typically have a control system at the group level that controls voltage and power output of the ~~facility~~ Facility. The control system is capable of recognizing the capability of each individual unit or inverter to appropriately distribute the contribution required of the ~~facility~~ Facility across the available units or inverters. The

¹³ NERC December 13, 2013 filing, page 15 (FERC Docket No. RD14-2); NERC December 13, 2013 filing, page 17 (FERC Docket No. RD14-2); NERC January 25, 2012 filing, page 18 (FERC Docket No. RD14-2), FERC Order Approving Revised Definition, Docket No. RD14-2-000, Issued March 20, 2014.

¹⁴ “Electricity Markets and Variable Generation Integration,” WECC, January 6, 2011. <https://www.wecc.biz/committees/StandingCommittees/JGC/VGS/MWG/ActivityM1/WECC%20Whitepaper%20-%20Electricity%20Markets%20and%20Variable%20Generation%20Integration.pdf>

¹⁵ “Accommodating High Levels of Variable Generation,” NERC, April, 2009. http://www.nerc.com/files/ivgtf_report_041609.pdf

¹⁶ See Rules Concerning Certification of the Electric Reliability Organization; and Procedures for the Establishment, Approval, and Enforcement of Electric Reliability Standards, Order No. 672, FERC Stats. & Regs. ¶ 31,204, at P 335, order on reh’g, Order No. 672-A, FERC Stats. & Regs. ¶ 31,212 (2006).

variable generation control system must also recognize and account for the variation of uncontrollable factors such as wind speed and solar irradiance levels. Thus, for some standards discussed in this paper it is appropriate to apply requirements at the plant level rather than the individual generating unit.

3.2.2 Operational Characteristics

Dispersed [generation-power producing](#) resources often rely on a variable energy source (wind, for example) that is not able to be stored. Because of this, a ~~facility~~Facility operator cannot provide a precise forecast of the expected output to a Balancing Authority (BA), Transmission Operator (TOP) or Reliability Coordinator (RC); however, short-term forecasting capability is improving and thus reducing uncertainty.¹⁷ The forecasting and variable operating conditions are well understood by BAs, TOPs, and RCs as evidenced by the successful operation of these generating resources over the years. Dispersed generation resources by their nature result in each individual generating unit potentially experiencing varied power system parameters (e.g. voltage, frequency, etc.) due to varied impedances and other variations in the aggregating facilities design.

Many older dispersed [generation-power producing](#) resources are limited in their ability to provide essential reliability services. However, due to technological improvements, newer dispersed generation resources are capable of providing system support for voltage and frequency. For efficiency, the facilities are designed to provide the system requirements at the point of interconnection to the transmission system.

3.2.3 Reliability Impact

A dispersed [generation-power producing](#) resource is typically made up of many individual generating units. In most cases, the individual generating units are similar in design and from one manufacturer. The aggregated capability of the ~~facility~~Facility may in some cases contribute significantly to the reliability of the BPS. As such, there can be reliability benefits from ensuring the equipment utilized to aggregate the individual units to a common point of connection are operated and maintained as required in certain applicable NERC standards. When evaluated individually, however, the individual generating units often do not provide a significant impact to BPS reliability, as the unavailability or failure of any one individual generating resource may have a negligible impact on the aggregated capability of the ~~facility~~Facility. The SDT acknowledges that FERC addressed the question of whether individual resources should be included in the BES definition in Order Nos. 773 and 773-A and concluded that individual wind turbine generators should be included as part of the BES. The SDT is not challenging this conclusion, but rather is addressing the applicability of standards on a requirement-by-requirement basis as necessary to account for the unique characteristics of dispersed generation. Thus, the applicability of requirements to individual generating units may be unnecessary except in cases where a common mode issue exists that could lead to a loss of a significant number of units or the entire ~~facility~~Facility in response to a transmission system event.

¹⁷ “*Electricity Markets and Variable Generation Integration*,” WECC, January 6, 2011. <https://www.wecc.biz/committees/StandingCommittees/JGC/VGS/MWG/ActivityM1/WECC%20Whitepaper%20-%20Electricity%20Markets%20and%20Variable%20Generation%20Integration.pdf>

3.3 Drafting Team Efforts

The SDT ~~is~~ ~~ed~~ing this project in multiple phases. First, after a thorough discussion of the new definition of the BES, the SDT reviewed each standard, as shown in Appendix A, at a high level to recommend changes that would promote consistent applicability for dispersed ~~generation-power~~ ~~producing~~ resources through the entire set of Reliability Standards. This review provided the type of changes proposed, the justification for the changes, and the priority of the changes. The SDT ~~has~~ documented its review in this ~~white-paper~~ ~~White Paper~~, which will continue to be updated throughout the SDT efforts. The second phase, currently in progress, includes revising standards where necessary, ~~addressing high-priority issues first~~, and supporting the balloting and commenting process.

3.3.1 Scope of Standards Reviewed

Initially, the focus of the standards review was on standards and requirements applicable to GOs and GOPs. However, during discussions, a question was raised to the SDT whether consideration is necessary for other requirements that affect the interaction of a Balancing Authority (BA), Transmission Operator (TOP), or Reliability Coordinator (RC) with individual BES Elements. For example, a requirement that states “an RC shall monitor BES Elements” may unintentionally affect the RC operator due to the ~~newly~~ revised BES definition. As such, the SDT ~~decided to take~~took a high-level look at all standards adopted by the NERC Board of Trustees (~~Board~~) or approved by FERC to ensure this issue ~~was~~is not significant.

All standards that were reviewed are listed in Appendix A along with the status of the standards as of ~~July 2~~December 11, 2014. ~~There are several new standards included in Appendix A that the drafting team will review and provide updates within this paper if applicability changes are needed. These standards include IRO-001-3, IRO-005-4, MOD-031-1, TOP-002-3, and TOP-003-2.~~ The fields in Appendix A include the following:

- List of standards (grouped by approval status)
- Approval status of the standards which include
 - Subject to Enforcement
 - Subject to Future Enforcement
 - Filed and Pending Regulatory Approval
 - Pending Regulatory Filing
 - Designated for Retirement (2 standards – MOD-024-1 and MOD-025-1 – officially listed as Filed and Pending Regulatory Approval but will be superseded by MOD-025-2)
 - In concurrent active development
- Indication of change or additional review necessary

The SDT also reviewed, at a high-level, any approved regional standards. In cases where a change is recommended to a regional standard, the SDT will notify the affected Region. In addition, the SDT is prepared to provide recommendations to other active NERC standard development efforts, where ~~appropriate~~sc1].

Status	Number of Standards	Number of Standards to be Addressed (Standard, RSAW, Guidance or Further Review)
NERC Standards	166	27
Subject to Enforcement	101	12
Subject to Future Enforcement	20	5
Pending Regulatory Approval	28	4
Pending Regulatory Filing	7	0
Designated for Retirement	2	0
Proposed for Remand	8	6
Region-specific Standards (*Out of Scope)	17	4
Subject to Enforcement	15	3
Subject to Future Enforcement	2	1
Pending Regulatory Approval	0	0
Grand Total	183	31

3.3.2 Reliability Objectives Principles

The SDT used the following Reliability Objectives Principles to review the standards:

- Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
- The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
- Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
- Plans for ~~emergency~~-Emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained, and implemented.
- Facilities for communication, monitoring, and control shall be provided, used, and maintained for the reliability of interconnected bulk power systems.
- Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.
- The reliability of the interconnected bulk power systems shall be assessed, monitored, and maintained on a wide-area basis.
- Bulk power systems shall be protected from malicious physical or cyber attacks.

3.3.3 Prioritization Methodology

The SDT established a prioritization ~~for to the~~ review and ~~modification of~~ applicability changes recommended to NERC standards and requirements. The SDT evaluated each requirement to identify the appropriate applicability to support reliability of the BPS. ~~After the SDT identified a standard or requirement where changes to the applicability are warranted, it performed a prioritization.~~ In general, any standard or requirement ~~in which~~ the SDT ~~believes modifications are~~ determined required modification was required has been assigned a high, medium, or low priority. The standards and requirements priorities were established as follows:

- High priority was assigned so that standard or requirement changes would be made quickly enough to avoid an entity having to expend inordinate resources prematurely to comply with a

standard or requirement that, after appropriate modification, would not be applicable to that entity.

- Medium priority was assigned if significant effort and resources with no appreciable reliability benefit would be required by an entity to be compliant; and
- Low priority was assigned to other changes that may need to be made to further ensure requirements add to reliability, but are not perceived as a significant compliance burden.

The prioritization of each recommendation is identified in Appendix B.

- List of standards (grouped by priority)
- Approval status of the standards (same designations as used in Appendix A)
- Recommendation of changing the ~~applicability section~~ Applicability Section of the standard or by changing the applicability for specific requirements
- Recommendation of which applicability options should apply.

~~The SDT remains on schedule to complete its recommendations on the high priority standards by the November 2014 NERC Board of Trustees (Board) meeting, with recommendations on the medium and low priority standards by the February 2015 Board meeting.~~

5.4 Technical Discussion

This section provides a review of each group of standards, focusing on the impact of the BES definition on reliability and compliance efforts. This discussion proposes a resolution for each standard, whether it is a change in the ~~applicability section~~ Applicability Section or in a specific requirement, clarification in a guidance document, or no action needed.

5.14.1 BAL

The group of BAL standards focuses primarily on ensuring the Balancing Authority (BA) has the awareness, ability, and authority to maintain the frequency and operating conditions within its BA Area. Only two standards in this group affect GO and/or GOP, and no BAL standard reviewed affected the interaction of a host BA, TOP, or RC with individual BES Elements.

5.1.14.1.1 BAL-005 — Automatic Generation Control

The purpose of this standard, as it applies to GOPs, is to ensure that all facilities electrically synchronized to the Interconnection are included within the metered boundary of a BA Area so that balancing of resources and demand can be achieved. Ensuring the ~~facility~~ Facility as a whole is within a BA Area ensures the individual units are included. *Therefore, the applicability of the BAL-005 standard does not need to be changed for dispersed ~~power producing~~ generation resources.*

5.1.24.1.2 BAL-001-TRE-1 — Primary Frequency Response in the ERCOT Region

The purpose of BAL-001-TRE-1 standard is to maintain Interconnection steady-state frequency within defined limits. This standard should be modified to clarify the applicability for dispersed ~~generation~~ power producing resources to the total plant level to ensure coordinated performance. However, this is a

regional standard and not part of the SDT scope. *The SDT will communicate this recommendation to the relevant Region.*

5.24.2 COM

The COM¹⁸ standards focus on communication between the RC, BAs, TOPs, and GOPs. The only requirements in any of the current or future enforceable standards that apply to the GOP are clearly intended to apply to the individual GOP registered functional entity (i.e., requires communication between GOPs, TOPs, BAs, and RCs), not the constituent Elements it operates. Consequently, there is no need to differentiate the GOPs obligation for dispersed ~~generation power producing~~ resources from any other resources. *Therefore, the applicability of the COM-001-2, COM-002-2a, and COM-002-4 standards that were reviewed do not need to be changed for dispersed ~~generation power producing~~ resources^[SC2].*

5.34.3 EOP

The EOP standards focus on emergency operations and reporting. The standards that apply to GO and/or GOP entities are EOP-004 and EOP-005. No EOP standard reviewed affects the interaction of a host BA, TOP, or RC with individual BES Elements.

5.3.14.3.1 EOP-004 — Event Reporting

The purpose of this standard is to improve the reliability of the BES by requiring the reporting of events by Responsible Entities. The requirements of this standard that apply to the GO and GOP appear to apply to the individual GO and GOP registered functional entity, not the constituent elements. *The SDT has considered whether there is a need to differentiate dispersed ~~power producing generation~~ resources from any other GO and/or GOP resource and determined that no changes are required to the standard.*

5.3.24.3.2 EOP-005 — System Restoration from Blackstart Resources

EOP-005 ensures plans are in place to restore the grid from a de-energized state. The requirements that apply to a GOP are primarily for individual generation facilities designated as Blackstart Resources, with one requirement to participate in restoration exercises or simulations as requested by the RC. The inclusion of Blackstart Resources is already identified in the BES definition through Inclusion I3. The expectation is that all registered GOPs will participate in restoration exercises as requested by its RC. *Therefore, the applicability of EOP-005 does not need to be changed for dispersed ~~power producing generation~~ resources.*

5.44.4 FAC

The FAC standards focus on establishing ratings and limits of the ~~facility~~ Facility and interconnection requirements to the BES. Several standards apply to GOs and/or GOPs. No FAC standard reviewed affects the interaction of a host BA, TOP, or RC with individual BES Elements.

5.4.14.4.1 FAC-001 — Facility Connection Requirements

Requirements R2 and R3 of this standard apply to any GO that has an external party applying for interconnection to the GO's existing Facility in order to connect to the transmission system. This scenario

¹⁸ ~~Note that COM-002-2a and COM-002-3, which are Pending Regulatory Filing, will be replaced by COM-002-4.~~

is uncommon and there is no precedent for applicability of this standard to dispersed ~~power producing generation~~ resources known to the SDT. Current practice primarily includes the GO stating that they will comply with the standard if this scenario is ever realized. This standard allows the GO to specify the conditions that must be met for the interconnection of the third-party, thus providing inherent flexibility to tailor the requirements specifically for the unique needs of the Facility. ~~Furthermore, in 2012, the NERC Integration of Variable Generation Task Force (IVGTF) provided some suggested changes¹⁹ to this standard for the next version. The IVGTF report included modifying requirements to this standard as well as recommended guidance for considering integration of variable generation plants. The recommendations on Standards changes are technology neutral and independent of the type of generation. For these reasons~~Therefore, the applicability of FAC-001 does not need to be changed for dispersed power producing resources.

5.4.24.4.2 FAC-002 — Coordination of Plans for New Facilities

The purpose of FAC-002 is to ensure coordinated assessments of new facilities. The requirement applicable to GOs requires coordination and cooperation on assessments to demonstrate the impact of new facilities on the interconnected system and to demonstrate compliance with NERC standards and other applicable requirements. The methods used to demonstrate compliance are independent of the type of generation and are typically completed at the point of interconnection. Therefore, the applicability of FAC-002 does not need to be changed for dispersed ~~power producing generation~~ resources.

5.4.34.4.3 FAC-003 — Transmission Vegetation Management

The purpose of this standard is to ensure programs and efforts are in place to prevent vegetation-related outages. This standard applies equally to dispersed generation facilities and traditional Facilities in both applicability and current practices, as it pertains to overhead transmission lines of applicable generation interconnection Facilities. Therefore, the applicability of FAC-003 does not need to be changed for dispersed ~~power producing generation~~ resources.

5.4.44.4.4 FAC-008 — Facility Ratings

FAC-008 ensures ~~facility~~Facility ratings used in the planning and operation of the BES are established and communicated. The ~~facility~~Facility ratings requirement has historically been applicable to dispersed power producing resources and current practices associated with compliance are similar to traditional generation facilities. There is inherent flexibility in the standard requirements for the GO to determine the methodology utilized in determining the ~~facility~~Facility ratings.

To identify the ~~facility~~Facility rating of a dispersed power producing resource the analysis of the entire suite of ~~facility~~Facility components is necessary to adequately identify the minimum and maximum Facility Rating and System Operating Limits, and thus there would be no differentiation between the compliance obligations between dispersed power producing resources and traditional generation. The SDT believes the industry and Regions would benefit from additional guidance on FAC-008 in the form of changes to add a technical guidance section to the standard the corresponding RSAW, and as follows: or other guidance.

¹⁹http://www.nerc.com/files/2012_IVGTF_Task_1_3.pdf

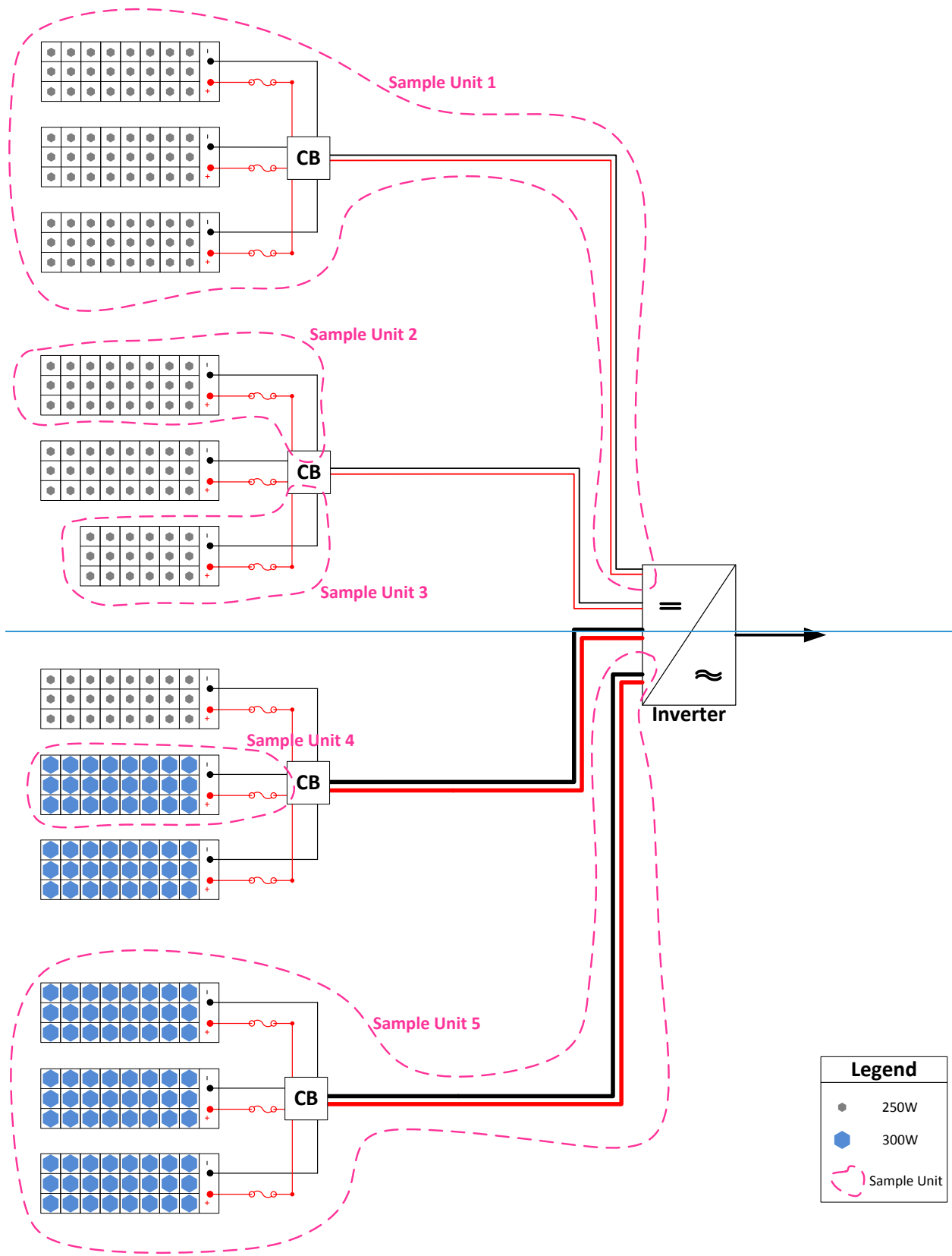
~~The applicability language in the standard is somewhat ambiguous as this language can potentially be interpreted to exclude the non-BES equipment from the generator to the low side terminals of the step up transformer (transformer with at least one winding at 100 kV). The use of the term “main step up transformer” in Requirements R1 and R2 refers to the final GSU (the last transformer(s) used exclusively for stepping up the generator output) prior to the point of interconnection or, when the point of interconnection is before the GSU, the GSU that steps up voltage to transmission line voltage level and is used strictly as a delineation point between Requirements R1 and R2. In an attempt to address this potential misinterpretation, the SDT provides the following clarifications:~~

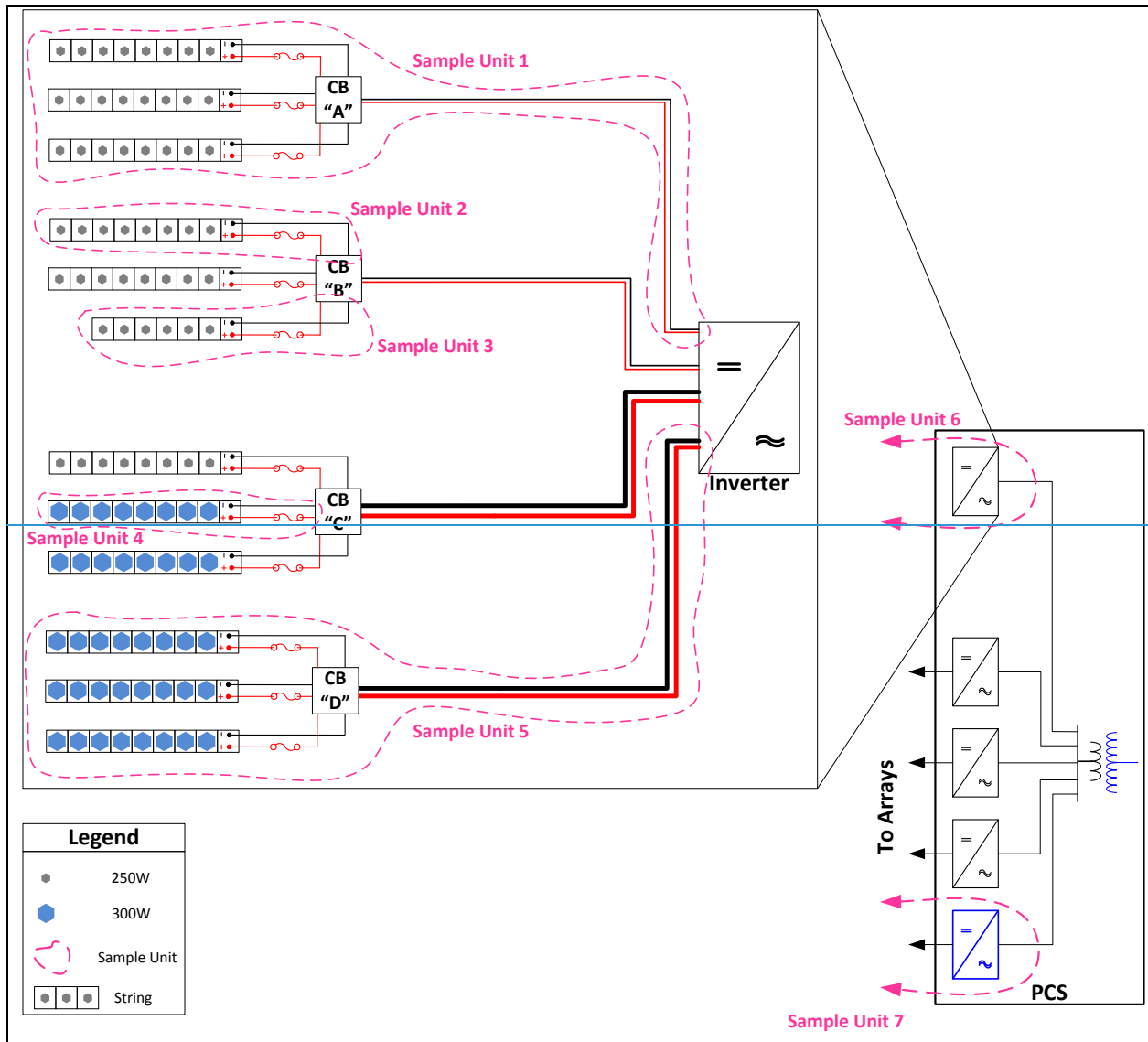
- ~~0. Referencing the NERC Glossary definition of Facility Ratings, identifies that the voltage, current, frequency, real or reactive power flow through a facility must not violate the equipment rating of any equipment of the facility (which is subjected to the voltage, current, etc.). With this definition, it is clear that each component or piece of equipment must be reviewed to ensure the ratings are not exceeded, and that applicable documentation be maintained.~~
- ~~0. The use of the term “Facilities” in the phrase “...determining the Facility Ratings of its solely and jointly owned generator Facility(ies) up to the low side terminals of the main step up transformer...” could potentially be interpreted to refer only to BES Facilities because the Glossary definition of “Facility” includes the term “Bulk Electric System Element,” and for dispersed power producing facilities could leave out portions of the facility, specifically the collection system. However, the intent of the standard is to address the Facility Ratings of all electrical equipment from the generator to the point of interconnection.~~

~~As an example for solar arrays provide ratings for Array or Panel, DC Cables (Positive and Negative), Combiner Boxes, Inverters, as well as associated breakers, Instrument transformers (CVT's, PT's), disconnect switches, and relays, etc. This is shown in Figure X~~

~~If there are multiple chains with the same ratings then only one path needs to be provided with a “multiplier number” for that piece of equipment when calculating the facility rating value. For example; A facility is comprised of 50 identical inverter units rated at 2 MW, which have identical Combiner Box, Module string and module compositions/orientations; then the Facility rating would be $50 * 2 \text{ MW} = 100 \text{ MW}$.~~

~~In order to identify the most limiting component of the facility a complete analysis of every component in a sample unit must be conducted. This will include analysis from the generator (solar module or WTG) up through the high side terminals of the main step up transformer. In an effort to simplify this analysis, grouping of identical equipment configurations into a sample unit is an accepted industry practice. The following discussion and diagrams provide an explanation of how this could be accomplished for dispersed power producing resources (wind and solar).~~





Once a complete analysis of the sample unit is completed, this sample unit can then be referred to in future rating analysis without repeating the complete sample unit analysis.

<u>Element</u>	<u>Unit Rating</u>	<u>#Units in system</u>	<u>Rating</u>
<u>Sample Unit #1 (Nine strings of Eight 250 W modules each)</u>	<u>18 kW</u>	<u>1</u>	<u>18 kW</u>
<u>Sample Unit #2 (Three strings of Eight 250 W modules)</u>	<u>6 kW</u>	<u>3</u>	<u>18 kW</u>
<u>Sample Unit #3 (Three Strings of Six 250 W modules)</u>	<u>4.5 kW</u>	<u>1</u>	<u>4.5 kW</u>
<u>Sample Unit #4 (Three strings of Six 300 W modules)</u>	<u>5.4 kW</u>	<u>2</u>	<u>10.8 kW</u>
<u>Sample Unit #5 (Nine strings of Eight 300 W modules each)</u>	<u>21.6 kW</u>	<u>1</u>	<u>21.6 kW</u>
<u>Sample Unit #6</u>	<u>80 kW</u>	<u>4</u>	<u>320 kW</u>
<u>Sample Unit #7</u>	<u>80 kW</u>	<u>1</u>	<u>80 kW</u>

Element	Multiplier
15-module String	100
Fuses	100
Positive/Negative DC Cables	200
Combiner Box	20
Inverter	20
Transformer	1

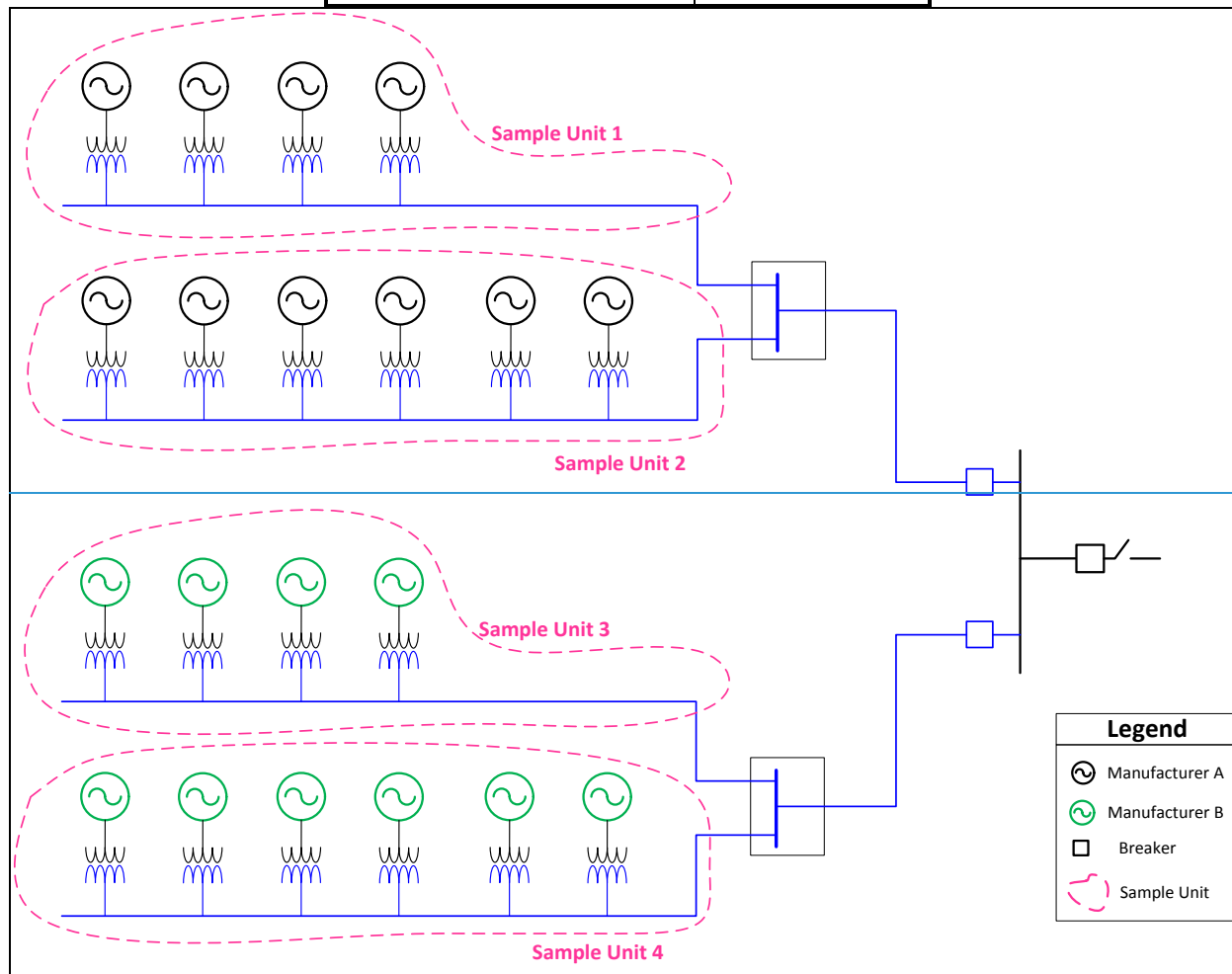


Figure Y: Sample Unit Representation (Wind)

5.454.5 INT

The INT standards provide BAs the authority to monitor power interchange between BA Areas. No INT standard is applicable to the GO or GOP, or affects the interaction of a host BA, TOP, or RC with individual BES Elements. *Therefore, the applicability of the INT standards do not need to be changed for dispersed power producing generation resources.*

5.46.4.6 IRO

The IRO standards provide RCs their authority. There are three IRO Standards that apply directly to GO and/or GOP entities. There are three standards that apply to the interaction of the RC with individual BES Elements. No other IRO standard reviewed affected the interaction of a host BA, TOP, or RC with GOs and/or GOPs.

5.46.14.6.1 IRO-001 — Reliability Coordination — Responsibilities and Authorities²⁰

The purpose of these standards and their requirements as applicable to a GOP is to ensure RC directives are complied with so long as they do not violate safety, equipment, or regulatory or statutory requirements, or cannot be physically implemented. If a GOP is unable to follow a RC directive they are to inform the RC immediately of such.

Directives from RCs have been traditionally applied to the dispersed power producing resource at the aggregate ~~facility~~ Facility level when they are related to either active power or voltage, such as an output reduction or the provision of voltage support. When such directives are not specific to any one Element within the Facility, it is up to the GOP to determine the appropriate method to achieve the desired result of the directive consistent with other applicable NERC Reliability Standards. When an RC directive specifies a particular Element or Elements at the GOP's ~~facility~~ Facility, it is the expectation and requirement that the GOP will act as directed, so long as doing so does not violate safety, equipment, or regulatory or statutory requirements or cannot be physically implemented. For example, a directive could specify operation of a particular circuit breaker at a GOP Facility. *For these reasons, the applicability of IRO-001 does not need to be changed for dispersed ~~generation-power producing~~ resources.*

5.46.24.6.2 IRO-005 — Reliability Coordination — Current Day Operations²¹

The purpose of this standard and its requirements as it relates to GOPs is to ensure when there is a difference in derived limits the BES is operated to the most limiting parameter. A difference in derived limits can occur on any Element and therefore any limitation of the applicability of this standard may create a reliability gap. There is no need to differentiate applicability to dispersed generation resources from any other GOP resources. *Therefore, the applicability of IRO-005 does not need to be changed for dispersed ~~generation-power producing~~ resources.*

5.46.34.6.3 IRO-010 — Reliability Coordinator Data Specification and Collection

The purpose of this standard and its requirement(s) as it relates to GOs and GOPs is to ensure data and information specified by the RC is provided. As each RC area is different in nature, up to and including the tools used to ensure the reliability of the BPS, a 'one size fits all' approach is not appropriate. This Reliability Standard allows for the RC to specify the data and information required from the GO and/or the GOP, based on what is required to support the reliability of the BPS. *Therefore, the applicability of IRO-010 does not need to be changed for dispersed ~~power producing~~ generation resources.*

²⁰ Note that IRO-001-3, which is adopted by the ~~NERC BOT~~ Board, was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3 – Revisions to TOP and IRO Standards.

²¹ Note that applicability to GOPs has been removed in IRO-005-4, which is adopted by the ~~Board~~ NERC BOT. However, this standard was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3 – Revisions to TOP and IRO Standards.

5.474.7 MOD

The MOD group of standards ensures consistent modeling data requirements and reporting procedures. The MOD standards provide a path for Transmission Planners (TPs) and Planning Coordinators (PCs) to reach out to entities for specific modeling information, if required. The SDT believes the existing and proposed modeling standards are sufficient for modeling dispersed ~~generation power producing~~ resources. However, due to the unique nature of dispersed ~~power producing~~ generation resources and an effort to bring consistency to the models, *the SDT believes additional guidance on the MOD standards would be beneficial and will communicate its determination to with other groups responsible for developing such guidance, e.g., the NERC Planning Committee and the MOD-032 SDT, in their determination of whether developing guidelines would be valuable to support accurate modeling.*

5.47.14.7.1 MOD-010 — Steady-State Data for Transmission System Modeling and Simulation

This standard is anticipated to be retired in the near future. There is no need to differentiate dispersed generation resources from any other GOP resources as discussed in 5.7.8 regarding MOD-032. *Therefore, the applicability of MOD-010 does not need to be changed for dispersed generation resources.*

5.47.24.7.2 MOD-012 — Dynamics Data for Transmission System Modeling and Simulation

This standard is anticipated to be retired in the near future. There is no need to differentiate dispersed generation resources from any other GOP resources as discussed in 5.7.8 regarding MOD-032. *Therefore, the applicability of MOD-012 does not need to be changed for dispersed generation resources.*

5.47.34.7.3 MOD-024-1 — Verification of Generator Gross and Net Real Power Capability

This standard was established to ensure accurate information on generator gross and net Real Power capability is available for steady-state models used to assess BES reliability. This standard will be superseded by MOD-025-2.²² *Therefore, the applicability of MOD-024-1 does not need to be changed for dispersed generation resources.*

5.47.44.7.4 MOD-025-1 — Verification of Generator Gross and Net Reactive Power Capability

This standard was established to ensure accurate information on generator gross and net Reactive Power capability is available for steady-state models used to assess BES reliability. This standard will be superseded by MOD-025-2. *Therefore, the applicability of MOD-025-1 does not need to be changed for dispersed generation resources.*

5.47.54.7.5 MOD-025-2 — Verification and Data Reporting of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability

The purpose of MOD-025-2 is to ensure that accurate information on generator gross and net Real and Reactive Power capability is available for planning models used to assess BES reliability. This standard is appropriate for and includes specific provisions for dispersed generation resources to ensure changes in

²² MOD-024-1 and MOD-025-1 are ~~NERC BOT Board~~ Adopted but not subject to enforcement. They are commonly followed as good utility practice.

capabilities are reported. *Therefore, the SDT will recommendis further evaluating whether to revisions revise to 4.2.3 the applicability of the standard to align the language with the revised BES definition.*

5.47.64.7.6 MOD-026 — Verification of Models and Data for Generator Excitation Control System or Plant Volt/Var Control Functions

This standard provides for verification of models and data for voltage control functions. This standard is appropriate for dispersed generation resources. ~~to ensure changes in control systems and capabilities are reported. However~~Originally, the DGR SDT considered ~~recommends~~clarifying the applicability ~~to ensure~~of the Facilities section ~~aligns with dispersed generation resources, however, upon further review, the DGR SDT recommends no change.~~

5.47.74.7.7 MOD-027 — Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions

This standard was established to verify that the turbine/governor and frequency control model accurately represent generator unit Real Power response to system frequency variations. This standard is appropriate for dispersed generation resources ~~to ensure changes in control systems and capabilities are reported.~~Originally, the DGR SDT considered clarifying the applicability of the Facilities section, however, upon further review, the DGR SDT recommends no change. ~~However, the SDT recommends clarifying the applicability to ensure the Facilities section aligns with dispersed generation resources.~~

5.47.84.7.8 MOD-032 — Data for Power System Modeling and Analysis

The MOD-032 standard was established to ensure consistent modeling data requirements and reporting procedures for the planning horizon cases. The nature of dispersed generation resources is a challenge in modeling the steady-state and dynamic electrical properties of the individual components (e.g. individual units, collector system, interconnection components, etc.).

Models for dispersed ~~generation power producing~~ resources are typically proprietary and unique for each ~~facility~~Facility. Generic models exist for dynamic analysis that may provide sufficient accuracy in lieu of a ~~facility~~Facility-specific model. Some sections of the MOD-032 Attachment 1 pertain to modeling individual units, which may not be feasible. Guidance should be provided to show how to best model dispersed ~~generation power producing~~ resources. Such guidance should require modeling requirements for each type of dispersed ~~power producing generation~~ resource within a ~~facility~~Facility and aggregate model for each reasonable aggregation point. *The applicability of MOD-032 does not need to be changed for dispersed ~~generation power producing~~ resources.*

5.484.8 NUC

The requirements in standard NUC-001 — *Nuclear Plant Interface Coordination* individually define the applicability to Registered Entities, not to the Elements the entities own or operate. While it is unlikely any Elements that are part of a dispersed ~~power producing generation~~ resource would be subject to an agreement required by this standard, limiting the applicability of this standard could create a reliability gap and thus, there is no need to differentiate applicability to dispersed generation resources. *Therefore, the applicability of the NUC standard does not need to be changed for dispersed ~~generation power producing~~ resources.*

5.494.9 PER

The PER standards focus on operator personnel training. The only requirements in any of the current or future enforceable standards that apply to the GOP is requirement R6 in PER-005-2 – *Operations Personnel Training*, and it is clearly intended to apply to the individual GOP registered functional entity that controls a fleet of generating facilities, not the constituent Elements it operates. As such, there is no need to differentiate dispersed [power producing generation](#) resources from any other GOP resources. *Therefore, the applicability of the PER standards do not need to be changed for dispersed [power producing generation](#) resources.*

5.504.10 PRC

The PRC standards establish guidance to ensure appropriate protection is established to protect the BES.

5.50.14.10.1 PRC-001-1.1 — System Protection Coordination

Requirement R1 requires GOPs to be familiar with the purpose and limitations of Protection System schemes applied in their area. The recently approved changes to the BES definition extend the applicability of this requirement. Often this familiarity is provided to GOP personnel through training on the basic concepts of relay protection and how it is utilized. The basic relaying concepts utilized in protection on the aggregating equipment at a dispersed generation site typically will not vary significantly from the concepts used in Protection Systems on individual generating units.

Requirement R2 requires that GOPs report protective relay or equipment failures that reduce system reliability. Protective System failures occurring within a single individual generating unit at a dispersed [power producing generation](#) resource will not have any impact on overall system reliability and thus it should not be necessary for GOPs to report these failures to their TOP and host BA. Only failures of Protection Systems on aggregating equipment have the potential to impact BPS reliability and may require notification. When interpreted as stated above, no related changes should be required to the existing PRC-001-1 standard, as the BES definition changes do not have an impact on these requirements.

Requirement R3 requires GOPs to coordinate new protective systems. Coordinating new and changes to existing protective relay schemes should be applied to aggregating equipment protection only if a lack of coordination could cause unintended operation or non-operation of an interconnected entity's protection, thus potentially having an adverse impact to the BPS. Existing industry practice is to share/coordinate the protective relay settings on the point of interconnect (e.g. generator leads, radial generator tie-line, etc.) and potentially the main step-up transformer, but not operating (collection) buses, collection feeder, or individual generator protection schemes, as these Protection Systems do not directly coordinate with an interconnected utility's own Protection Systems. Relay protection functions such as under and overfrequency and under and overvoltage changes are independent of the interconnected utility's protective relay settings and the setting criteria are defined in PRC-024.

Requirement R5 requires GOPs to coordinate changes in generation, transmission, load, or operating conditions that could require changes in the Protection Systems of others. A GOP of a dispersed generation resource should be required to notify its TOP of changes to generation, transmission, load, or operating conditions on an aggregate ~~facility~~[Facility](#) level.

Project 2007-06 – System Protection Coordination and Project 2014-03 – Revisions to TOP and IRO Standards are presently revising various aspects of this standard or addressing certain requirements in other standards.

For these reasons, the ~~DGR SDT~~ ~~has~~ coordinated with the other SDTs currently reviewing this standard and ~~has~~ recommended revisions to Requirement R3.1 to indicate that coordination by a GOP with their TOP and host BA of new or changes to protection systems on individual generating units of dispersed power producing resources is not required. ~~account for the unique characteristics of dispersed power producing resources.~~

5.50.24.10.2 PRC-001-2 — System Protection Coordination

The concerns addressed with PRC-001-1.1b are removed in PRC-001-2, which is adopted by the ~~NERC BOTBoard~~. However, this standard was included in the proposed remand by FERC and is subject to revision as part of Project 2014-03 – Revisions to TOP and IRO Standards. This Standard version is not in effect and ~~will be~~ withdrawn ~~when the currently~~as the proposed versions of the TOP and IRO Reliability Standards included in Project 2014-3 effectively replace PRC-001-2 and other TOP standards are filed at FERC~~scs~~. *For this reason, no changes are required.*

5.50.34.10.3 PRC-002-NPCC-01— Disturbance Monitoring

PRC-018-1 — Disturbance Monitoring Equipment Installation and Data Reporting

Requirements related to installation of Fault/Disturbance monitoring and/or sequence of events (SOE) recording capabilities on generating units and substation equipment which meet regional specific criteria may require installation of these capabilities on the aggregating equipment at a dispersed ~~generation power producing~~ resource ~~facility~~Facility, and also requires maintenance and periodic reporting requirements to their RRO. However, these requirements have been previously applicable to the aggregating equipment at these dispersed ~~generation power producing~~ resources, and these capabilities are not required to be installed on the individual generating units. The BES definition changes have no direct impact on applicability of these standards to dispersed ~~generation power producing~~ resources. *Therefore, the applicability of these standards ~~does~~ not need to be changed for dispersed ~~generation power producing~~ resources.*²³

5.50.44.10.4 PRC-004-2.1a – Analysis and Mitigation of Transmission and Generation

Protection System Misoperations

PRC-004-3 — Protection System Misoperation Identification and Correction

Misoperation reporting per PRC-004 is currently a requirement applied on the aggregating equipment at applicable dispersed ~~generation power producing~~ resource sites meeting BPS criteria. The continuation of this analysis and reporting on the aggregating equipment by dispersed generation resource owners can provide value to BPS reliability and should remain in place. However, based on the experience of the SDT, there is minimal impact to BPS reliability for analyzing, reporting and developing Corrective Action Plans for each individual generating unit that trips at a dispersed ~~generation power producing~~ resource site, as the tripping of one or a small number of these units has no material impact to the BPS reliability.

²³ See NPCC CGS-005.

Additionally, reporting of Misoperations on each individual generating unit may result in substantial and unnecessary burdens on both the dispersed generation resource owner and the Regional Entities that review and track the resulting reports and Corrective Action Plan implementations. The SDT recognizes that many turbine technologies do not have the design capability of providing sufficient data for an entity to evaluate whether a Misoperation has occurred. Furthermore, dispersed [power producing generation](#) resources by their nature result in each individual generating unit potentially experiencing varied power system parameters (e.g., voltage, frequency, etc.) due to varied impedances and other variations in the aggregating facilities design. This limits the ability to determine whether an individual unit correctly responded to a system disturbance.

However, the SDT maintains that Misoperations occurring on the Protection Systems of individual generation resources identified under Inclusion I4 of the BES definition do not have a material impact on BES reliability when considered individually; however, the aggregate capability of these resources may impact BES reliability if a large number of the individual generation resources (aggregate nameplate rating of greater than 75 MVA) incorrectly operated or failed to operate as designed during a system event. As such, if a trip aggregating to greater than 75 MVA occurs in response to a system disturbance, the SDT ~~proposes-proposed~~ requiring analysis and reporting of Misoperations of individual generating units for which the root cause of the Protection System operation(s) affected an aggregate rating of greater than 75 MVA of BES Facilities. Note that the SDT selected the 75 MVA nameplate threshold for consistency and to prevent confusion.

The SDT ~~was~~ also ~~is~~ concerned with the applicability of events where one or more individual units tripped and the root cause of the operations was identified as a setting error. In this case, the requirements of PRC-004 would be applicable for any individual units where identical settings were applied on the Protection Systems of like individual generation resources identified under Inclusion I4 of the BES definition.

The SDT ~~concludes-concluded~~ that it is not necessary under PRC-004 to analyze each individual Protection System Misoperation affecting individual generating units of a dispersed [generation power producing](#) resource, ~~but is concerned with the potential for unreported Misoperations involving a common mode failure of multiple individual generating units as described. The SDT has recommended changes to the applicability of this standard to require misoperation analysis on individual generating units at a dispersed [generation power producing](#) resource site, only for events affecting greater than 75MVA aggregate nameplate; the SDT feels-determined that this will ensure that common mode failure scenarios and their potential impact on BPS reliability are appropriately addressed. The SDT's recommended changes passed industry ballot on November 6, 2014, and were approved by the Board on November 13, 2014, and are currently pending regulatory approval.~~

5.50.54.10.5 PRC-004-WECC-1 — Protection System and Remedial Action Scheme Misoperation

Dispersed [generation power producing](#) resource sites typically would not be associated with a WECC Major Transfer Path or Remedial Action Scheme (RAS), and thus would not be affected by PRC-004-WECC-1. If a site were to be involved with one of these paths or schemes, it is likely that associated protection or RAS equipment would be located on the aggregating equipment rather than the individual generating units. As such, the BES definition changes may have an impact on applicability of this

standard to dispersed ~~generation-power producing~~ resources. This standard should be modified to clarify the applicability for dispersed generation resources; however, this is a regional standard and not part of the SDT's scope. *Therefore, the SDT ~~will recommend that the relevant Region communicate this recommendation to the evaluate the standard for modification relevant Region.~~*

5.50.64.10.6 PRC-005-1.1b — Transmission and Generation Protection System Maintenance and Testing

The SDT recognizes that PRC-005-1.1b will be phased out beginning in early 2015. Therefore, the SDT recommends only guidance on PRC-005-1.1b rather than suggesting language changes to the standard. *Therefore, the SDT does not recommend revising the applicability of this standard ~~does not need to be changed~~ for dispersed generation resources, ~~as rather, the SDT provided guidance has been provided in the form of recommended changes recommendations for revisions to the applicable RSAW to NERC staff, which NERC has implemented after consultation with the Regions.~~*

5.50.74.10.7 PRC-005-2.— Protection System Maintenance

PRC-005-3 — Protection System and Automatic Reclosing Maintenance

PRC-005-4~~x~~ — ~~Protection System, Automatic Reclosing, and Sudden Pressure Relaying Maintenance~~ Protection System Maintenance and Testing: Sudden Pressure Relays

The aggregated capability of the individual generating units may in some cases contribute to the reliability of the BPS; as such, there can be reliability benefit from ensuring certain BES equipment utilized to aggregate the individual units to a common point of connection are operated and maintained as required in PRC-005²⁴. When evaluated individually, however, the generating units themselves do not have the same impact on BPS reliability as the system used to aggregate the units. The unavailability or failure of any one individual generating unit would have a negligible impact on the aggregated capability of the ~~faeility~~ Facility; this would be irrespective to whether the dispersed generation resource became unavailable due to occurrence of a legitimate fault condition or due to a failure of a control system, protective element, dc supply, etc.

The protection typically utilized in these generating units includes elements which would automatically remove the individual unit from service for certain internal or external conditions, including an internal fault in the unit. These units typically are designed to provide generation output at low voltage levels, (i.e., less than 1000 V). Should these protection elements fail to remove the generating unit for this scenario, the impacts would be limited to the loss the individual generating unit and potentially the next device upstream in the collection system of the dispersed ~~generation-power producing~~ resource. However, this would still only result in the loss of a portion of the aggregated capability of the ~~faeility~~ Facility, which would be equally likely to occur due to a scenario in which a fault occurs on the collection system.

Internal faults on the low voltage system of these generating units would not be discernible on the interconnected transmission systems, as this is similar to a fault occurring on a typical utility distribution

²⁴ ~~Reliability Standard PRC-005 is currently being revised as part of Project 2007-17.3 — Protection System Maintenance and Testing — Phase 3, available here: http://www.nerc.com/pa/Stand/Pages/Project_2007-17-3_Protection_System_Maintenance_and_Testing_Phase_3.aspx. Any proposed changes to the PRC-005 Reliability Standard will be coordinated with this project. Project 2007-17.1 is considering technical changes and Project 2014-01 will consider any applicability change.~~

system fed from a substation designed to serve customer load. It is important to note that the collection system equipment (e.g., breakers, relays, etc.) used to aggregate the individual units may be relied upon to clear the fault condition in both of the above scenarios, which further justifies ensuring portions of the BES collection equipment is maintained appropriately.

For this reason, activities such as Protection System maintenance on each individual generating unit at a dispersed generation ~~facility~~Facility would not provide any additional reliability benefits to the BPS, but Protection System maintenance on facilities where generation aggregates to 75 MVA or more would. The SDT proposes that the scope of PRC-005 be limited to include only the protection systems that operate at a point of aggregation above 75 MVA nameplate rating. If the aggregation point occurs at a component in the collection system, then the protection systems associated with this component would be in scope. *The SDT has recommended changes to the Applicability ~~section~~Section (Facilities) of PRC-005-2, -3, and -4~~X~~ to indicate that maintenance activities should only apply on the aggregating equipment at or above the point where the aggregation exceeds 75 MVA. The SDT's recommended applicability changes to PRC-005-2 and PRC-005-3 were approved by the Board on November 13, 2014. The SDT's recommended applicability changes to PRC-005-4 were posted for an initial ballot period that ends on January 22, 2014.*

5.50.94.10.8 PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding **PRC-006-SERC -1 — Automatic Underfrequency Load Shedding Requirements**

The regional specific PRC-006 standards deviate from the PRC-006-1 standard in that they have specific requirements for GOs. In particular, the NPCC version requires that GOs set their underfrequency tripping to meet certain criteria to ensure reliability of the BPS. Typically a dispersed generation resource site may have underfrequency protection on both the aggregating equipment (i.e., collection buses or feeders) as well as the individual generating units. Were this standard only to apply to aggregating equipment, the net impact to the BPS should a system disturbance occur may still result in a loss of significant generating capacity should each of the individual generating units trip for the event. Therefore it may be appropriate to include the individual generating units at a dispersed generation resource site as subject to this standard. The standard could be interpreted this way as written, but further clarification in the standard language may be considered. While this standard may need to be modified to clarify the applicability for dispersed generation resources, this is a regional standard and not part of the SDT's scope. Therefore, the SDT recommends that the relevant Region evaluate the standard for modification. *Therefore, the SDT will communicate this recommendation to the relevant Region.*

The SERC version of PRC-006 requires GOs to provide, upon request, certain under and overfrequency related setpoints and other related capabilities of the site relative to system disturbances. It may be appropriate to include the capabilities of the individual generating units at a dispersed generation resource site when providing this information; however, it may be sufficient to provide only the capabilities of a single sample unit within a site as these units are typically set identically. This would be in addition to any related capabilities or limitations of the aggregating equipment as well. This may be accomplished by providing clarifications in the requirements sections. While this standard may need to be modified to clarify the applicability for dispersed generation power producing resources, this is a regional standard and not part of the SDT's scope. Therefore, the SDT recommends that the relevant Region evaluate the standard for modification. *Therefore, the SDT will communicate this recommendation to the relevant Region.*

5.50.104.10.9 PRC-015 — Special Protection System Data and Documentation

PRC-016 — Special Protection System Misoperations

PRC-017 — Special Protection System Maintenance and Testing

Relatively few dispersed ~~generation-power producing~~ resources own or operate Special Protection Systems (SPSs); however, they do exist and therefore need to be evaluated for applicability based on the revised BES definition. The vast majority of these SPSs involve the aggregating equipment (transformers, collection breakers, etc.) and not the individual generating units. The SPSs are installed to protect the reliability of the BPS, and as such the aggregated response of the site (e.g., reduction in output, complete disconnection from the BES, etc.) is critical, not the response of individual generating units. *Therefore, the applicability of these standards does not need to be changed for dispersed ~~generation-power producing~~ resources.*

5.50.114.10.10 PRC-019-1 — Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection

Dispersed ~~generation-power producing~~ resources typically utilize a site level voltage control scheme that directs the individual generating units to adjust their output to meet the voltage requirements at an aggregate ~~facility~~Facility level. In these cases the individual generating units will simply no longer respond once they are “maxed out” in providing voltage or reactive changes, but also need to be properly coordinated with protection trip settings on the aggregating equipment to mitigate risk of tripping in this scenario. For those facilities that solely regulate voltage at the individual unit, these facilities also need to consider the Protection Systems at the individual units and their compatibility with the reactive and voltage limitations of the units. The applicability in PRC-019-1 (section 4.2.3) includes a “Generating plant/Facility consisting of one or more units that are connected to the Bulk Electric System at a common bus with total generation greater than 75 MVA (gross aggregate nameplate rating).” *Therefore, the DGR SDT revised the Facilities section of the standard to clarify that facilities which solely regulate voltage at the individual generating unit are subject to this standard’s requirements. The SDT’s recommended applicability changes to PRC-019-1 were posted for an initial comment and ballot period scheduled to close December 22, 2014.*

5.50.124.10.11 PRC-023— Transmission Relay Loadability

Dispersed ~~power producing~~generation resources in some cases contain facilities and Protection Systems that meet the criteria described in the ~~applicability section~~Applicability Section (e.g., load responsive phase Protection System on transmission lines operated at 200 kV or above); however, in the majority of cases these lines are radially connected to the remainder of the BES and are excluded from the standard requirements of PRC-023-3. While certain entities with dispersed ~~generation-power producing~~ resources are required to meet the requirements of PRC-023 on components of their aggregating equipment (e.g., main step-up transformers, interconnecting transmission lines) the standard is not applicable to the individual generating units, as the individual generating units are addressed in PRC-025. The BES definition changes have no direct impact on the applicability of this standard to dispersed ~~generation power producing~~ resources. *Therefore, the applicability of these standards does not need to be changed for dispersed ~~generation-power producing~~ resources.*

5.50.134.10.12 PRC-024— Generator Frequency and Voltage Protective Relay Settings

If the individual generating units at a dispersed ~~generation-power producing~~ resource were excluded from this requirement, it is possible large portions or perhaps the entire output of a dispersed ~~generation-power producing~~ resource site may be lost during certain system disturbances, negatively impacting BES reliability. The SDT has determined it is appropriate to require that Protection System settings applied on both the individual generating units and aggregating equipment (including any Protection Systems applied on non-BES portions of the aggregating equipment), are set within the “no-trip zone” referenced in the requirements to maintain reliability of the BES. However, for the purpose of compliance evidence, the SDT believes it should be sufficient for an entity to provide evidence for a single sample generating unit within a site rather than providing documentation for each individual unit, providing the entity used that methodology to set its protection systems for all the units, rather than providing documentation for each individual unit. This would be in addition to any Protection System settings evidence for the aggregating equipment. *The SDT therefore recommended changes to the standard requirements to ensure these requirements are applied to the individual power producing resources as well as all equipment, potentially including non-BES equipment, from the individual power producing resource up to the point of interconnection and communicated compliance evidence requirement considerations to NERC staff for RSAW development. The SDT’s recommended applicability changes to PRC-024 were posted for an initial comment and ballot period scheduled to close December 22, 2014.*

The SDT therefore recommended changes to the standard requirements addressing the scope of applicability as stated above and will recommend changes to the RSAW to address documentation options.

5.50.144.10.13 PRC-025— Generator Relay Loadability

The Protection System utilized on individual generating units at a dispersed ~~generation-power producing facility~~Facility may include load-responsive protective relays and thus would be subject to the settings requirements listed in this standard. Were this standard only to apply to aggregating equipment, the net impact to the BPS should a system disturbance occur, may be a loss of significant generating capacity should each of the individual generating units trip for the event. The SDT has determined it is appropriate to require that Protection System settings applied on both the individual generating units at a dispersed ~~generation-power producing~~ resource site as applicable to this standard. However, for the purpose of compliance evidence, the SDT believes it should be sufficient for an entity to provide evidence for a single sample generating unit within a site rather than providing documentation for each individual unit, providing the entity used that methodology to set its protection systems for all the units, rather than providing documentation for each individual unit. This would be in addition to any Protection System settings evidence for the aggregating equipment. As such the SDT recommends the RSAW be modified as stated above. *The SDT recommended ~~no~~ changes to the standard ~~are required~~; however, the DGR SDT communicated compliance evidence requirement considerations to NERC staff for RSAW development. is recommending changes to the RSAW to clarify compliance evidence requirements.*

5.514.11 TOP

The TOP standards provide TOPs their authority. There are four TOP standards that apply directly to GO and GOP entities. The TOP standards as they relate to GOs/GOPs ensure RCs and TOPs can issue directives to the GOP, and the GOP follows such directives. They also ensure GOPs render all available

emergency assistance as requested. Finally, they require GO/GOPs to coordinate their operations and outages and provide data and information to the BA and TOP. No TOP standard refers to the interaction of a host BA, TOP, or RC with individual BES Elements.

5.51.14.11.1 TOP-001-1a — Reliability Responsibilities and Authorities

This standard as it applies to GOPs is reviewed at the requirement level, with only one change recommended.

5.51.1.14.11.1.1 Requirement R3

The purpose of requirement R3 as it relates to GOPs is to ensure the RC and TOP reliability directives are complied with so long as they do not violate safety, equipment, or regulatory or statutory requirements. If a GOP is unable to follow a RC or TOP reliability directive they are to inform the RC or TOP immediately of such. The requirement is applicable to the registered functional entity, not the constituent Elements it operates. *Therefore, there is no need to differentiate applicability to dispersed ~~generation power producing~~ resources from any other GOP resources, and no change to this requirement is needed.*

5.51.1.24.11.1.2 Requirement R6

The purpose of requirement R6 as it relates to GOPs is to ensure all available emergency assistance to others as requested, unless such actions would violate safety, equipment, or regulatory or statutory requirements. The requirement is applicable to the registered functional entity, not the constituent Elements it operates. *Therefore, there is no need to differentiate applicability to dispersed ~~generation power producing~~ resources from any other GOP resources, and no change to this requirement is needed.*

5.51.1.34.11.1.3 Requirement R7

The purpose of requirement R7 as it relates to GOPs is to ensure BES facilities are not removed from service without proper notification and coordination with the TOP and, when time does not permit such prior notification and coordination, notification and coordination shall occur as soon as reasonably possible. This is required to avoid burdens on neighboring systems. It should be noted that the purpose of this standard is to keep the TOP informed of all generating ~~facility~~Facility capabilities in case of an emergency. It is assumed that required notification and coordination from the GOP to the TOP would be done in real-time and through verbal communication media. The concern here is how to apply this to a dispersed ~~power producinggeneration~~ resource ~~facility~~Facility. The SDT recommends that the GOP report at the aggregate ~~facility~~Facility level to the TOP any generator outage above 20 MVA for dispersed ~~power producinggeneration~~ resource facilities. The justification is based on the following:

- This is consistent with Inclusion I2 of the revised BES definition, which addresses only generating units greater than 20 MVA.
- TOP-002-2.1b Requirement R14 requires real-time notification of changes in Real Power capabilities, planned and unplanned. Setting the threshold at 20 MVA would address routine maintenance on a small portion of the ~~facility~~Facility (e.g., 2% of the generators are out of service on any given day) and individual generating units going into a failure. Otherwise, coordinating each individual generating unit outage would burden the TOP without providing an increase in reliability to the interconnected BPS.

Dispersed power producing generation resource outages should be reported as X MW out of Y MW are available. *Therefore, the SDT recommends that a modification to the applicability of this requirement is necessary for dispersed power producing resources for generator outages greater than 20 MVA.*

5.51.24.11.2 TOP-001-23— Transmission Operations²⁵

The purpose of this standard as it relates to GOPs is to ensure TOP directives are complied with so long as they do not violate safety, equipment, or regulatory or statutory requirements. If a GOP is unable to follow a TOP directive they are to inform the TOP immediately of such. It directs the TOP to issue directives and as such the TOP may provide special requirements for dispersed power producing generation resources for its unique capabilities. *Note that while this standard is adopted by the NERC BOT, this standard was included in the proposed remand by FERC and is subject to revision as part of Project 2014-03—Revisions to TOP and IRO Standards. The SDT recommends that Project 2014-3 provide direction for a dispersed power producing generation resource to be only reported at the aggregate facility level. If TOP-001-1a R7 is reintroduced, then the recommendation provided above should be included in their efforts.*

5.51.34.11.3 TOP-002-2.1b — Normal Operations Planning²⁶

This TOP standard has five requirements applied to GOPs. Several modifications are recommended below, and the SDT recommends that the most effective and efficient way to accomplish this is through modification of the Applicability ~~section~~ Section of this standard.

5.51.3.14.11.3.1 Requirement R3

The purpose of requirement R3 as it relates to GOPs is to ensure a GOP's current day, next-day and seasonal operations are coordinated with its Host-host BAs and TSP. This requirement relates to planned operations at a generator and does not include unplanned operations such as forced or emergency operations. The SDT recommends that this requirement be applied at the aggregate ~~facility~~ Facility level for dispersed power producing resources. For example, forecasting available MW at the aggregated ~~facility~~ Facility level is currently one method used. The SDT does not see any reliability gap in that would prompt this team to apply R3 to any point less than the dispersed power resource aggregated ~~facility~~ Facility level.

*The SDT has not found or been made aware of a reliability gap that would prompt this team to apply R3 to any point less than the dispersed power resource aggregated ~~facility~~ Facility level and **recommends such modification to the applicability of this requirement.***

5.51.3.24.11.3.2 Requirement R13

The purpose of requirement R13 as it relates to GOPs is to ensure Real Power and Reactive Power capabilities are verified as requested by the BA and TOP. The SDT believes a modification to the applicability of this requirement is necessary for dispersed power producing resources. The SDT is

²⁵ Note that TOP-001-2 was adopted by the Board and remanded by FERC. TOP-001-2 is currently under revision as part of Project 2014-03 – Revisions to TOP and IRO Standards, and was posted for additional ballot period that is scheduled to close January 7, 2015 as TOP-001-3.

²⁶ The GOP applicability is removed in TOP-002-3, which was adopted by the NERC BOT Board. However, TOP-002-3 was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3 – Revisions to TOP and IRO Standards.

recommending that this requirement be applied at the aggregate ~~facility~~Facility level for dispersed power producing resources for the following reasons:

- Due to the nature, amount of individual generators at a dispersed power producing -resource, internal Real Power losses, and natural inductance and capacitance of dispersed power resource system connected in series, verification of real and reactive capabilities should be conducted at the dispersed power producing resource aggregate ~~facility~~Facility level. Performing verification in this manner will provide an actual net real and reactive capability, which would be seen by both the BA and TOP. In addition, performing verification in this manner is also consistent with operating agreements such as an interconnection agreement, which the dispersed power resource has with the TOP and BA.
- MOD-025-2 also provides that verification for any generator <20MVA may be completed on an individual unit basis or as a “group.” Reporting capability at the aggregated ~~facility~~Facility level is consistent with the MOD-025-2 provision for group verification.

The SDT recommends a modification to the applicability of this requirement at the aggregated ~~facility~~Facility level for dispersed power producing resources.

5.51.3.34.11.3.3 Requirement R14

The purpose of requirement R14 as it relates to GOPs is to ensure BAs and TOPs are notified of changes in real output capabilities without any intentional time delay. It should be noted that the purpose of this requirement is to address unplanned changes in real output capabilities. It is assumed the required notification and coordination from the GOP to the BA and TOP would be done in real-time and through verbal communication media. The concern here is how to apply this to dispersed power producing resources. The SDT recommends that the GOP notify at the aggregate ~~facility~~Facility level to the TOP any unplanned changes in real output capabilities above 20 MVA. The justification is based on the following:

- This is consistent with Inclusion I2 of the revised BES definition which includes generating units greater than 20MVA.
- TOP-002-2.1b R14 requires real-time notification of changes in Real Power capabilities, planned and unplanned. Setting the threshold at 20 MVA would address routine maintenance on a small portion of the ~~facility~~Facility (e.g. 2% of the generators are out of service on any given day) and individual generating units going into a failure. Otherwise, coordinating each individual generating unit outage would burden the TOP without providing an increase in reliability to the interconnected BPS.

Dispersed generation resources changes in real output capabilities should be reported as X MW out of Y MW are available. *The SDT recommends that a modification to the applicability of this requirement is necessary for dispersed power producing resources for unplanned outages greater than 20 MVA.*

5.51.3.44.11.3.4 Requirement R15

The purpose of requirement R15 as it relates to GOPs is to ensure BAs and TOPs are provided a forecast (e.g., seven day) of expected Real Power. The SDT believes this requirement as requested by the BA or TOP is being applied at the aggregate ~~facility~~Facility level for dispersed power producing resources.

Based on the SDT's experience, expected Real Power forecasts (e.g. 5 or 7 forecast) for a dispersed power producing resource has been traditionally coordinated with the BA and TOP at the aggregate ~~facility~~Facility level for dispersed power producing resources. *Therefore, the SDT recommends that R15 be applied at the aggregate ~~facility~~Facility level for dispersed power resources and as such, modification to the applicability of this requirement is necessary.*

5.51.3.54.11.3.5 Requirement R18

The purpose of requirement R18 as it relates to a GOP is to ensure uniform line identifiers are used when referring to transmission facilities of an interconnected network. The standard applies to transmission facilities of an interconnected network, which would not apply to any Elements within the dispersed generation ~~facility~~Facility. There is no need to differentiate applicability to dispersed generation resources from any other GOP resources. *Therefore, the applicability of this requirement does not need to be changed for dispersed generation resources.*

5.51.44.11.4 TOP-003-1— Planned Outage Coordination²⁷

This TOP Standard has three requirements applied to GOPs. Modification to one of these requirements is recommended.

5.51.4.14.11.4.1 Requirement R1

The purpose of requirement R1 as it relates to GOPs is to ensure TOPs are provided planned outage information on a daily basis for any scheduled generator outage >50MW for the next day. *Therefore, the applicability of this requirement does not need to be changed for dispersed generation resources.*

5.51.4.24.11.4.2 Requirement R2

The purpose of requirement R2 as it relates to GOPs is to ensure all voltage regulating equipment scheduled outages are planned and coordinated with affected BAs and TOPs. A modification to the applicability of this requirement is necessary for dispersed power producing resources. The SDT recommends that this requirement be applied at the aggregate ~~facility~~Facility level for dispersed power producing resources.

Based on the SDT's experience, scheduled outages of voltage regulating equipment at a dispersed power producing resource has been traditionally provided to the BA and TOP at the aggregate ~~facility~~Facility level for dispersed power producing resources. Outages of voltage regulating equipment at a dispersed power producing resource are coordinated typically as a reduction in Reactive Power capabilities, specifying whether it is inductive, capacitive or both. Additionally, automatic voltage regulators that do not necessarily provide Reactive Power, but direct the actions of equipment that do supply Reactive Power, are typically coordinated at the aggregate ~~facility~~Facility level as they usually are the master controller for all voltage regulating equipment at the ~~facility~~Facility. A key aspect of the SDT project is to maintain the status quo, if it is determined not to cause a reliability gap. *The SDT has not found or been made aware of a reliability gap, which would prompt this team to apply R2 to any point less than the dispersed power ~~producing r-~~resource aggregated ~~facility~~Facility level and as ~~in-~~such, ~~feels-~~determined a*

²⁷ ~~Note that TOP-003-2, which is adopted by the NERC BOT, was included in the proposed remand by FERC and is subject to revision as part of Project 2014-3—Revisions to TOP and IRO Standards.~~

modification to the applicability of this requirement is necessary for dispersed power producing resources.

5.51.4.34.11.4.3 Requirement R3

The purpose of requirement R3 as it relates to GOPs is to ensure scheduled outages of telemetering and control equipment and associated communication channels are planned and coordinated among BAs and TOPs. Based on the SDT technical expertise, scheduled outages of telemetering and control equipment and associated communication channels at a dispersed power producing resource have been traditionally provided to the BA and TOP at the aggregate ~~facility~~Facility level for dispersed power producing resources. In addition, only scheduled outages of telemetering and control equipment and associated communication channels that can affect the BA and TOP are coordinated with the BA and TOP.

Therefore, the applicability of this requirement does not need to be changed for dispersed ~~generation~~ power producing resources.

5.51.54.11.5 TOP-006 — Monitoring System Conditions

The purpose of this standard as it relates to GOPs is to ensure BAs and TOPs know the status of all generation resources available for use as informed by the GOP. It should also be noted that the purpose of this standard is to ensure critical reliability parameters are monitored in real-time. It then can be extrapolated that the requirement, “GOP shall inform...,” is done by sending dispersed power producing resource telemetry in real-time and through a digital communication medium, such as an ICCP link or RTU. The SDT feels a modification to the applicability of this requirement is necessary for dispersed power producing resources. The SDT is recommending that this requirement be applied at the aggregate ~~facility~~Facility level for dispersed power producing resources for the following reasons:

- This is consistent with Inclusion I2 of the revised BES definition, which includes generating units greater than 20MVA. If removing <20MVA would cause a burden to the BPS, then the threshold for inclusion in the BES would have been less than 20MVA.
- Routine maintenance is frequently completed on a small portion of the entire ~~facility~~Facility (e.g. 2% of the generators are out of service on any given day) such as to not have a significant impact to the output capability of the ~~facility~~Facility. Additionally, it is not uncommon to have individual generating units at a dispersed power producing resource to go into a failure mode due to internal factors of the equipment, such as hydraulic fluid pressure tolerances, gearbox bearing thermal tolerances, etc. As such, coordinating each individual generating unit outage would burden the TOP without providing an increase in reliability to the interconnected BPS.
- As this standard requires real-time monitoring, this is most likely completed through a digital medium such as an ICCP link or RTU. The data that a dispersed power resource provides to the BA and TOP in real-time should include the aggregate active power output of the ~~facility~~Facility, among other telemetry points. These data specifications are usually outlined in interconnection agreements among the parties.

Based on the SDT technical expertise, BAs and TOPs are informed by the GOP of all generation resources available at the dispersed power producing resource at the aggregate ~~facility~~Facility level. Traditionally the dispersed power producing resources are providing the BA and TOP, at minimum, the following telemetry points in real-time: aggregate Real Power, aggregate Reactive Power and main high-side circuit breaker status. A key aspect of the SDT project is to maintain the status quo, if it is

determined not to cause a reliability gap. *The SDT has not found or been made aware of a reliability gap, which would prompt this team to apply these requirement to any point less than where the dispersed power producing resource aggregates and as in such, recommends a modification to the applicability of this requirement is necessary for dispersed power producing resources.*

5.524.12 TPL

At the time of this paper, these standards do not affect GOs or GOPs directly. Input from GO or GOP entities is provided to transmission planning entities through the MOD standards. *Therefore, the applicability of the TPL standards does not need to be changed for dispersed generation-power producing resources. ~~The SDT will continue to coordinate with other SDTs that consider changes that encompass new standards that may implicate potential power producing resource applicability changes.~~*

5.534.13 VAR

The VAR standards exist to ensure that voltage levels, reactive flows, and reactive resources are monitored, controlled, and maintained. There are two VAR Standards that apply to GOs and/or GOPs. The voltage and/or reactive schedule provided by TOPs is specified to be at the point of interconnection or the point specified in the interconnection agreement.

5.53.14.13.1 VAR-001 — Voltage and Reactive Control (WECC Regional Variance)

The purpose of this standard as it relates to GOPs in WECC is to ensure a generator voltage schedule is issued that is appropriate for the type of generator(s) at a specific facilityFacility. Additionally, it requires GOPs to have a methodology for how the voltage schedule is met taking into account the type of equipment used to maintain the voltage schedule. Based on the SDT technical expertise, voltage control and voltage schedule adherence for dispersed power producing resource occurs at the aggregate facilityFacility level. There is no need to differentiate dispersed generation resources from any other GOP resources. *Therefore, the applicability of VAR-001 does not need to be changed for dispersed generation resources.*

5.53.24.13.2 VAR-002-2b — Generator Operation for Maintaining Network Voltage Schedules

VAR-002-3 — Generator Operation for Maintaining Network Voltage Schedules

The purpose of these standards as they relate to GOs and GOPs is to ensure generators operate in automatic voltage control mode as required by the TOP voltage or reactive power schedule provided to ensure voltage levels, reactive flows, and reactive resources are maintained within applicable Facility Ratings to protect equipment and reliability of the Interconnection. Based on the SDT technical expertise, voltage control and voltage schedule adherence for dispersed power producing resource occurs at the aggregate facilityFacility level and such guidance should be provided.

In addition, the voltage-controlling equipment and the methodology to ensure the facilityFacility has an automatic and dynamic response to ensure the TOP's instructions are maintained can be very different for each facilityFacility. It is implied in VAR-001-3 that each TOP should understand capabilities of the generation facilityFacility and the requirements of the transmission system to ensure a mutually agreeable solution/schedule is used.

5.53.34.13.3 VAR-002-2b — Requirement R3.1

VAR-002-3 — Requirement R4

The purpose of these requirements is to ensure that a GOP notifies the TOP, within 30 minutes, any status and capability changes of any generator Reactive Power resource, including automatic voltage regulator, power system stabilizer or alternative voltage controlling device. Based on the experience of the SDT, status and capability changes is traditionally coordinated at the aggregate ~~facility~~Facility level point of interconnection. *Therefore, the SDT has recommended changes to the standard to clarify the applicability of VAR-002-2b R3.1 and VAR-002-3 R4 for dispersed power producing resources. [These changes were successfully balloted in VAR-002-4 on November 6, 2014, and approved by the Board on November 13, 2014.](#)*

5.53.54.13.4 VAR-002-2b — Requirement R4

VAR-002-3 — Requirement R5

The purpose of these requirements is to ensure that Transmission Operators and Transmission Planners have appropriate information and provide guidance to the GOP in regards to Generator Operator's transformers to ensure voltage levels, reactive flows, and reactive resources are maintained within applicable Facility Ratings to protect equipment and reliability of the Interconnection. Based on the experience of the SDT dispersed power producing resources individual generator transformers have traditionally been excluded from the requirements of VAR-002-2b R4 and VAR-002-3 R5, as they are not used to improve voltage performance on the Interconnection. As such, applicability should be limited to transformers with at least one winding at a voltage of 100kV or above. *Therefore, the SDT has recommended changes to the standard to clarify the applicability of VAR-002-2b R4 and VAR-002-3 R5 for dispersed generation resources. [These changes were successfully balloted in VAR-002-4 on November 6, 2014, and approved by the Board on November 13, 2014.](#)*

5.544.14 CIP

5.54.14.14.1 CIP v5[SC4]

[The CIP standards are still under revision in Project 2014-02. The DGR SDT and the CIP SDT continue to coordinate revisions to the CIP standards, and will update this section to reflect the outcome of that effort at the appropriate time.](#)

The CIP standards ensure physical and cyber security for BES Cyber Assets and BES Cyber Systems critical to the reliability and security of the BES. CIP-002 identifies critical assets or systems of a ~~facility~~Facility, while CIP-003 to CIP-011 depend on the outcome of the CIP-002 assessment to determine applicability.

~~The DGR SDT and the CIP SDT continued coordination of possible revisions to the CIP standards.~~

During the Project 2014-02 CIP Version 5 Revisions SDT first comment period, it received comments to modify CIP-003-6 in the ~~applicability section~~Applicability Section. The CIP SDT made drastic modifications to the second posting of CIP-003-6 to take into accounts all of the comments received, which was posted for an additional 45-day comment and ballot period on September 3, 2014.

At its September meeting, the DGR SDT had a focused discussion with the CIP SDT surrounding the technical nature of the dispersed power producing resources and how it relates to the CIP standards. The

coordinating effort resulted in discussions of the revised CIP-003-6. As for that posted revised standard, the CIP SDT took the approach of including an Attachment 1 for Responsible Entities. The Attachment 1 requires elements to be developed in Responsible Entities' cyber security plan(s) for assets containing low impact BES Cyber Systems. The elements in CIP-003-6, Attachment 1 allow flexibility for the controls to be established for each of the main four elements below. The CIP SDT encourages observers of the DGR SDT to review the Attachment 1 in detail. Here is some information regarding the attachment.

Element 1: Security Awareness

The intent of the security awareness program is for entities to reinforce good cyber security practices with their personnel at least once every 15 calendar months. It is up to the entity as to the topics and how it schedules these topics. The Responsible Entity should be able to produce the awareness material that was delivered and the delivery method(s) (posters, emails, topics at staff meetings, etc.) that were used. The SDT does not intend that the Responsible Entity must maintain lists of recipients and track the reception of the awareness material by personnel.

Element 2: Physical Security

The Responsible Entity has flexibility in the controls used to restrict physical access to low impact BES Cyber Systems at a BES asset using one or a combination of access controls, monitoring controls, or other operational, procedural, or technical physical security controls. Entities may utilize perimeter controls (e.g., fences with locked gates, guards, site access policies, etc.) and/or more granular areas of physical access control in areas where low impact BES Cyber Systems are located, such as control rooms or control houses. User authorization programs and lists of authorized users are not required.

Element 3: Electronic Access Controls

Where Low Impact External Routable Connectivity (LERC) or Dial-up Connectivity exists, the Responsible Entity must document and implement controls that include the LERC and Dial-up Connectivity to the BES asset such that the low impact BES Cyber Systems located at the BES asset are protected. Two glossary terms are included in order to help clarify and simplify the language in Attachment 1. The SDT's intent in creating these terms is to avoid confusion with the similar concepts and requirements (ESP, EAP, ERC, EACMS) needed for high and medium impact BES Cyber Systems by utilizing separate terms that apply only to assets containing low impact BES Cyber Systems.

Element 4: Cyber Security Incident Response

The entity should have one or more documented cyber security incident response plans that include each of the topics listed. For assets that do not have LERC, it is not the intent to increase their risk by increasing the level of connectivity in order to have real-time monitoring. The intent is if in the normal course of business suspicious activities are noted at an asset containing low impact BES Cyber Systems, there is a cyber security incident response plan that will guide the entity through responding to the incident and reporting the incident if it rises to the level of a Reportable Cyber Security Incident.

Therefore, the DGR SDT recommends that no changes be made to proposed CIP-003-6. CIP-002-5.1 needs to remain as is because entities must go through the process for identifying and categorizing its BES Cyber Systems and their associated BES Cyber Assets. The controls put in place for proposed CIP-

003-6, Attachment 1, are not burdensome, are realistic and achievable, and does not express undue compliance burden. In conclusion, the DGR SDT states that the reliability objective of these controls are adequate and the applicability of CIP-003-6 should not be modified.

The SDT states that the CIP Version 5 Revisions SDT should consider developing guidance documentation around the following areas:

- Low Impact BES Cyber Systems that must comply with a limited number of requirements, all located in CIP-003-5. The only technical requirement is R2, which will be modified during the current drafting activity to add clarity to the requirement. The SDT notes that the CIP Version 5 Revisions SDT should consider developing guidance around how this requirement relates to dispersed generation.
- Any programmable logic device that has the capability to shut down the plant within 15 minutes; and
- Remote access from third party entities into the SCADA systems that control the aggregate capacity of a ~~facility~~Facility should be assessed to determine if there is a need of any additional cyber security policies.

The SDT intends to recommend guidance for those companies that only operate their turbines from one central location. Individual Elements lumped into a BES Cyber System should be addressed. When operations are on a turbine-by-turbine basis, the SDT believes there should not be rigid controls in place. The inability to “swim upstream” should be addressed as well. Further, the guidance intends to address when manufacturers operate or have control of the SCADA environment to conduct troubleshooting and other tasks, and ensure that proper security is in place.

NERC staff has committed to facilitate communication between the SDT and the CIP Version 5 Revisions SDT as appropriate to ensure alignment and to develop language for guidance, coordinated between the two SDTs. *Therefore, the applicability of CIP standards does not need to be changed for dispersed generation resources.*

Appendix A: List of Standards

Appendix B: List of Standards Recommended for Further Review

Standard Number	Status	Further Review by SDT	Regional
BAL-001-1	Subject to Enforcement	No	No
BAL-001-TRE-1	Subject to Enforcement	Yes	Yes
BAL-002-1	Subject to Enforcement	No	No
BAL-002-WECC-2	Subject to Enforcement	No	Yes
BAL-003-0.1b	Subject to Enforcement	No	No
BAL-004-0	Subject to Enforcement	No	No
BAL-004-WECC-02	Subject to Enforcement	No	Yes
BAL-005-0.2b	Subject to Enforcement	No	No
BAL-006-2	Subject to Enforcement	No	No
BAL-502-RFC-02	Subject to Enforcement	No	Yes
CIP-002-3	Subject to Enforcement	No	No
CIP-003-3	Subject to Enforcement	No	No
CIP-004-3a	Subject to Enforcement	No	No
CIP-005-3a	Subject to Enforcement	No	No
CIP-006-3c	Subject to Enforcement	No	No
CIP-007-3a	Subject to Enforcement	No	No
CIP-008-3	Subject to Enforcement	No	No
CIP-009-3	Subject to Enforcement	No	No
COM-001-1.1	Subject to Enforcement	No	No
COM-002-2	Subject to Enforcement	No	No
EOP-001-2.1b	Subject to Enforcement	No	No
EOP-002-3.1	Subject to Enforcement	No	No
EOP-003-2	Subject to Enforcement	No	No
EOP-004-2	Subject to Enforcement	Yes	No
EOP-005-2	Subject to Enforcement	No	No
EOP-006-2	Subject to Enforcement	No	No
EOP-008-1	Subject to Enforcement	No	No
FAC-001-1	Subject to Enforcement	No	No
FAC-002-1	Subject to Enforcement	No	No
FAC-003-3	Subject to Enforcement	No	No
FAC-008-3	Subject to Enforcement	Yes	No
FAC-010-2.1	Subject to Enforcement	No	No
FAC-011-2	Subject to Enforcement	No	No
FAC-013-2	Subject to Enforcement	No	No
FAC-014-2	Subject to Enforcement	No	No
FAC-501-WECC-1	Subject to Enforcement	No	Yes
INT-004-3	Subject to Enforcement	No	No
INT-006-4	Subject to Enforcement	No	No
INT-009-2	Subject to Enforcement	No	No
INT-010-2	Subject to Enforcement	No	No
INT-011-1	Subject to Enforcement	No	No
IRO-001-1.1	Subject to Enforcement	No	No
IRO-002-2	Subject to Enforcement	No	No
IRO-003-2	Subject to Enforcement	No	No
IRO-004-2	Subject to Enforcement	No	No
IRO-005-3.1a	Subject to Enforcement	No	No
IRO-006-5	Subject to Enforcement	No	No
IRO-006-EAST-1	Subject to Enforcement	No	Yes
IRO-006-TRE-1	Subject to Enforcement	No	Yes
IRO-006-WECC-2	Subject to Enforcement	No	Yes
IRO-008-1	Subject to Enforcement	No	No
IRO-009-1	Subject to Enforcement	No	No
IRO-010-1a	Subject to Enforcement	No	No
IRO-014-1	Subject to Enforcement	No	No
IRO-015-1	Subject to Enforcement	No	No
IRO-016-1	Subject to Enforcement	No	No
MOD-001-1a	Subject to Enforcement	No	No
MOD-004-1	Subject to Enforcement	No	No
MOD-008-1	Subject to Enforcement	No	No

Note: Make sure "Appendix A Source" is correct. This table will auto-populate.

Zeroes indicate missing value on "Appendix A Source".

MOD-010-0	Subject to Enforcement	No	No
MOD-012-0	Subject to Enforcement	No	No
MOD-016-1.1	Subject to Enforcement	No	No
MOD-017-0.1	Subject to Enforcement	No	No
MOD-018-0	Subject to Enforcement	No	No
MOD-019-0.1	Subject to Enforcement	No	No
MOD-020-0	Subject to Enforcement	No	No
MOD-021-1	Subject to Enforcement	No	No
MOD-026-1	Subject to Enforcement	Yes	No
MOD-027-1	Subject to Enforcement	Yes	No
MOD-028-2	Subject to Enforcement	No	No
MOD-029-1a	Subject to Enforcement	No	No
MOD-030-2	Subject to Enforcement	No	No
NUC-001-2.1	Subject to Enforcement	No	No
PER-001-0.2	Subject to Enforcement	No	No
PER-003-1	Subject to Enforcement	No	No
PER-004-2	Subject to Enforcement	No	No
PER-005-1	Subject to Enforcement	No	No
PRC-001-1.1	Subject to Enforcement	Yes	No
PRC-002-NPCC-01	Subject to Enforcement	No	Yes
PRC-004-2.1a	Subject to Enforcement	Yes	No
PRC-004-WECC-1	Subject to Enforcement	Yes	Yes
PRC-005-1.1b	Subject to Enforcement	Yes	No
PRC-006-1	Subject to Enforcement	No	No
PRC-006-SERC-01	Subject to Enforcement	Yes	Yes
PRC-008-0	Subject to Enforcement	No	No
PRC-010-0	Subject to Enforcement	No	No
PRC-011-0	Subject to Enforcement	No	No
PRC-015-0	Subject to Enforcement	No	No
PRC-016-0.1	Subject to Enforcement	No	No
PRC-017-0	Subject to Enforcement	No	No
PRC-018-1	Subject to Enforcement	No	No
PRC-021-1	Subject to Enforcement	No	No
PRC-022-1	Subject to Enforcement	No	No
PRC-023-3	Subject to Enforcement	No	No
PRC-025-1	Subject to Enforcement	Yes	No
TOP-001-1a	Subject to Enforcement	Yes	No
TOP-002-2.1b	Subject to Enforcement	Yes	No
TOP-003-1	Subject to Enforcement	Yes	No
TOP-004-2	Subject to Enforcement	No	No
TOP-005-2a	Subject to Enforcement	No	No
TOP-006-2	Subject to Enforcement	Yes	No
TOP-007-0	Subject to Enforcement	No	No
TOP-007-WECC-1a	Subject to Enforcement	No	Yes
TOP-008-1	Subject to Enforcement	No	No
TPL-001-0.1	Subject to Enforcement	No	No
TPL-002-0b	Subject to Enforcement	No	No
TPL-003-0b	Subject to Enforcement	No	No
TPL-004-0a	Subject to Enforcement	No	No
VAR-001-4	Subject to Enforcement	No	No
VAR-002-3	Subject to Enforcement	Yes	No
VAR-002-WECC-1	Subject to Enforcement	No	Yes
VAR-501-WECC-1	Subject to Enforcement	No	Yes
BAL-003-1	Subject to Future Enforcement	No	No
CIP-002-5.1	Subject to Future Enforcement	No	No
CIP-003-5	Subject to Future Enforcement	No	No
CIP-004-5.1	Subject to Future Enforcement	No	No
CIP-005-5	Subject to Future Enforcement	No	No
CIP-006-5	Subject to Future Enforcement	No	No
CIP-007-5	Subject to Future Enforcement	No	No

CIP-008-5	Subject to Future Enforcement	No	No
CIP-009-5	Subject to Future Enforcement	No	No
CIP-010-1	Subject to Future Enforcement	No	No
CIP-011-1	Subject to Future Enforcement	No	No
CIP-014-1	Subject to Future Enforcement	No	No
EOP-010-1	Subject to Future Enforcement	No	No
FAC-001-2	Subject to Future Enforcement	No	No
FAC-002-2	Subject to Future Enforcement	No	No
MOD-025-2	Subject to Future Enforcement	Yes	No
MOD-032-1	Subject to Future Enforcement	Yes	No
MOD-033-1	Subject to Future Enforcement	No	No
NUC-001-3	Subject to Future Enforcement	No	No
PER-005-2	Subject to Future Enforcement	No	No
PRC-005-2	Subject to Future Enforcement	Yes	No
PRC-006-NPCC-1	Subject to Future Enforcement	Yes	Yes
PRC-019-1	Subject to Future Enforcement	Yes	No
PRC-024-1	Subject to Future Enforcement	Yes	No
TPL-001-4	Subject to Future Enforcement	No	No
BAL-001-2	Pending Regulatory Approval	No	No
BAL-002-1a	Pending Regulatory Approval	No	No
COM-001-2	Pending Regulatory Approval	No	No
COM-002-4	Pending Regulatory Approval	No	No
MOD-001-2	Pending Regulatory Approval	No	No
MOD-011-0	Pending Regulatory Approval	No	No
MOD-013-1	Pending Regulatory Approval	No	No
MOD-014-0	Pending Regulatory Approval	No	No
MOD-015-0	Pending Regulatory Approval	No	No
MOD-031-1	Pending Regulatory Approval	No	No
PRC-002-1	Pending Regulatory Approval	No	No
PRC-003-1	Pending Regulatory Approval	No	No
PRC-004-3	Pending Regulatory Approval	Yes	No
PRC-005-3	Pending Regulatory Approval	Yes	No
PRC-012-0	Pending Regulatory Approval	No	No
PRC-013-0	Pending Regulatory Approval	No	No
PRC-014-0	Pending Regulatory Approval	No	No
PRC-020-1	Pending Regulatory Approval	No	No
TOP-006-3	Pending Regulatory Approval	Yes	No
TPL-001-3	Pending Regulatory Approval	No	No
TPL-002-2b	Pending Regulatory Approval	No	No
TPL-003-2a	Pending Regulatory Approval	No	No
TPL-004-2	Pending Regulatory Approval	No	No
TPL-005-0	Pending Regulatory Approval	No	No
CIP-002-3b	Pending Regulatory Filing	No	No
CIP-003-3a	Pending Regulatory Filing	No	No
CIP-007-3b	Pending Regulatory Filing	No	No
COM-002-2a	Pending Regulatory Filing	No	No
IRO-001-4	Pending Regulatory Filing	No	No
IRO-002-4	Pending Regulatory Filing	No	No
IRO-008-2	Pending Regulatory Filing	No	No
IRO-010-2	Pending Regulatory Filing	No	No
IRO-014-3	Pending Regulatory Filing	No	No
IRO-017-1	Pending Regulatory Filing	0	No
TOP-002-4	Pending Regulatory Filing	Yes	No
TOP-003-3	Pending Regulatory Filing	Yes	No
IRO-001-3	*See Project 2014-03	Yes	No
IRO-002-3	*See Project 2014-03	No	No
IRO-005-4	*See Project 2014-03	Yes	No
IRO-014-2	*See Project 2014-03	No	No
PRC-001-2	*See Project 2014-03	Yes	No
TOP-001-2	*See Project 2014-03	Yes	No

Priority	Standard Number	Area To Change	Target Applicability
High	PRC-004-2.1a	Applicability Section	Misoperations affecting >75MVA
High	PRC-004-3	Applicability Section	Misoperations affecting >75MVA
High	PRC-005-1.1b	Guidance	Point where aggregates to >75MVA
High	PRC-005-2	Applicability Section	Point where aggregates to >75MVA
High	PRC-005-3	Applicability Section	Point where aggregates to >75MVA
High	VAR-002-3	Applicability Section & Footnote	Aggregate Facility Level for Voltage Control; Transmission voltage GSUs
Medium	EOP-004-2	No Action	NA
Medium	FAC-008-3	Guidance	Individual BES Resources /Elements to Include Aggregating Equipment
Medium	IRO-017-1	TBD	TBD
Medium	MOD-025-2	No Action	NA
Medium	MOD-026-1	No Action	NA
Medium	MOD-027-1	No Action	NA
Medium	MOD-032-1	No Action	NA
Medium	PRC-001-1.1	Applicability Section	Aggregate Facility Level
Medium	PRC-019-1	Applicability Section	Individual BES Resources/Elements
Medium	PRC-024-1	By Requirement	Individual BES Resources /Elements to Include Aggregating Equipment
Medium	PRC-025-1	Guidance	Individual BES Resources /Elements to Include Aggregating Equipment
Medium	TOP-001-1a	No Action	NA
Medium	TOP-002-2.1b	Applicability Section	Aggregate Facility Level
Medium	TOP-002-4	TBD	TBD
Medium	TOP-003-1	By Requirement	Aggregate Facility Level
Medium	TOP-003-3	TBD	TBD
Medium	TOP-006-2	No Action	NA
Medium	TOP-006-3	TBD	TBD
Low	BAL-001-TRE-1	Applicability Section	Aggregate Facility Level
Low	PRC-004-WECC-1	Applicability Section	Point where aggregates to >75MVA
Low	PRC-006-NPCC-1	By Requirement	Individual BES Resources/Elements
Low	PRC-006-SERC-01	By Requirement	Individual BES Resources/Elements
0	0	0	0
0	0	0	0
0	0	w cells. Ensure rest aligns with the pap	0
0	0	0	0
0	0	0	0
0	0	0	0

Note: Make sure "Appendix B Source" is correct. This table will auto-populate.

Zeros indicate missing value on "Appendix B Source".