

Draft White Paper

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

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

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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 2014,² 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 (relevant versions) are:

- PRC-004;⁴
- PRC-005;⁵ and
- VAR-002.

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 *See Glossary of Terms Used in NERC Reliability Standards (or “Glossary”), available at http://www.nerc.com/pa/Stand/Glossary%20of%20Terms/Glossary_of_Terms.pdf, 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 effective~~ 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.

This White Paper includes: (1) a 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) a determination of the priority to address standards, supported by corresponding technical justification.

The SDT's intent is 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 Definition Reference Document*,⁹ 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).

⁹ *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.

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 2010-17,¹⁰ 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.*

The *BES Definition Reference Document*¹² includes a description of what constitutes a 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.

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.

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 that 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, they 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 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.

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.

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).

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.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 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 White Paper, which will continue to be updated throughout the SDT efforts. The second phase, currently

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>

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 regarding 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 (status types listed below):
 - Subject to Enforcement
 - Subject to Future Enforcement
 - Filed and Pending Regulatory Approval
 - Pending Regulatory Filing
 - Designated for Retirement (two 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.

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, ~~and~~ 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 to require 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.
- 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 Balancing Authority 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 Balancing Authority Area so that balancing of resources and demand can be achieved. Ensuring the Facility as a whole is within a Balancing Authority 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 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 GOP's 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 does 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 their 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 the technical guidance provided below.*

Guidelines and Technical Basis

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.

The use of the term “main step-up transformer” in Requirements R1 and R2 refers to the final Generator Step Up (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:

1. Referencing the NERC Glossary definition of Facility Ratings identifies that the voltage, current, frequency, and real or reactive power flow through a facility must not violate the equipment rating of any equipment of the facility (that 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.
2. 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.” For dispersed power producing facilities, that 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.

Using one of the two options provided below, there is no need for different compliance obligations for dispersed power producing resources.

Option 1: The GO has the ability to establish the generator’s rating, in line with BES reference I4 drawing interpretation (combined solar panel and inverter as the generator) and provide operational info (commissioning test results) to rate the generator.

Or.

Option 2: The GO can provide the individual nameplate rating for all components, up to and including the inverter, and utilize the drafted recommendations for aggregating these ratings to a comprehensive Facility Rating as described in the technical guidelines.

~~To identify the facility rating of a dispersed power producing resource utilizing Option 2 shown above, the analysis of the entire suite of facility components 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 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:~~

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- ~~2. 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.” For dispersed power producing facilities, that 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 facilities, a GO or GOP should ~~have~~provide ratings for array or panel, dc cables (positive and negative), combiner boxes, and inverters, as well as associated breakers, instrument transformers (CVTs, PTs), disconnect switches, and relays, etc. This is shown in Figure A.

If there are multiple sample units comprised of a multiple of identical components with identical ratings, then only one sample unit must be provided for that piece of equipment when calculating the facility rating value. For example, if a facility is comprised of 50 identical inverter units rated at 2 MW that have identical combiner box, module string, and module compositions/orientations, then the Facility rating would be $50 \times 2 \text{ MW} = 100 \text{ MW}$.

In order to identify the most limiting component of the facility, a complete analysis of every component in a sample unit must be conducted. Under the assumption that the GO owns the main step-up transformer, this will include analysis from the generator (solar module or wind turbine generator (WTG)) up through the high side terminals of the main step-up transformer. In an effort to simplify this analysis, grouping 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).

Figure A Walk-through: For each sample unit identified, it should be clarified that a thorough rating analysis of each sample unit component must be conducted at least once to identify any potential limiting component and determine the sample unit rating. Upon completion of this analysis and arrival at a rating value, future representations of the sample unit would then be able to utilize this calculated sample unit rating as opposed to reiterating the individual component analysis.

Sample Unit #1: This sample unit is comprised of the 250 W solar modules, combiner box “A,” conductors, and other electrical equipment from the solar module to, but not including, the inverter. This sample unit encompasses three strings. In order to be referenced as a sample unit in future occurrences, this exact configuration must be met (three strings, same type and number of modules, same conductor type and configuration, and same electrical components).

Sample Unit #2: This sample unit is limited to an individual string and its components (eight 250 W modules and conductors) up to the combiner box “B.” The middle string (without dotted line) associated with combiner box B is actually a second instance of the Sample Unit #2 and thus would not need a separate rating analysis and would instead be represented as a multiple of Sample Unit #2 in the overall rating analysis.

Sample Unit #3: This sample unit is also limited to a single string and its components up to combiner box B. While this string utilizes the same type of solar module (250 W) as Sample Unit #2, there are fewer modules in this string, which differentiates this string from Sample Unit #2 and thus requires this string to be represented separately.

Note that combiner box B is not included in either Sample Unit #2 or #3 and thus would need to be rated separately.

Sample Unit #4: This sample unit is limited to an individual string and its components (eight 300 W modules and conductors) up to the combiner box “C.” The upper string (without dotted line) associated with combiner box C is actually a third instance of the Sample Unit #2. The lower string (without dotted line) associated with combiner box C is actually a second instance of the sample unit #4. Note that combiner box C is not included in any sample unit and thus would need to be rated separately.

Sample Unit #5: This sample unit is similar to the sample unit #1 configuration but utilizes 300W modules instead of 250W modules thus would need a separate rating analysis.

Sample Unit #6: This sample unit represents all the components and sample units leading up to, and including, the inverter. The lower right-hand section of Figure A shows that the inverter that comprises these various sample units is one of four identical units that feed into a substation bus. Thus, since the rating of this inverter has been identified as 80 kW (from manufacturer) and all the components have previously been thoroughly analyzed, the other three identical units can be represented as other instances of sample unit #6.

Sample Unit #7: This sample unit represents an inverter and/or component configuration that is different from sample unit #6. This scenario, in which the inverter in this sample unit is identical to the inverter utilized in sample unit #6, but the underlying component configuration is different from in Sample Unit #6, necessitates representation of this sample unit separately from Sample Unit #6.

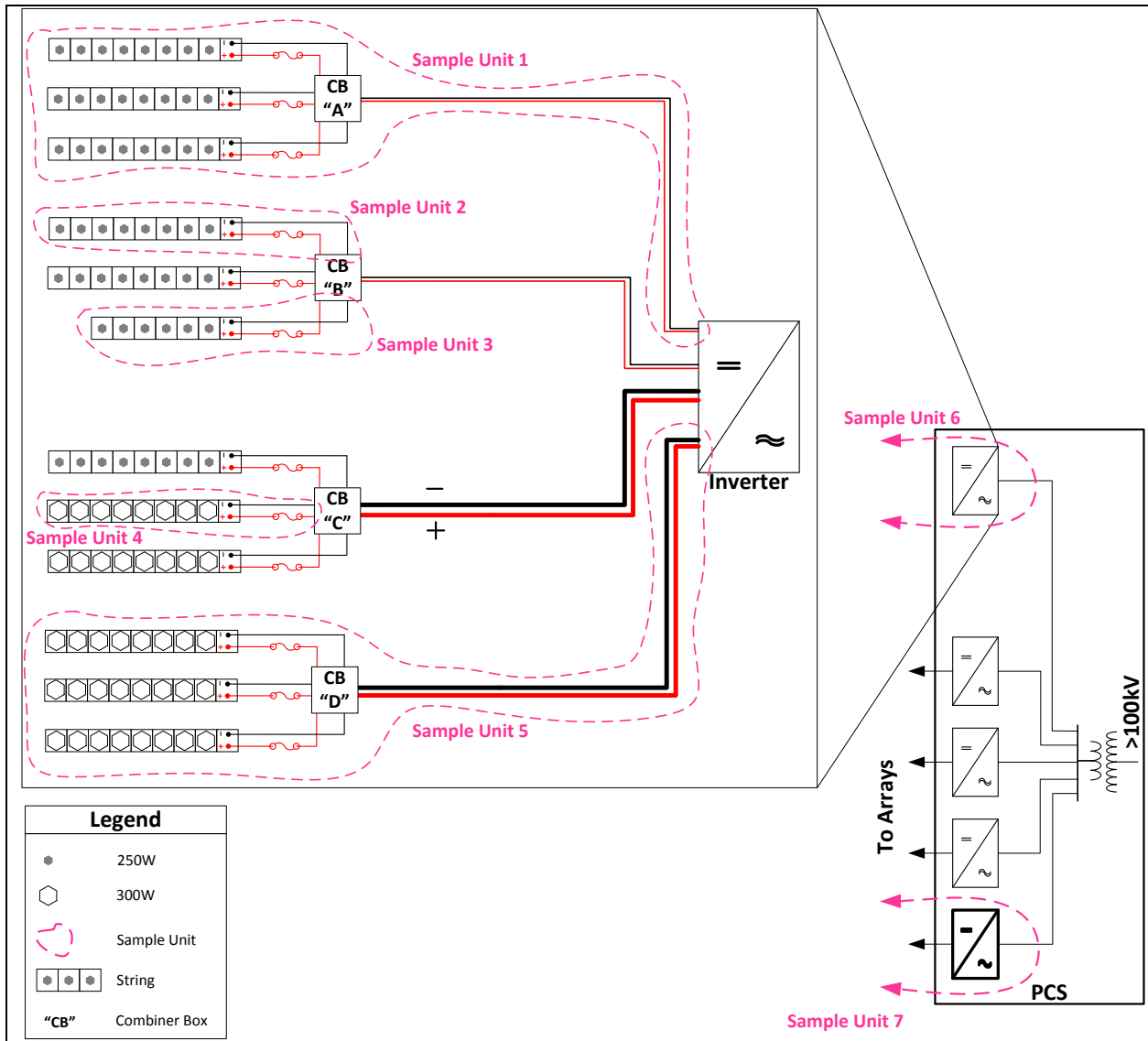


Figure A: Sample Unit Representation (Solar)

Once a complete analysis of the sample unit is conducted, this sample unit can then be referred to in future rating analyses without repeating the complete sample unit analysis. This scenario is illustrated in Table A below.

Table A:

Element	Unit Rating	#Units in system	Rating
Sample Unit #1 (Nine strings of eight 250-W modules each)	18 kW	1	18 kW
Sample Unit #2 (Three strings of eight 250-W modules)	6 kW	3	18 kW
Sample Unit #3 (Three strings of six 250-W modules)	4.5 kW	1	4.5 kW
Sample Unit #4 (Three strings of six 300-W modules)	5.4 kW	2	10.8 kW
Sample Unit #5 (Nine strings of eight 300-W modules each)	21.6 kW	1	21.6 kW
Sample Unit #6	80 kW	4	320 kW
Sample Unit #7	80 kW	1	80 kW
<u>Element/Unit</u>	<u>Unit Rating</u>	<u>#Units in system</u>	<u>Rating</u>
<u>Sample Unit #1 (Three strings of eight 250 W modules each)</u>	<u>6 kW</u>	<u>1</u>	<u>6 kW</u>
<u>Sample Unit #2 (One string of eight 250 W modules)</u>	<u>2 kW</u>	<u>3</u>	<u>6 kW</u>
<u>Sample Unit #3 (One string of six 250 W modules)</u>	<u>1.5 kW</u>	<u>1</u>	<u>1.5 kW</u>
<u>Sample Unit #4 (One string of eight 300 W modules)</u>	<u>2.4 kW</u>	<u>2</u>	<u>4.8 kW</u>
<u>Sample Unit #5 (Three strings of eight 300 W modules each)</u>	<u>7.2 kW</u>	<u>1</u>	<u>7.2 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>

As an example, for wind facilities, a GO or GOP should have ratings for the wind unit, transformer(s), associated breakers, instrument transformers (CVTs, PTs), disconnect switches, and relays, etc. as applicable. This is shown in Figure B.

Figure B Walk-through: For each sample unit identified, it should be clarified that a thorough rating analysis of each sample unit component and all other serial components through to the point of interconnection must be conducted once to identify any potential limiting component and determine the sample unit rating. Upon completion of this analysis and arrival at a rating value, future representations of the sample unit would then be able to utilize this calculated sample unit rating as opposed to reiterating the individual component analysis.

Sample Unit #1: This sample unit is comprised of the Manufacturer “A” wind turbines (WTG) rated at 2.0 MW, the associated step-up transformer, and conductors and other electrical equipment from the WTG to, but not including, the junction box. This sample unit encompasses a string of four WTGs. In order to be referenced as a sample unit in future occurrences, this exact configuration must be met (same type and number of WTGs, same step-up transformer, same conductor type and configuration, and same electrical components).

Sample Unit #2: This sample unit is comprised of the Manufacturer “A” wind turbines (WTG) rated at 2.0 MW, the associated step-up transformer, and conductors and other electrical equipment from the WTG to, but not including, the junction box. This sample unit encompasses a string of six WTGs. The different number of WTGs in this string versus those in the sample unit #1 necessitates a separate consideration from the sample unit #1.

Sample Unit #3: This sample unit is comprised of the Manufacturer “B” wind turbines (WTG) rated at 3.0 MW, the associated step-up transformer, and conductors and other electrical equipment from the WTG to, but not including, the junction box. This sample unit encompasses a string of four WTGs.

Sample Unit #4: This sample unit is comprised of the Manufacturer “B” wind turbines (WTG) rated at 3.0 MW, the associated step-up transformer, and conductors and other electrical equipment from the WTG to, but not including, the junction box. This sample unit encompasses a string of six WTGs. The different number of WTGs in this string versus in the sample unit #3 necessitates a separate consideration from the sample unit #3.

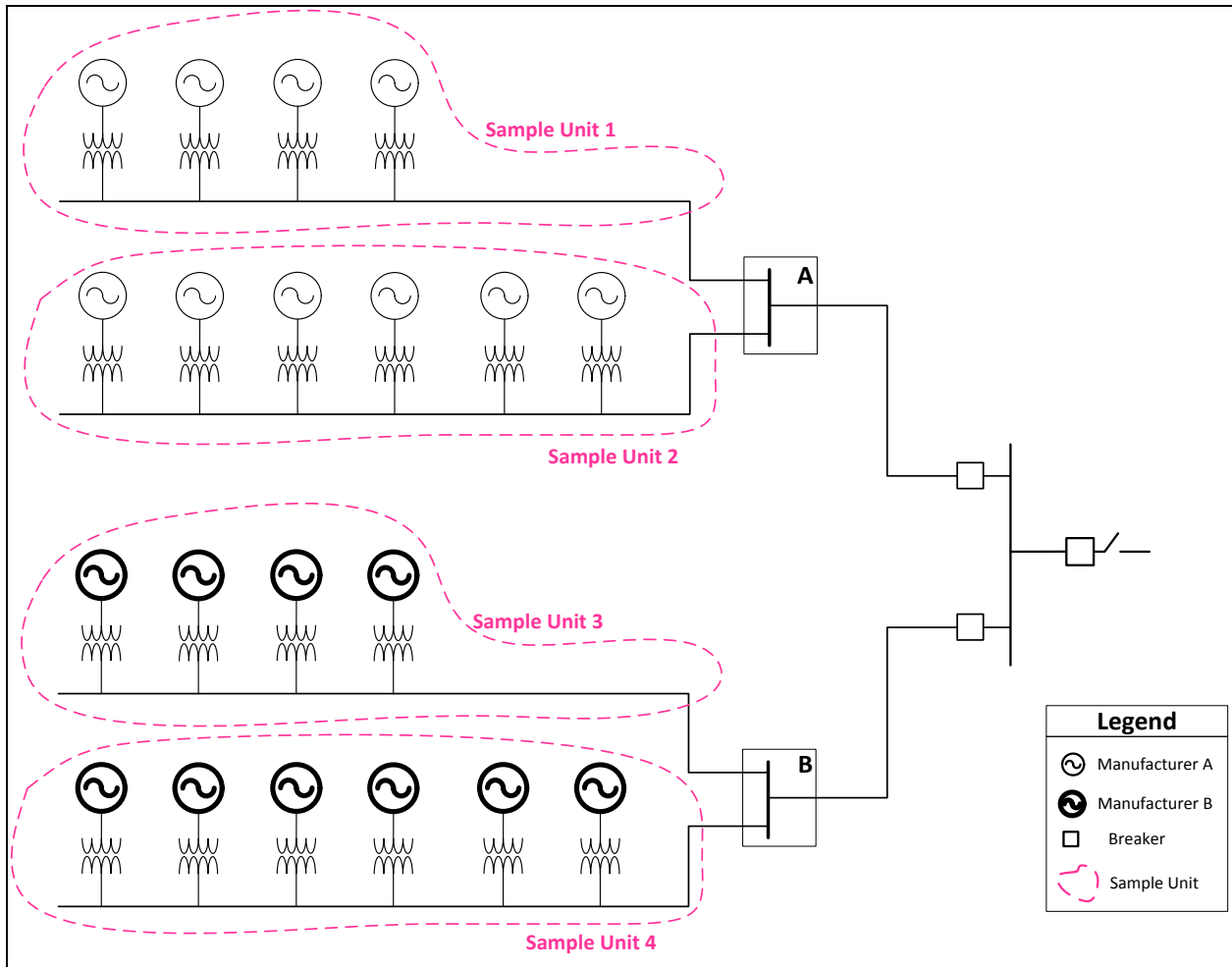


Figure B: Sample Unit Representation (Wind)

4.5 INT

The INT standards provide BAs the authority to monitor power interchange between Balancing Authority 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 does not need to be changed for dispersed power producing resources.*

4.6 IRO

The IRO standards provide RCs their authority. Three IRO standards apply directly to GO and/or GOP entities. Three standards 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 Authorities¹⁸

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 an RC directive, it is to inform the RC immediately.

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 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 Operations¹⁹

The purpose of this standard and its requirements as they relate to GOPs is to ensure that 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; 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.*

¹⁸ 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.

¹⁹ 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.

4.6.3 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 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 standards ensure 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.*

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-025-2.²⁰ *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.*

²⁰ MOD-024-1 and MOD-025-1 are Board-adopted but not subject to enforcement. They are commonly followed as good utility practice.

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 represents 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.).

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 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 does 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 TOPs and host BAs. Only failures of protective relays/equipment on equipment that aggregate to >75MVA have the potential to impact BPS reliability and may require notification~~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 feeders, 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 over frequency 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 its 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 requires maintenance and periodic reporting requirements to their ~~RRO~~Regional Entity. 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 does not need to be changed for dispersed power producing resources.*²¹

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 that meet 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

²¹ See NPCC CGS-005.

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 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 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 75 MVA 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, were approved by the Board on November 13, 2014, and were approved by FERC on May 29, 2015. 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

In some cases, the aggregated capability of the individual generating units may contribute to the reliability of the BPS; as such, there can be reliability benefit from ensuring that 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 that 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 of 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.

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 Board approved the SDT's recommended applicability changes to PRC-005-2 and PRC-005-3 on November 13, 2014, and FERC approved these changes on May 29, 2015. ~~The Board approved~~ The SDT's recommended applicability changes to PRC-005-4 ~~are pending Board approval~~ were approved by the Board on December 18, 2014, and are pending regulatory approval.*

4.10.8 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) and the individual generating units. If this standard were 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 if 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 the risk of tripping in this scenario. Facilities that solely regulate voltage at the individual unit 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 filed with FERC March 13, 2015 [and approved on May 29, 2015](#).*

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 protective relay settings applied on both the individual generating units and aggregating equipment (including any non-BES collection system equipment) are set respecting 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 filed with FERC March 13, 2015 and approved on May 29, 2015.*

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. If this standard were only to apply to aggregating equipment, the net impact to the BPS if a system disturbance were to occur may be a loss of significant generating capacity if each of the individual generating units trips for the event. The SDT has determined it is appropriate to require that Protection System settings be 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. Four TOP standards 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 an RC or TOP reliability directive, they are to inform the RC or TOP immediately. 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 Operations²²

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, it is to inform the TOP immediately. 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 recommended that Project 2014-3 provide direction for a dispersed power producing resource to be only reported at the aggregate facility level.*

4.11.3 TOP-002-2.1b — Normal Operations Planning²³

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 megawatts at the aggregated Facility level is currently one method used. The SDT does not see any reliability gap that would prompt this team to apply R3 to any point less than the dispersed power producing 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 producing 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 recommends 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 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

²² 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.

²³ 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.

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 less than 20 MVA 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 20 MVA; 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.

Changes in the real output capabilities of dispersed generation resources 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 days) 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., five- or seven-day forecast) for a dispersed power producing resource traditionally have been 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 greater than 50 MW 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 scheduled outages of voltage-regulating equipment 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 traditionally has been 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 that 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's technical expertise, scheduled outages of telemetering and control equipment and associated communication channels at a dispersed power producing resource traditionally have been provided to the BA and TOP at the aggregate Facility level. 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 that 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 concludes that 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 20 MVA. If removing “less than 20 MVA” would cause a burden to the BPS, then the threshold for inclusion in the BES would have been less than 20 MVA.
- 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.
- 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’s 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 provide 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 that would prompt this team to apply these requirement to any point less than where the dispersed power producing resource aggregates and, as such, recommends a modification to the applicability of this requirement 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. Two VAR standards 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's technical expertise, voltage control and voltage schedule adherence for dispersed power producing resources 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's technical expertise, voltage control and voltage schedule adherence for dispersed power producing resources 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 that a mutually agreeable solution/schedule is used.

4.13.3 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, of 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 are 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, and approved by FERC on May 29, 2015.*

4.13.4 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 regard to Generator Operators' 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 traditionally have 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 100 kV 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, and approved by FERC on May 29, 2015.*

4.14 CIP

4.14.1 CIP Version 5

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 first comment period for the Project 2014-02 CIP Version 5 Revisions, the SDT received comments to modify CIP-003-6 in the Applicability section. The CIP SDT made significant modifications to the second posting of CIP-003-6 to take into account all of the comments received. This 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. Attachment 1 requires elements to be developed in Responsible Entities' cybersecurity plans 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 Attachment 1 in detail. Below is some information regarding the attachment.

Element 1: Security Awareness

The intent of the security awareness program is for entities to reinforce good cybersecurity practices with their personnel at least once every 15 calendar months. The entity decides the topics and how it schedules them. 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 using 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 cybersecurity incident response plan that includes 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, a cybersecurity incident response plan 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 the proposed CIP-003-6. CIP-002-5.1 needs to remain as is, because entities must go through the process for identifying and categorizing their BES Cyber Systems and associated BES Cyber Assets. The controls put in place for proposed CIP-003-6, Attachment 1, are not burdensome, are realistic and achievable, and do not express undue compliance burden. In conclusion, the DGR SDT states that the reliability objective of these controls is 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.
- 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 cybersecurity 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