NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

IBR REGISTRATION INITIATIVE

# ERO Enterprise Webinar

## Application of the Registration Criteria for Category 2 Generator Owner and Generator Operator Inverter-Based Resources

March 3, 2025

RELIABILITY | RESILIENCE | SECURITY

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

IBR
REGISTRATION INITIATIVE

# NERC Antitrust Compliance Guidelines

RELIABILITY | RESILIENCE | SECURITY

# Slido Q&A

Join at **slido.com**

with the code**#2942388**

and passcode **IBRPractice**

**or Scan the QR Code.**

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

IBR REGISTRATION INITIATIVE

# Welcome and Opening Remarks

Jim Stuart – Director, Registration - NERC

# Agenda

- IBR Initiative Milestones and Workplan Overview
- Detailed Review of ERO Enterprise CMEP Practice Guide
  - Category 2 Generator Owner and Generator Operator Inverter-Based Resources
- Q&A

# IBR Initiative Milestones/Workplan

Steven Masse – Principal Engineer, Registration - NERC

# Registration of non-BES IBRs

- FERC Order on Registration of non-BES Inverter-Based Resources, Docket RD22-4-000 (Issued November 17, 2022)
  - Modify registration process within 12 months of Commission approval of the work plan (by May 2024)
  - Identify of owners and operators of IBRs that are connected to the Bulk Power System and that, in the aggregate, materially impact the reliable operation of the Bulk-Power System within 24 months of Commission approval of the work plan (by May 2025)
  - Complete registration of unregistered IBR owners and operators so they are required to comply with applicable Reliability Standards within 36 months of Commission approval of the work plan (by May 2026)
  - Submit Work Plan updates every 90 days

# Work Plan Milestones

## Phase 1: May 2023–May 2024

- Complete Rules of Procedure revisions and approvals
- Commence Category 2 GO and GOP candidate outreach and education (e.g., through trade organizations)

## Phase 2: May 2024–May 2025

- Complete identification of Category 2 GO and GOP candidates
- Continue Category 2 GO and GOP candidate outreach and education (e.g., quarterly updates, webinars, workshops, etc.)

## Phase 3: May 2025–May 2026

- Complete registration of Category 2 GO and GOP candidates thereafter subject to applicable NERC Reliability Standards
- Conduct specific Category 2 GO and GOP outreach and education (e.g., quarterly updates, webinars, workshops, etc.)

# Phase 1: ROP Revisions

- Revision to the NERC Registry Criteria for “Generator Owner” and “Generator Operator” to add a new category of owners and operators of unregistered bulk power system connected, non-BES IBRs
  - Appendix 5B, Statement of Compliance Registry Criteria
  - Appendix 2, Definitions used in the Rules of Procedure
- FERC approved these revisions on June 27, 2024

# Revised GO Definition

**Generator Owner**

The entity that:

1) owns and maintains generating Facility(ies) (Category 1 GO);or
2) owns and maintains non-BES inverter based generating resources that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV (Category 2 GO).

# Revised GOP Definition

**Generator Operator**

The entity that:

1) operates generating Facility(ies) and performs the functions of supplying energy and Interconnected Operations Services (Category 1 GOP); or
2) operates non-BES inverter based generating resources that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV (Category 2 GOP).

# Ph 2: Identification Cat2 GOs

- ERO Request for Information to registered Balancing Authorities and Transmission Owners
  - Completed on September 20, 2024
- IBRs identified per Workplan Update Submitted to FERC on 2/5/2025:

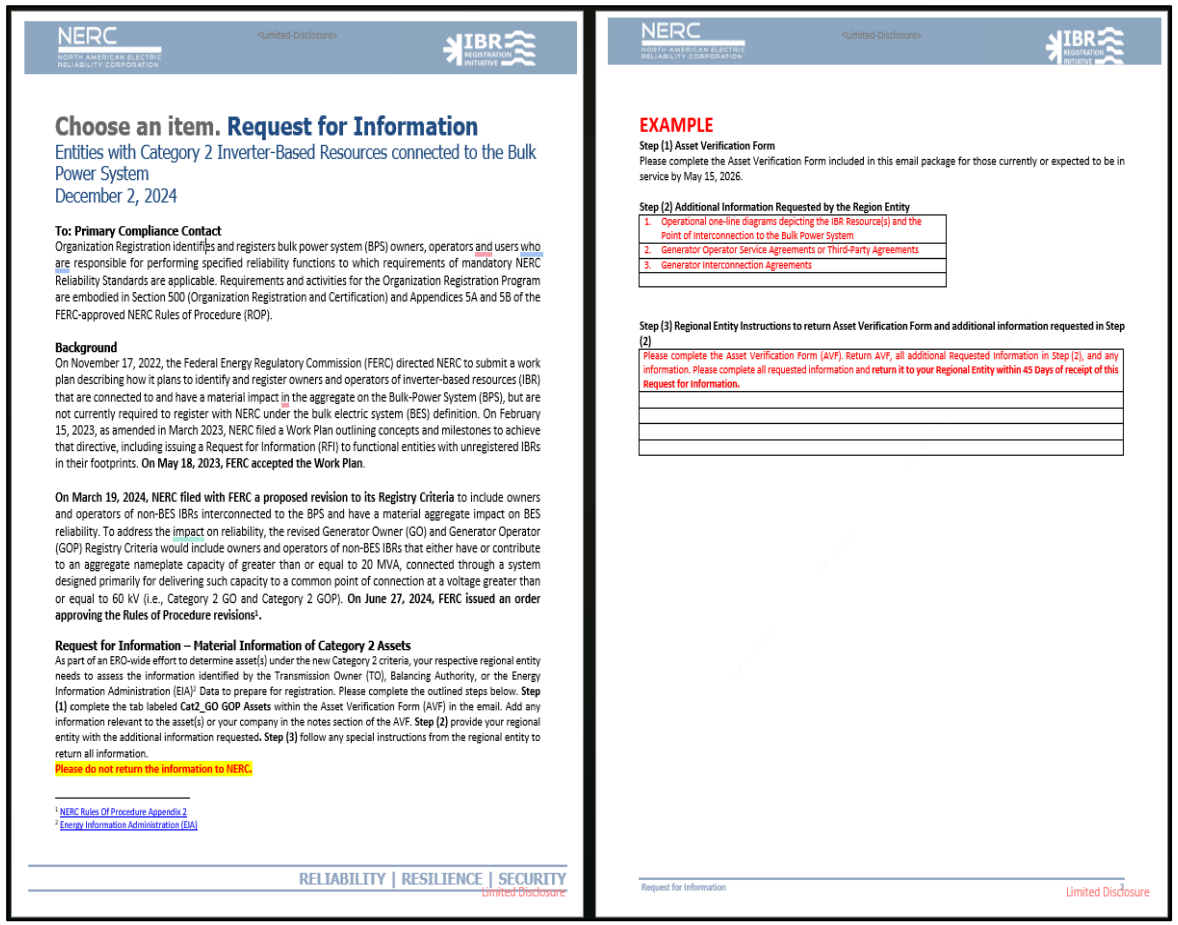
| REGIONAL ENTITY | NUMBER OF IBRS | MVA |
|---|---|---|
| MRO | 149 | 6,614 |
| NPCC | 75 | 2,422 |
| ReliabilityFirst | 100 | 4,194 |
| SERC | 175 | 10,473 |
| Texas RE | 41 | 2,167 |
| WECC | 323 | 12,915 |
| **TOTAL** | **863** | **38,785** |

*The numbers in this table are subject to change based on further validation.

- In Progress: Regional Requests for Information to the identified Category 2 GO Candidates

# Request For Information

## Request For Information





**Choose an item. Request for Information**

Entities with Category 2 Inverter-Based Resources connected to the Bulk Power System

December 2, 2024

**To: Primary Compliance Contact**

Organization Registration identifies and registers bulk power system (BPS) owners, operators and users who are responsible for performing specified reliability functions to which requirements of mandatory NERC Reliability Standards are applicable. Requirements and activities for the Organization Registration Program are embodied in Section 500 (Organization Registration and Certification) and Appendices 5A and 5B of the FERC-approved NERC Rules of Procedure (ROP).

**Background**

On November 17, 2022, the Federal Energy Regulatory Commission (FERC) directed NERC to submit a work plan describing how it plans to identify and register owners and operators of inverter-based resources (IBR) that are connected to and have a material impact in the aggregate on the Bulk-Power System (BPS), but are not currently required to register with NERC under the bulk electric system (BES) definition. On February 15, 2023, as amended in March 2023, NERC filed a Work Plan outlining concepts and milestones to achieve that directive, including issuing a Request for Information (RFI) to functional entities with unregistered IBRs in their footprints. **On May 18, 2023, FERC accepted the Work Plan**.

**On March 19, 2024, NERC filed with FERC a proposed revision to its Registry Criteria** to include owners and operators of non-BES IBRs interconnected to the BPS and have a material aggregate impact on BES reliability. To address the impact on reliability, the revised Generator Owner (GO) and Generator Operator (GOP) Registry Criteria would include owners and operators of non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV (i.e., Category 2 GO and Category 2 GOP). **On June 27, 2024, FERC issued an order approving the Rules of Procedure revisions[1].**

**Request for Information – Material Information of Category 2 Assets**

As part of an ERO-wide effort to determine asset(s) under the new Category 2 criteria, your respective regional entity needs to assess the information identified by the Transmission Owner (TO), Balancing Authority, or the Energy Information Administration (EIA)[2] Data to prepare for registration. Please complete the outlined steps below. **Step (1)** complete the tab labeled **Cat2_GO GOP Assets** within the Asset Verification Form (AVF) in the email. Add any information relevant to the asset(s) or your company in the notes section of the AVF. **Step (2)** provide your regional entity with the additional information requested. **Step (3)** follow any special instructions from the regional entity to return all information.

Please do not return the information to NERC.

[1] NERC Rules Of Procedure Appendix 2
[2] Energy Information Administration (EIA)





**EXAMPLE**

**Step (1) Asset Verification Form**

Please complete the Asset Verification Form included in this email package for those currently or expected to be in service by May 15, 2026.

**Step (2) Additional Information Requested by the Region Entity**

| |
|---|
| 1. Operational one-line diagrams depicting the IBR Resource(s) and the Point of Interconnection to the Bulk Power System |
| 2. Generator Operator Service Agreements or Third-Party Agreements |
| 3. Generator Interconnection Agreements |
| |

**Step (3) Regional Entity Instructions to return Asset Verification Form and additional information requested in Step (2)**

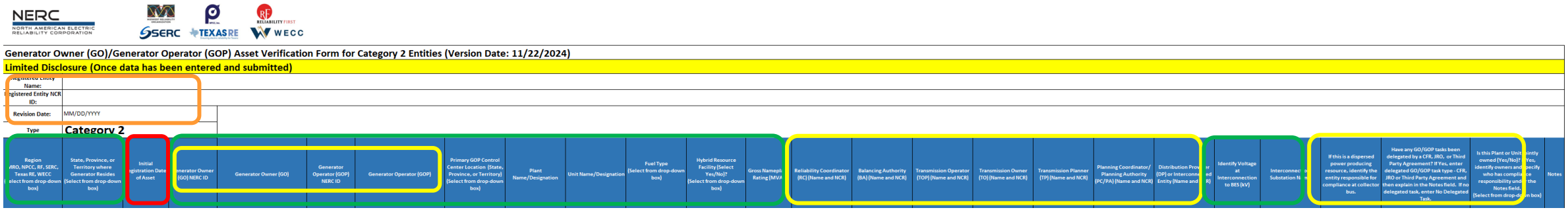
| |
|---|
| Please complete the Asset Verification Form (AVF). Return AVF, all additional Requested Information in Step (2), and any information. Please complete all requested information and **return it to your Regional Entity within 45 Days of receipt of this Request for Information.** |
| |
| |
| |
| |



## Regions Work Process

- Consistent process of collecting data
  - One line diagram(s)
  - Generator Operating Agreements or Third-Party Agreements
  - Generator Interconnection Agreements
- Ongoing since December 2024
- Requested information must be returned to the sending region within 45 days.

# GO/GOP Asset Verification Spreadsheet
## Tab 4b Category 2 GO GOP Assets



Generator Owner (GO)/Generator Operator (GOP) Asset Verification Form for Category 2 Entities (Version Date: 11/22/2024)

Limited Disclosure (Once data has been entered and submitted)

| | |
|---|---|
| Registered Entity Name: | |
| Registered Entity NCR ID: | |
| Revision Date: | MM/DD/YYYY |
| Type | Category 2 |

| Region (RRO, NPCC, RF, SERC, Texas RE, WECC (select from drop-down box) | State, Province, or Territory where Generator Resides (Select from drop-down box) | Initial Registration Date of Asset | Generator Owner (GO) NERC ID | Generator Owner (GO) | Generator Operator (GOP) NERC ID | Generator Operator (GOP) | Primary GOP Control Center Location (State, Province, or Territory) (Select from drop-down box) | Plant Name/Designation | Unit Name/Designation | Fuel Type (Select from drop-down box) | Hybrid Resource Facility (Select Yes/No)? (Select from drop-down box) | Gross Nameplate Rating (MVA | Reliability Coordinator (RC) (Name and NCR) | Balancing Authority (BA) (Name and NCR) | Transmission Operator (TOP) (Name and NCR) | Transmission Owner (TO) (Name and NCR) | Transmission Planner (TP) (Name and NCR) | Planning Coordinator/ Planning Authority (PC/PA) (Name and NCR) | Distribution Provider (DP) or Interconnection Entity (Name and | Identify Voltage at Interconnection to BES (kV) | Interconnection Substation N | If this is a dispersed power producing resource, identify the entity responsible for compliance at collector bus. | Have any GO/GOP tasks been delegated by a CFR, JRO, or Third Party Agreement? If Yes, enter delegated GO/GOP task type - CFR, JRO or Third Party Agreement and then explain in the Notes field. If no delegated task, enter No Delegated Task. | Is this Plant or Unit jointly owned (Yes/No)? If Yes, identify owners and specify who has compliance responsibility under the Notes field. (Select from drop-down box) | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

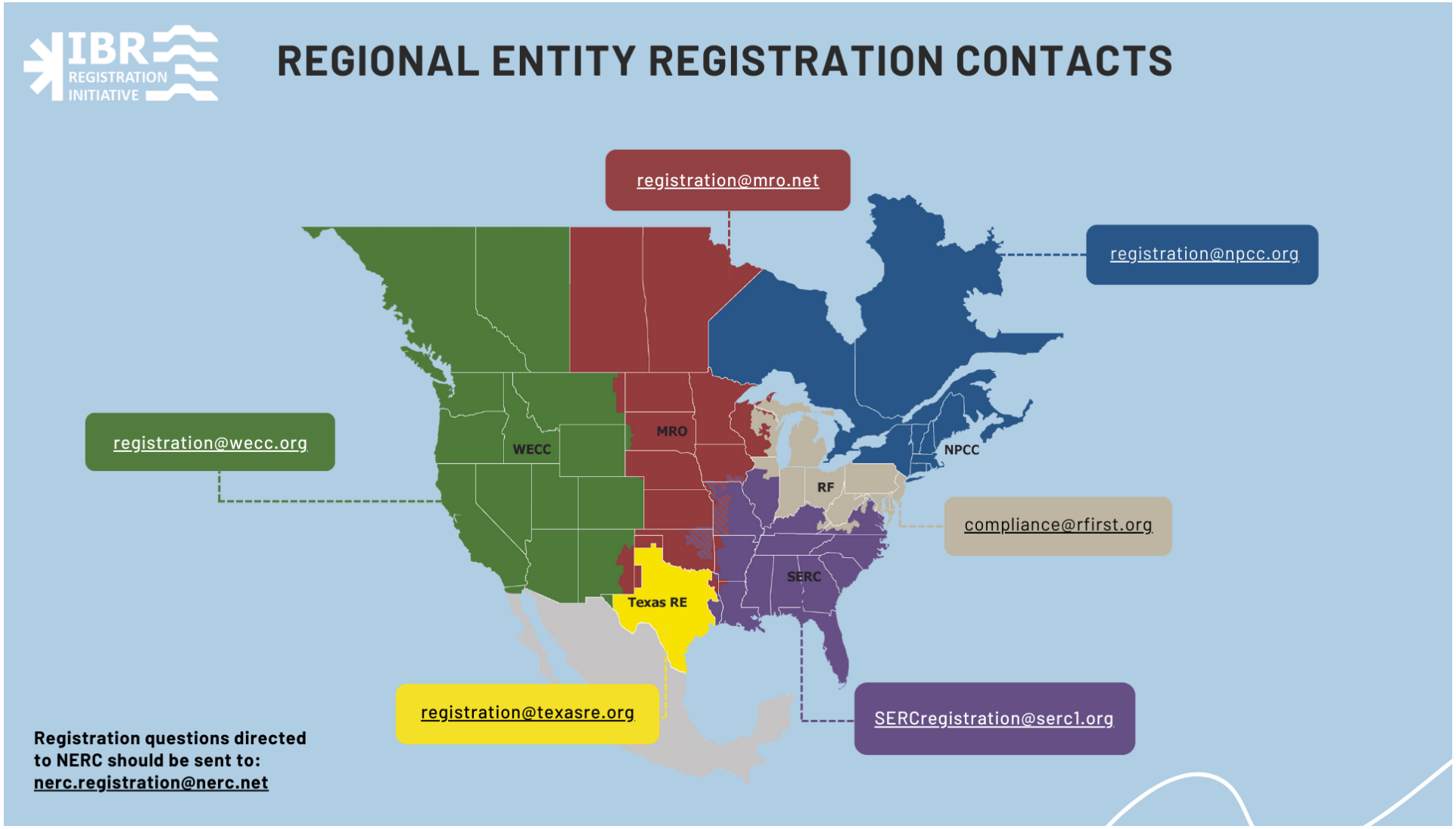
**Entity Information**
- Registered Entity Name
- Registered Entity NCR ID
- Revision Date

Effective Date (Commercial Operations Date)

**Relationships**
- Functional Relationships
- Responsibilities
- JRO / CFR / Third-Party Agreements
- Ownership

**Basic Registration Data**
- Region
- GO / GOP / NCRs
- Plant / Location (Region / State) / Unit / Type / Size / Hybrid
- GOP Control Center Location
- Connection Voltage / Location
- Generator Lead Line

# Regional Entity Map

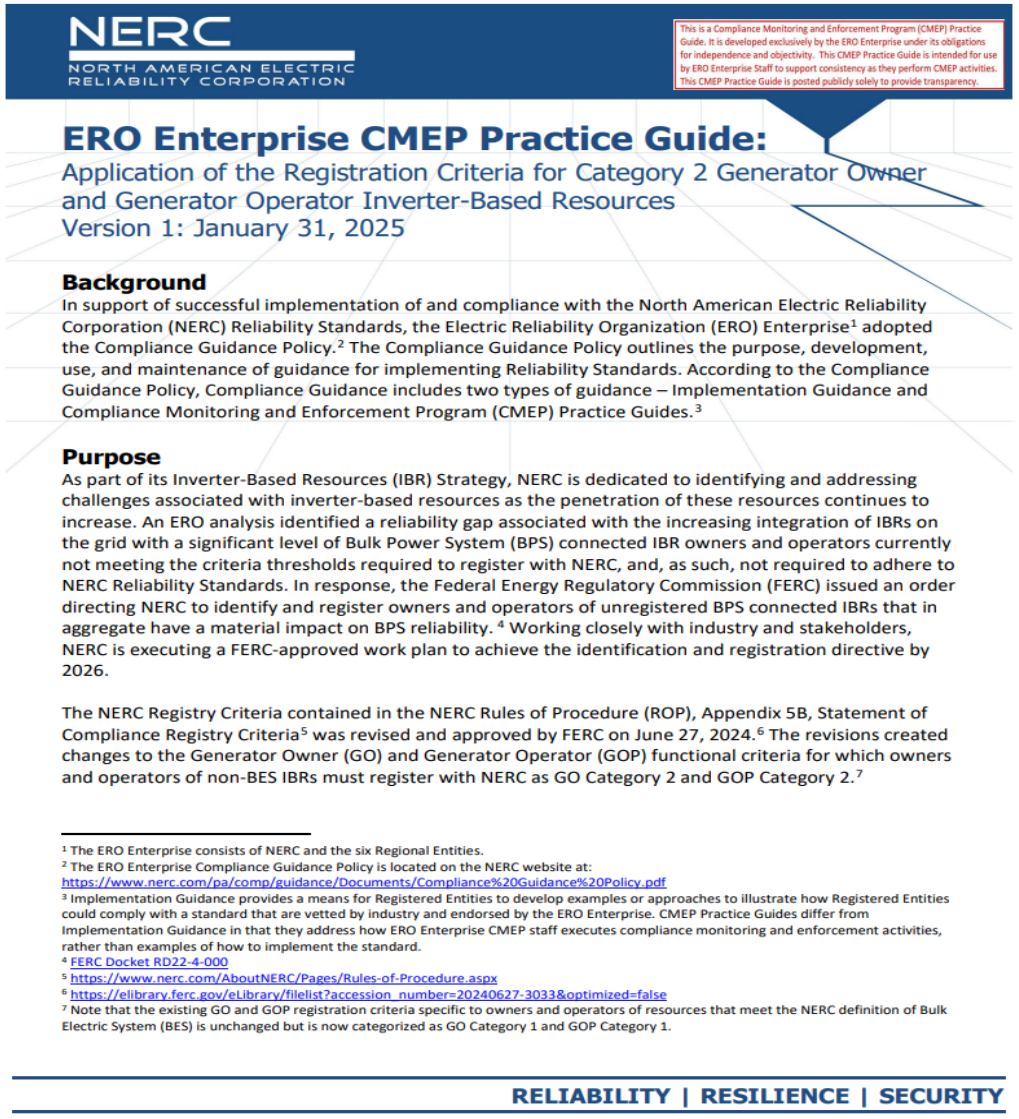


# ERO Enterprise CMEP Practice Guide: Application of the Registry Criteria for Category 2 Generator Owner and Generator Operator Inverter-Based Resources Version 1: January 31, 2025

Peter Heidrich, Principal Advisor Registration & Certification, SERC

# Practice Guide

- CMEP Practice Guides are developed solely by the ERO Enterprise to reflect the independent and objective judgment of ERO Enterprise staff
  - ➢ Application of the Registration Criteria for Category 2 Generator Owner and Generator Operator Inverter-Based Resources
- Intended to provide guidance to ERO Enterprise staff to support the consistent application of the revised Registration Criteria thresholds for Category 2 Generator Owners and Generator Operators



NERC NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

This is a Compliance Monitoring and Enforcement Program (CMEP) Practice Guide. It is developed exclusively by the ERO Enterprise under its obligations for independence and objectivity. This CMEP Practice Guide is intended for use by ERO Enterprise Staff to support consistency as they perform CMEP activities. This CMEP Practice Guide is posted publicly solely to provide transparency.

**ERO Enterprise CMEP Practice Guide:**
Application of the Registration Criteria for Category 2 Generator Owner and Generator Operator Inverter-Based Resources
Version 1: January 31, 2025

**Background**
In support of successful implementation of and compliance with the North American Electric Reliability Corporation (NERC) Reliability Standards, the Electric Reliability Organization (ERO) Enterprise[1] adopted the Compliance Guidance Policy.[2] The Compliance Guidance Policy outlines the purpose, development, use, and maintenance of guidance for implementing Reliability Standards. According to the Compliance Guidance Policy, Compliance Guidance includes two types of guidance – Implementation Guidance and Compliance Monitoring and Enforcement Program (CMEP) Practice Guides.[3]

**Purpose**
As part of its Inverter-Based Resources (IBR) Strategy, NERC is dedicated to identifying and addressing challenges associated with inverter-based resources as the penetration of these resources continues to increase. An ERO analysis identified a reliability gap associated with the increasing integration of IBRs on the grid with a significant level of Bulk Power System (BPS) connected IBR owners and operators currently not meeting the criteria thresholds required to register with NERC, and, as such, not required to adhere to NERC Reliability Standards. In response, the Federal Energy Regulatory Commission (FERC) issued an order directing NERC to identify and register owners and operators of unregistered BPS connected IBRs that in aggregate have a material impact on BPS reliability.[4] Working closely with industry and stakeholders, NERC is executing a FERC-approved work plan to achieve the identification and registration directive by 2026.

The NERC Registry Criteria contained in the NERC Rules of Procedure (ROP), Appendix 5B, Statement of Compliance Registry Criteria[5] was revised and approved by FERC on June 27, 2024.[6] The revisions created changes to the Generator Owner (GO) and Generator Operator (GOP) functional criteria for which owners and operators of non-BES IBRs must register with NERC as GO Category 2 and GOP Category 2.[7]

[1] The ERO Enterprise consists of NERC and the six Regional Entities.
[2] The ERO Enterprise Compliance Guidance Policy is located on the NERC website at: https://www.nerc.com/pa/comp/guidance/Documents/Compliance%20Guidance%20Policy.pdf
[3] Implementation Guidance provides a means for Registered Entities to develop examples or approaches to illustrate how Registered Entities could comply with a standard that are vetted by industry and endorsed by the ERO Enterprise. CMEP Practice Guides differ from Implementation Guidance in that they address how ERO Enterprise CMEP staff executes compliance monitoring and enforcement activities, rather than examples of how to implement the standard.
[4] FERC Docket RD22-4-000
[5] https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx
[6] https://elibrary.ferc.gov/eLibrary/filelist?accession_number=20240627-3033&optimized=false
[7] Note that the existing GO and GOP registration criteria specific to owners and operators of resources that meet the NERC definition of Bulk Electric System (BES) is unchanged but is now categorized as GO Category 1 and GOP Category 1.

RELIABILITY | RESILIENCE | SECURITY

- NERC Registry Criteria for Category 2 GOs and GOPs
- Principles of Application:
  - Bulk Electric System (BES) Definition and Hybrid Resource Guidance
  - Key Points: Evaluation of IBRs and Hybrid Resources
- Single Line Diagrams of IBR Configurations:
  - Solar PV and BESS (non-BES IBR Category 2)
  - Solar PV, BESS and/or Wind (non-BES IBR Category 2)
  - Non-BES IBR Ownership Principles
  - Non-BES IBR Aggregation Principles
  - Synchronous Generation and IBRs

# Principles of Application

- Bulk Electric System (BES) Definition and Hybrid Resource Guidance
  - Facilities should first be evaluated based on the criteria established by the BES Definition and the principles demonstrated in the ERO Enterprise CMEP Practice Guide: Application of the Bulk Electric System Definition to Battery Energy Storage Systems and Hybrid Resources.
- Application of the Category 2 GO and GOP Criteria is similar to the application of the BES Inclusion I4 for BES dispersed power producing resources, EXCEPT:
  - Lower aggregate nameplate capacity (=> 20 MVA) and connection voltage (=> 60 kV).
  - Limited to IBRs (ie: solar PV, battery storage, wind generation (type 3 or 4))
  - Hybrids cannot aggregate with non-IBR / synchronous resources

## Key Points: Evaluation of non-BES IBRs and Hybrid Resources

- Non-BES IBRs are connected at a common point of connection of 60 kV or above
- Gross nameplate capacity refers to the apparent power rating (MVA)
- In the determination of gross aggregate nameplate capacity
  - The apparent power rating of the inverter(s) should be used
  - Operational modes or limitations are not considered
  - Reactive resources (dynamic or static devices) are not included
- Ownership of the resource(s) is not considered.

# NERC Registration Considerations

- The owners of resources that meet the Registry Criteria for non-BES IBRs are required to register, per the NERC ROP, for the GO Category 2 function, even if there are multiple resources with more than one owner. The owner of each resource is required to register if the aggregate nameplate capacity is greater than or equal to 20 MVA that is connected at a common point of connection to the BPS at a voltage of greater than or equal to 60 kV.
- Likewise, the operator of the GO Category 2 resource is required to register as a GOP Category 2 or designate another entity that would then be required to register as a GOP Category 2.

# Attachments: Single Line Diagrams of IBR Configurations

- Key to figure color coding and annotation:
  - **Blue** indicates that an Element is included in the BES.
  - **Purple** indicates non-BES IBRs that meet the GO Category 2 criteria.
  - **Green** indicates that an Element is NOT included in the BES and/or non-BES IBRs that do NOT meet the GO Category 2 criteria.
  - **Orange** indicates 'points of connection'
  - **Black** indicates Elements/elements that are not evaluated based on the GO Category 2 criteria.

* Reactive Resources (static or dynamic devices) are depicted as capacitors to simplify the figures. Reactive Resources do not contribute to the generation site's gross aggregate nameplate capacity.

# Solar PV (Category 2)

Photovoltaic (Solar) generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: 50 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the solar generation resource (Photovoltaic Cells & the associated Inverter Banks) are candidates for registration as a Category 2 GO and/or GOP.

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

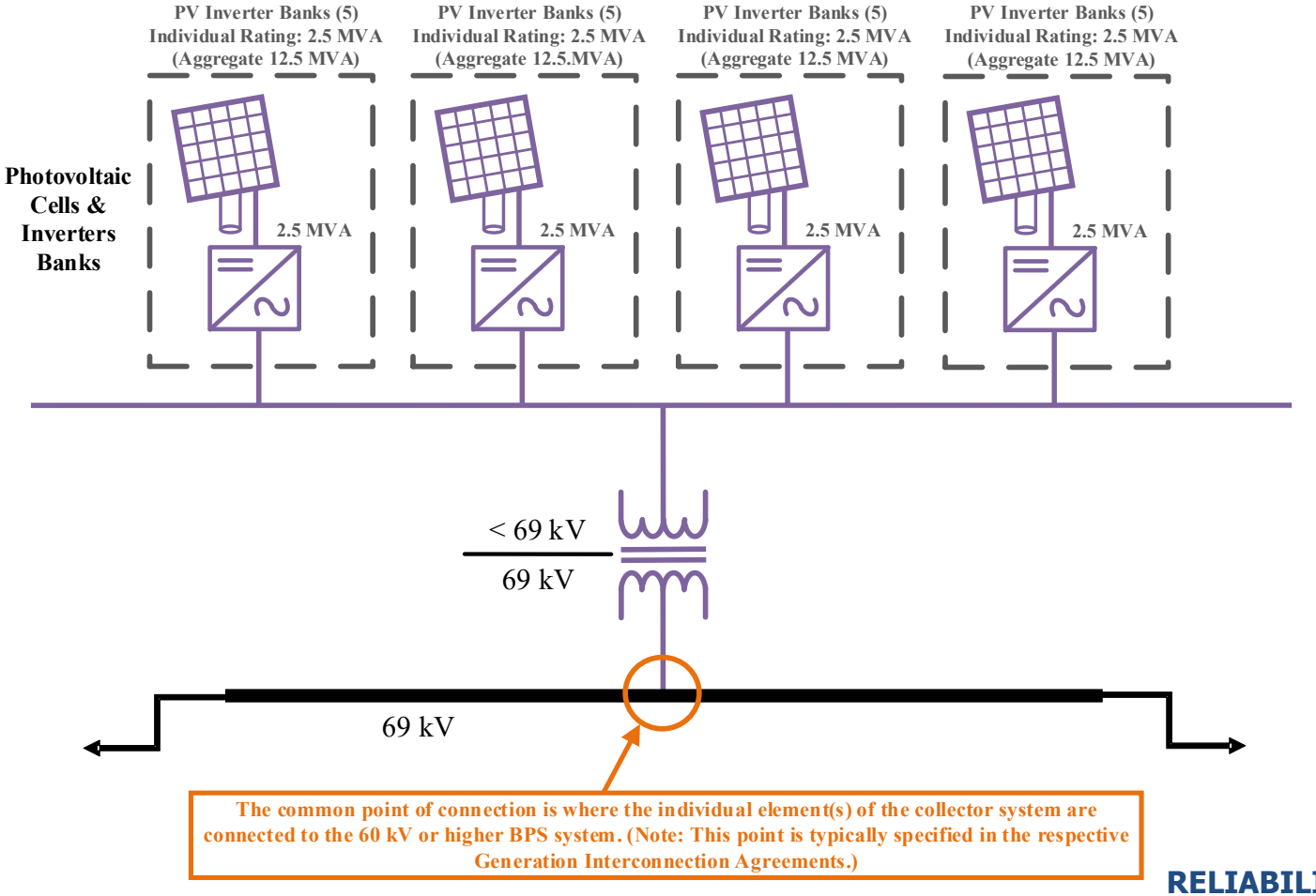



*Figure 1*

# Solar PV (non-Category 2)

Photovoltaic (Solar) generation resource and substation design with a gross aggregate nameplate capacity of < 20 MVA (Actual: 15 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the solar generation resource (Photovoltaic Cells & the associated Inverter Banks) are NOT candidates for registration as a Category 2 GO and/or GOP.

**Green identifies the non-BES IBRs that do NOT have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

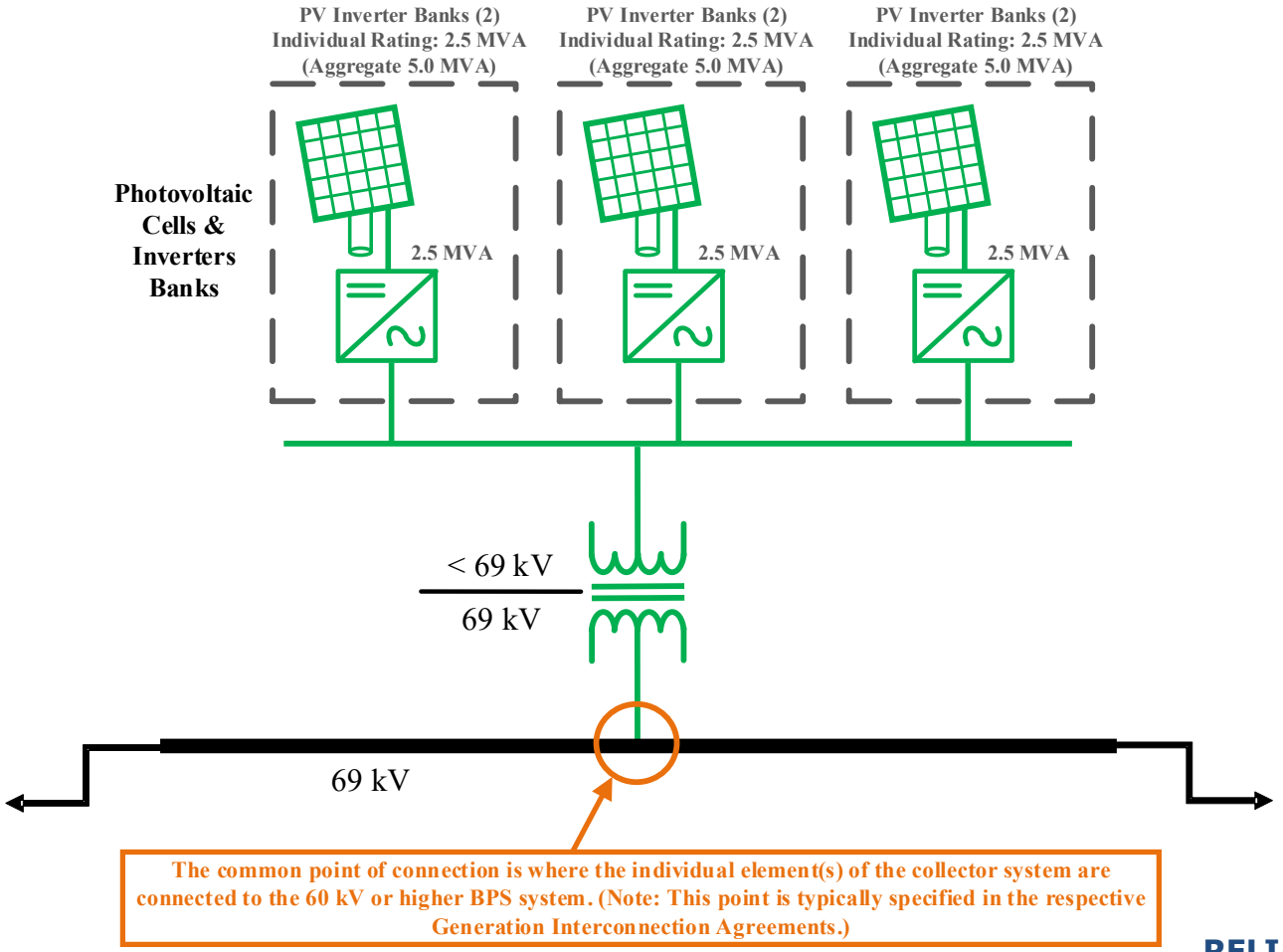



*Figure 2*

# Solar PV & BESS (Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: PV (15 MVA) + BESS (15 MVA) = 30 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the hybrid generation resource (Photovoltaic Cells & the associated Inverter Banks and the Battery Cells (BESS) & associated Inverter Banks) are candidates for registration as a Category 2 GO and/or GOP.

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

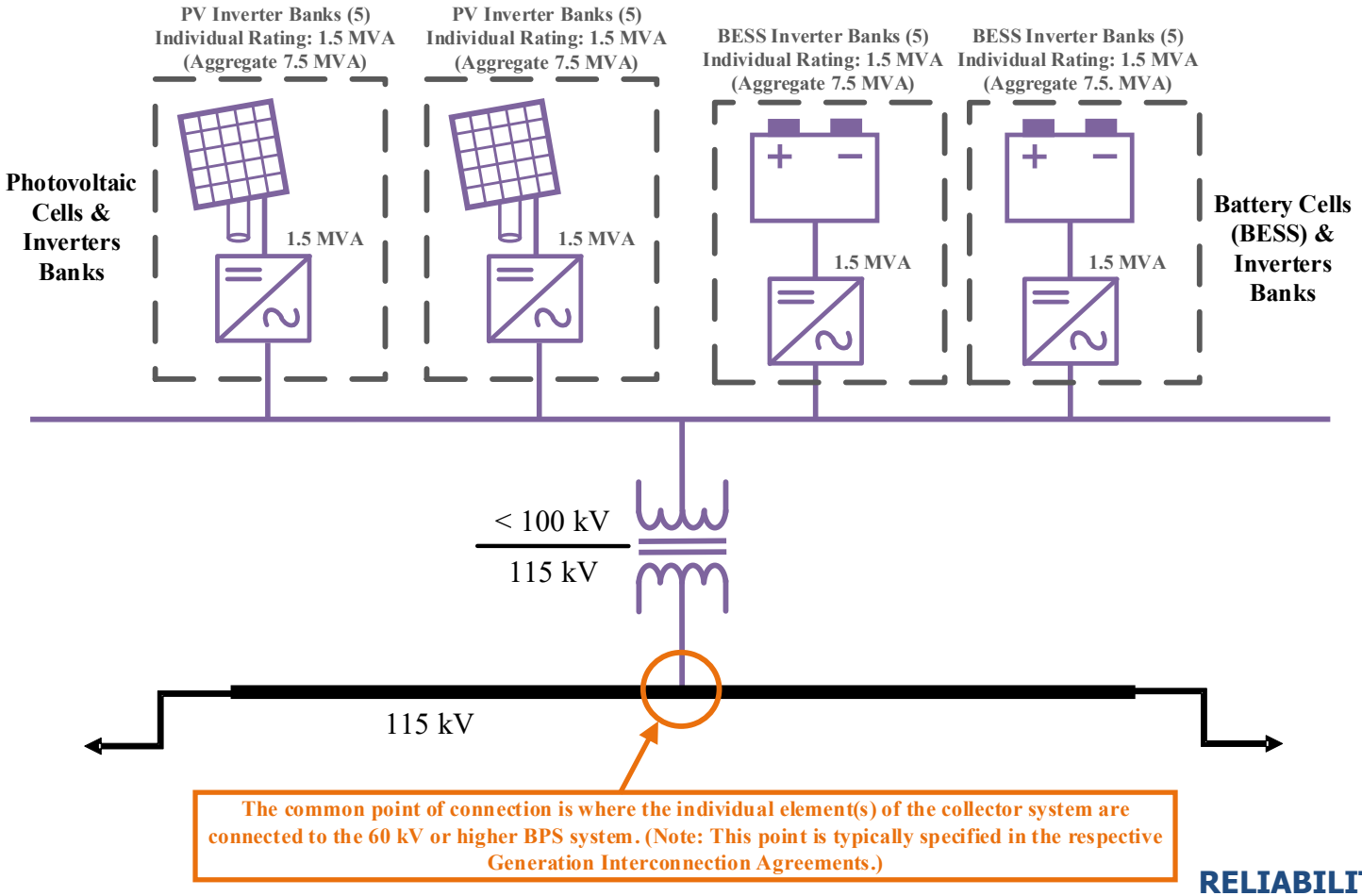



*Figure 3*

# Solar PV & BESS (DC Coupled) (Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: PV 50 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the Photovoltaic Cells & the associated Inverter Banks and the Battery Cells (BESS) & associated Converter Banks are candidates for registration as a Category 2 GO and/or GOP.

**Note: The gross aggregate nameplate rating of the DC/DC Converters (BESS generator units) does not contribute to the gross aggregate rating of the hybrid generation site due to the DC coupling with the PV Cells / Inverter Banks.**

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

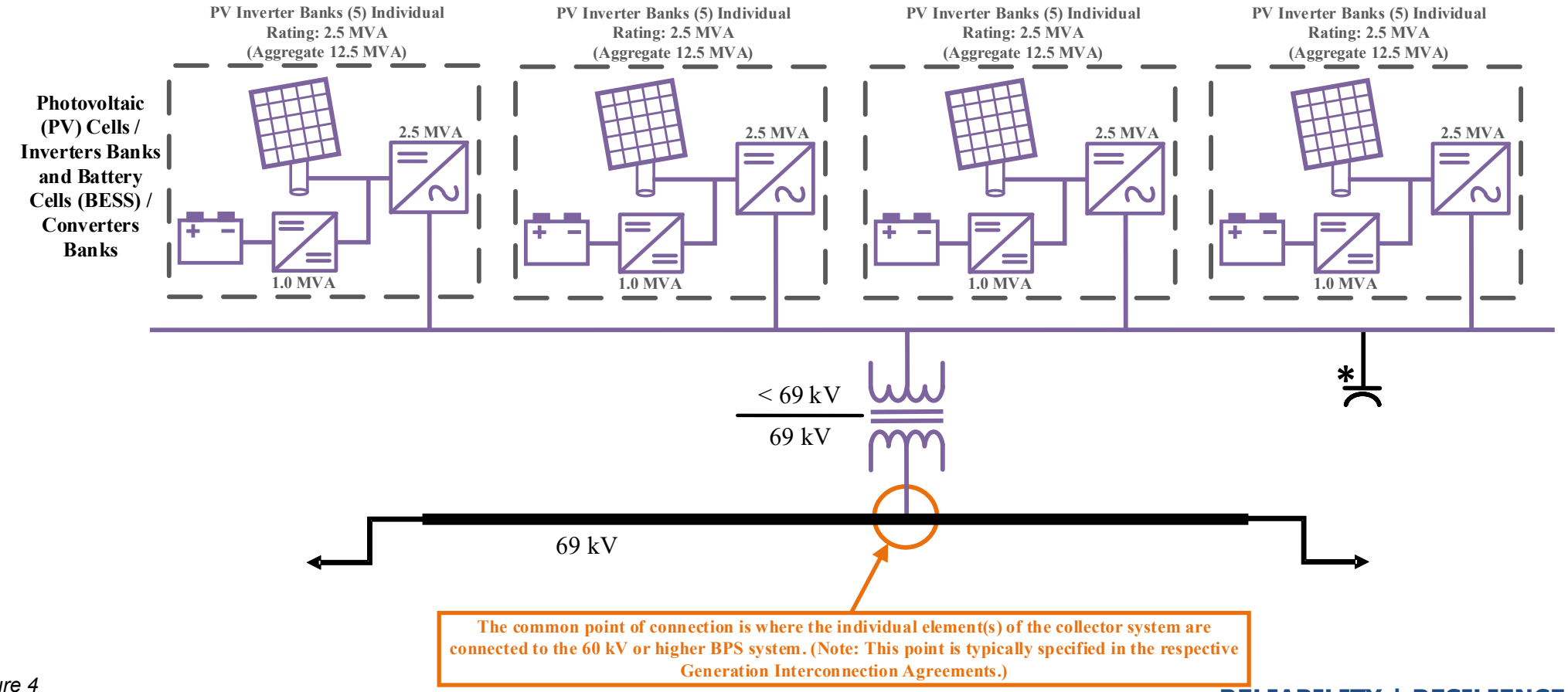



*Figure 4*

# Solar PV (Company A) & BESS (Company B) (Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: PV (15 MVA) + BESS (15 MVA) = 30 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owners and Operators (i.e.., **Company A** and **Company B**) of the hybrid generation resource (Photovoltaic Cells & the associated Inverter Banks and the Battery Cells (BESS) & associated Inverter Banks) are candidates for registration as a Category 2 GO and/or GOP.

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

**(Note: This diagram was developed to emphasize that ownership or operational responsibilities do not impact the application of the Gross Aggregate Nameplate Capacity provision in the GO and GOP Category 2 Registration Criteria.)**

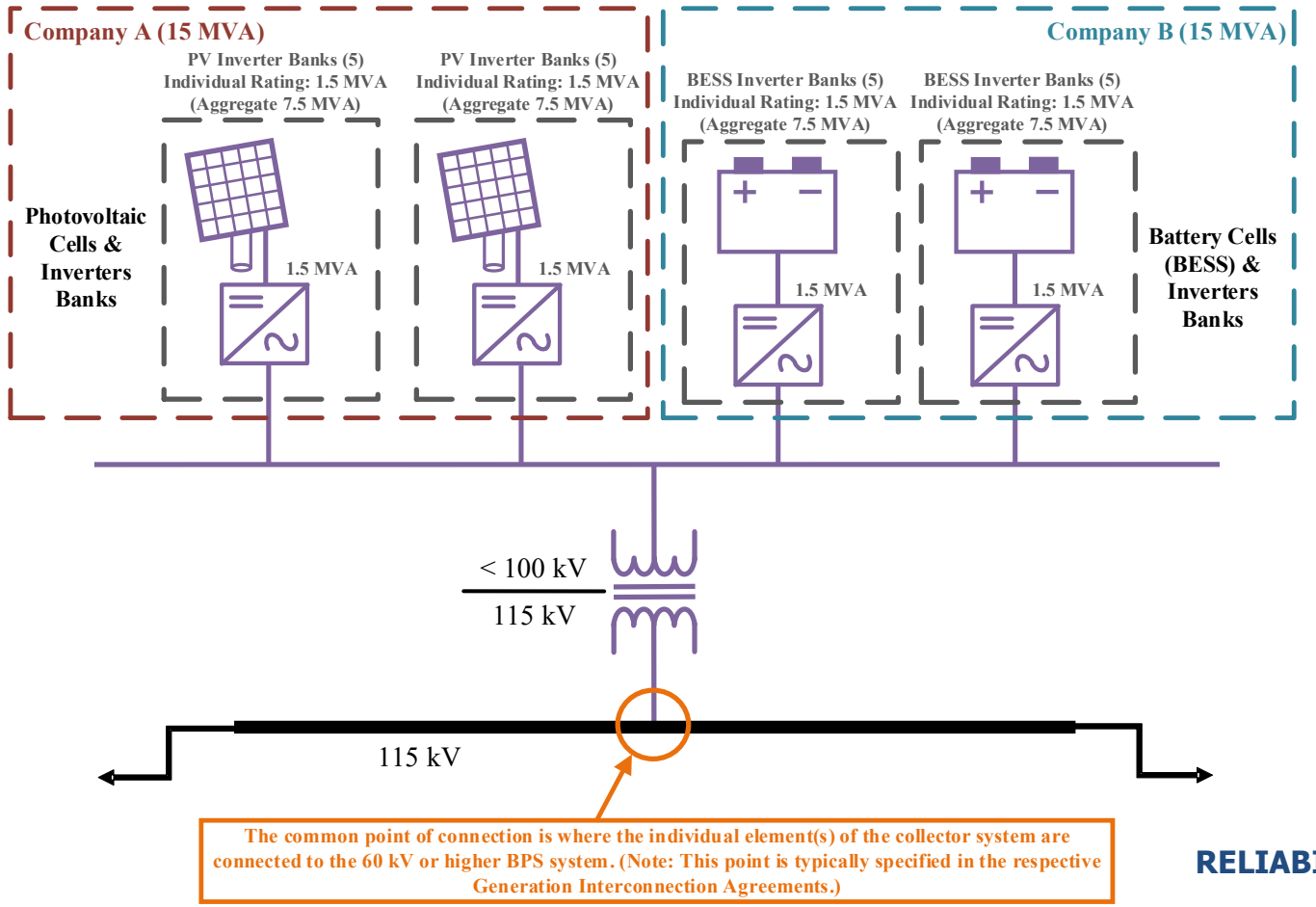



*Figure 5*

# Wind (Category 2)

Wind Turbine generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: 100 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the wind turbine generation resource (Wind Turbines (Type 3 and/or 4) & the associated Inverter Banks) are candidates for registration as a Category 2 GO and/or GOP.

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

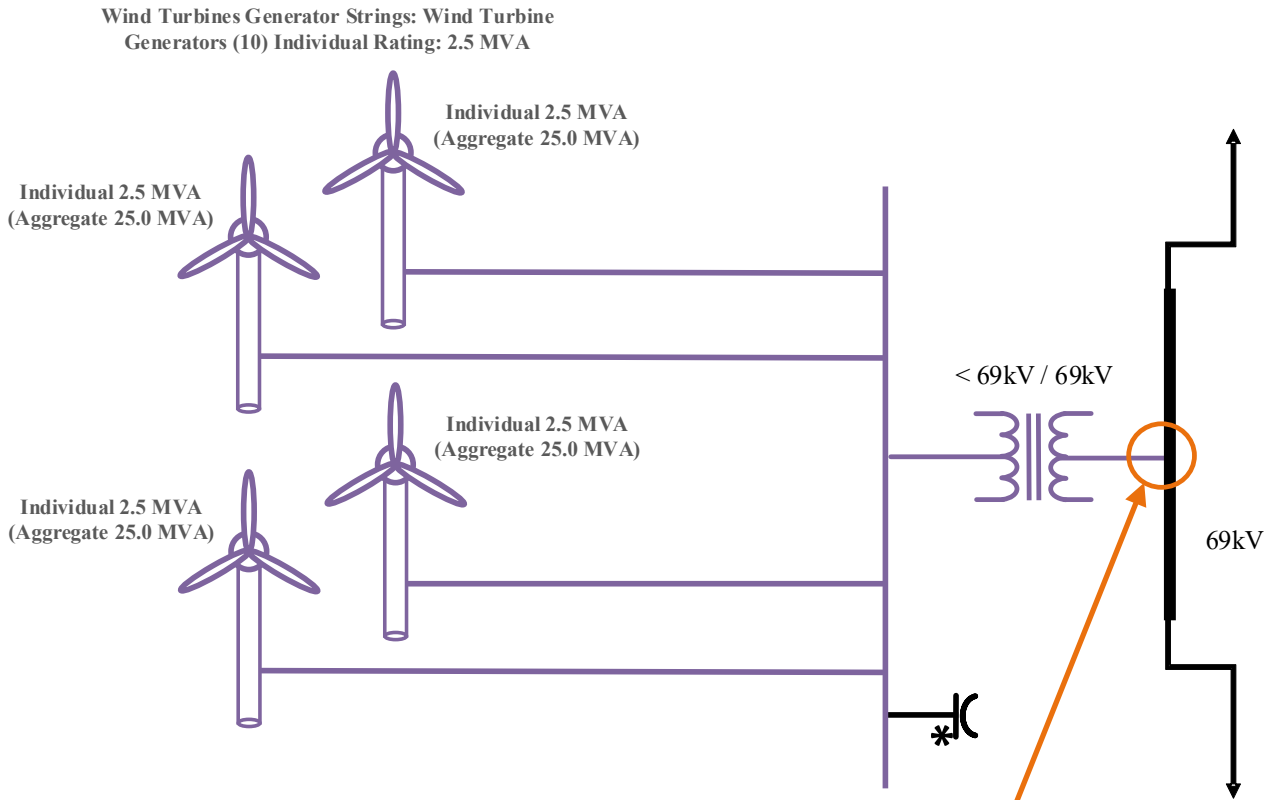



*Figure 6*

# Wind (non-Category 2)

Wind Turbine generation resource and substation design with a gross aggregate nameplate capacity of < 20 MVA (Actual: 15 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the wind turbine generation resource (Wind Turbines (Type 3 and/or 4) & the associated Inverter Banks) are NOT candidates for registration as a Category 2 GO and/or GOP.

**Green identifies the non-BES IBRs that do NOT have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

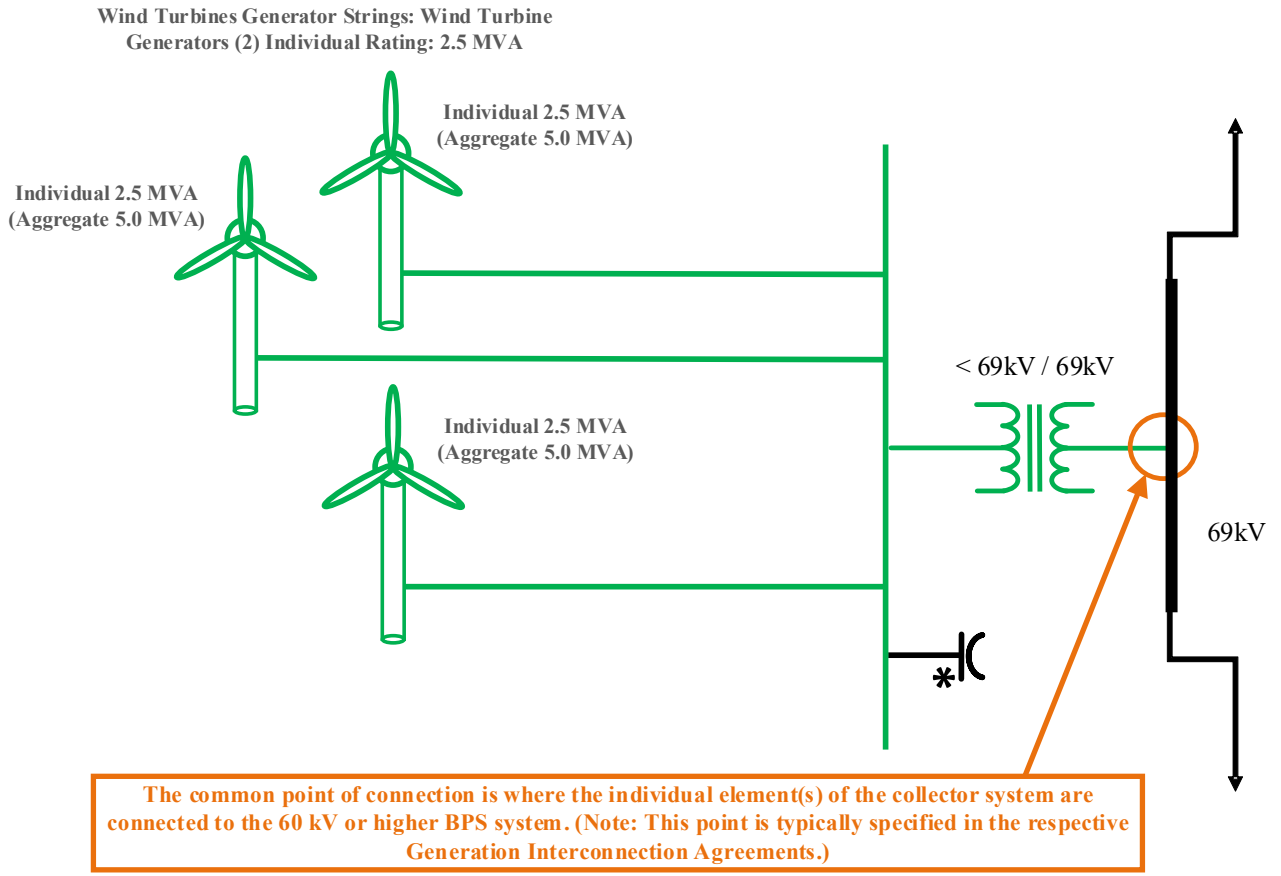



*Figure 7*

# Wind & BESS (Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: Wind (50 MVA) + BESS (20 MVA) = 70 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the hybrid generation resource (Wind Turbines (Type 3 and/or 4) & the associated Inverter Banks and the Battery Cells (BESS) & associated Inverter Banks) are candidates for registration as a Category 2 GO and/or GOP.

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

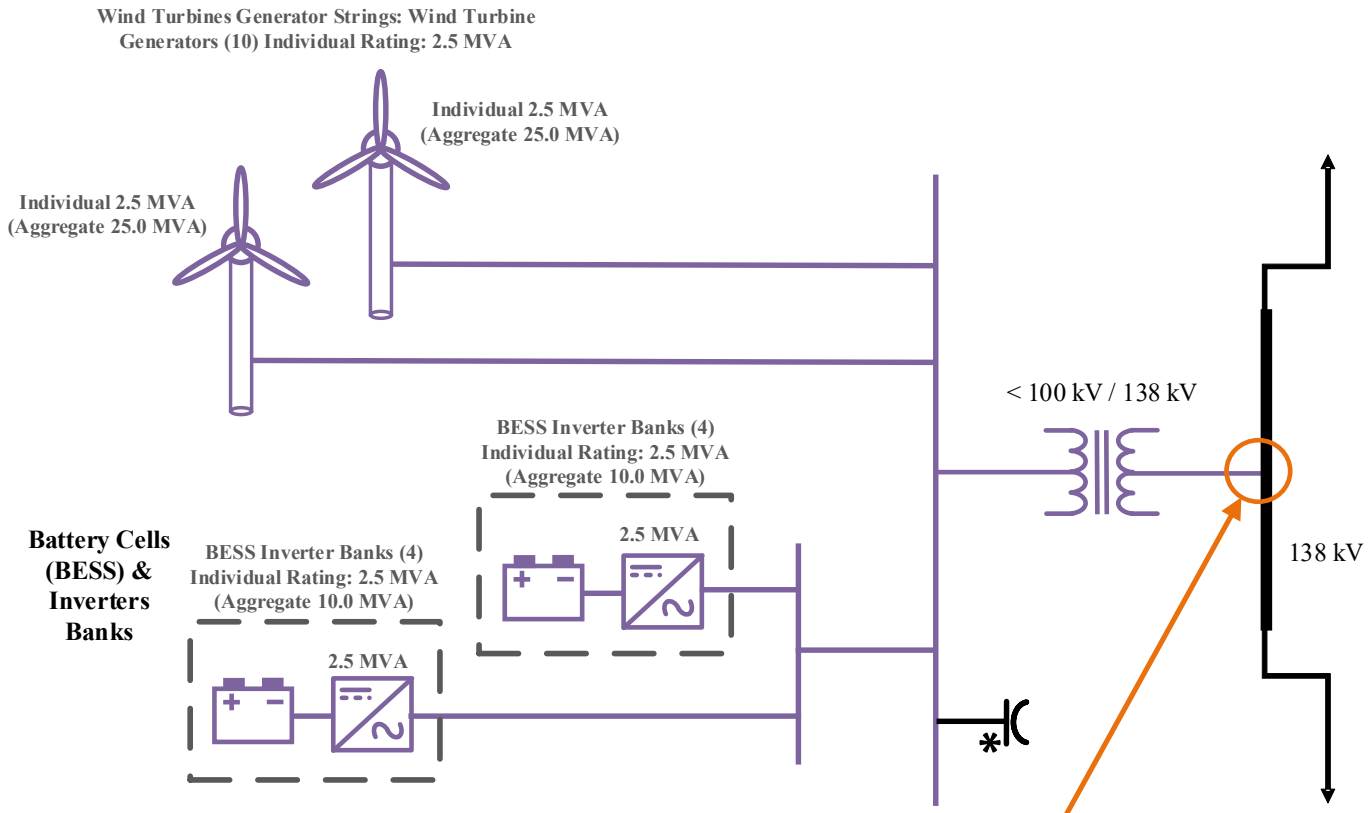



*Figure 8*

# Wind (Company) & BESS (Company B)(Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: Wind (15 MVA) + BESS (10 MVA) = 25 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owners and Operators (i.e.., **Company A** and **Company B**) of the hybrid generation resource (Wind Turbines (Type 3 and/or 4) & the associated Inverter Banks and the Battery Cells (BESS) & associated Inverter Banks) are candidates for registration as a Category 2 GO and/or GOP.

**Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

**(Note: This diagram was developed to emphasize that ownership or operational responsibilities do not impact the application of the Gross Aggregate Nameplate Capacity provision in the GO and GOP Category 2 Registration Criteria.)**

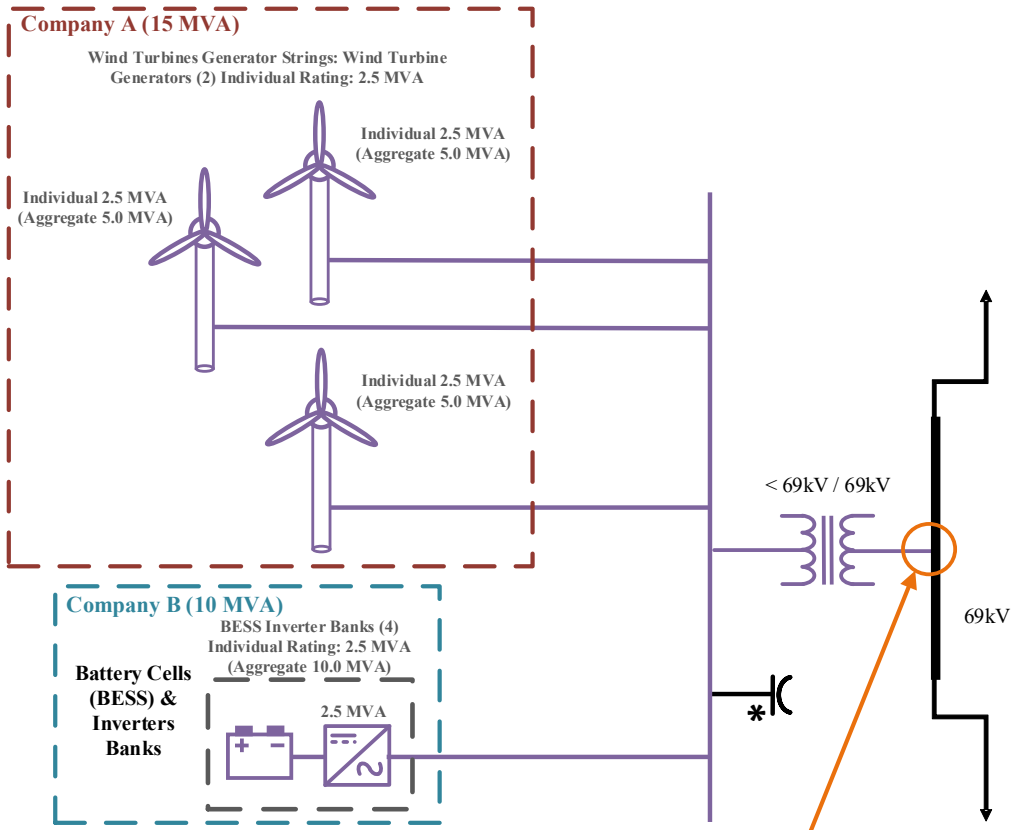



*Figure 9*

# Synchronous Generation (BES) & BESS (Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of < 75 MVA (Actual: Synchronous (50 MVA) + BESS (20 MVA) = 70 MVA).
By application of 'gross individual nameplate rating' provision in Inclusion I2 the synchronous generators, including the generator terminals through the high-side of the step-up transformers, are included in the BES.
By application of 'gross aggregate nameplate rating' provision in Inclusion I2 and I4 the Battery Cells (BESS) & associated Inverter Banks are excluded from the BES.
By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the Battery Cells (BESS) & associated Inverter Banks are candidates for registration as a Category 2 GO and/or GOP.

**Blue identifies BES synchronous generators, including the generator terminals through the high-side of the step-up transformers, and the BES Elements to the common point of connection.**

**Purple identifies the non-BES IBRs that have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

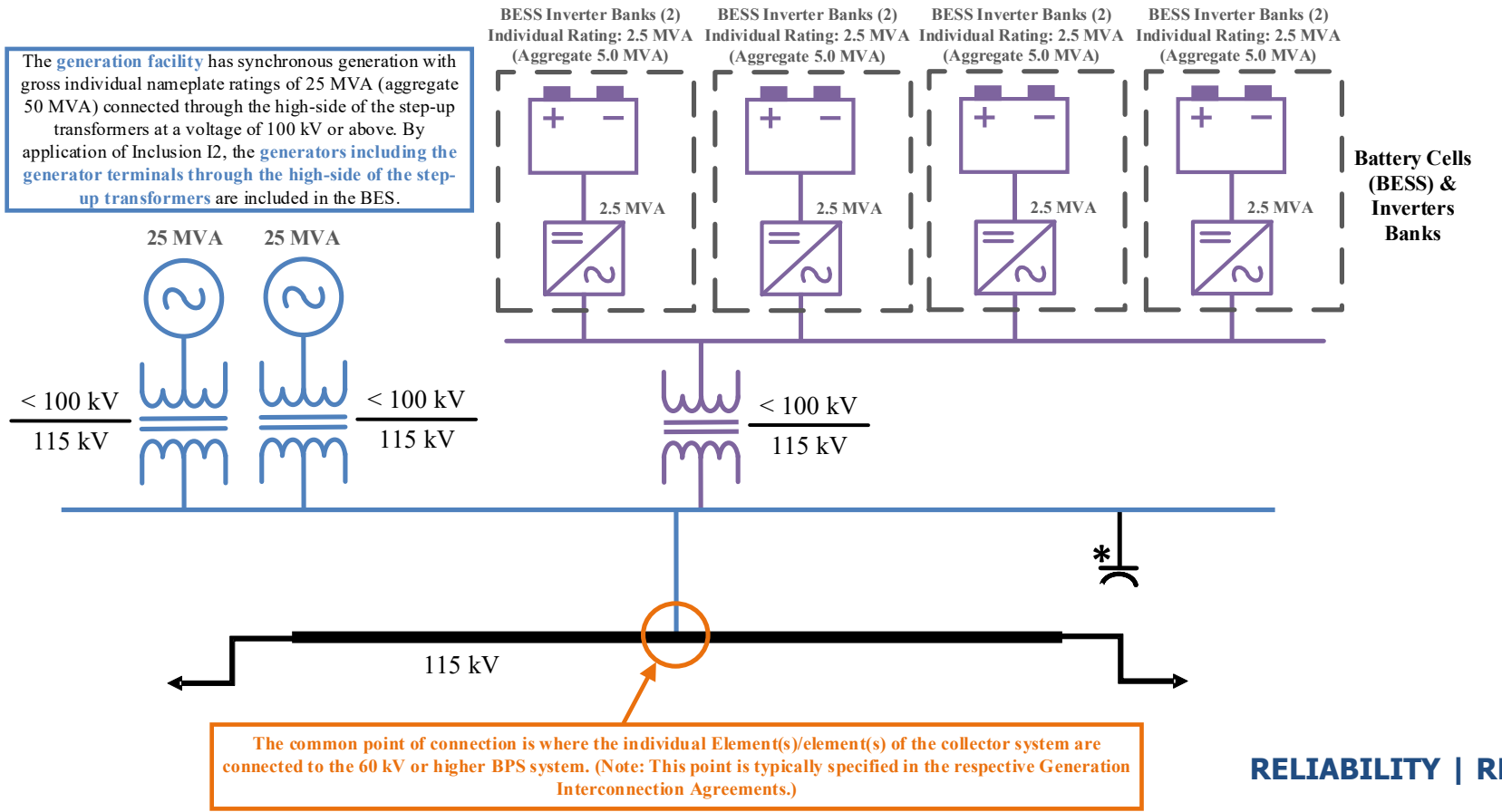



*Figure 10*

# Synchronous Generation (non-BES) & Solar PV (non-Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of < 75 MVA (Actual: Synchronous (25 MVA) + PV (15 MVA) = 40 MVA).
By application of 'gross individual nameplate rating' provision in Inclusion I2 the synchronous generator, including the generator terminals through the high-side of the step-up transformers, are excluded from the BES.
By application of Inclusion I2 and I4 the Photovoltaic Cells & the associated Inverter Banks (solar generator units) are excluded from the BES.
By application of 'gross aggregate nameplate capacity' provision in Inclusion I2 and I4 the synchronous generator and the Photovoltaic Cells & the associated Inverter Banks are excluded from the BES.
By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the Photovoltaic Cells & the associated Inverter Banks are NOT candidates for registration as a Category 2 GO and/or GOP.

**Green identifies the non-BES synchronous generator, including the generator terminals through the high-side of the step-up transformer, and the non-BES Elements to the common point of connection and the non-BES IBRs that do NOT have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

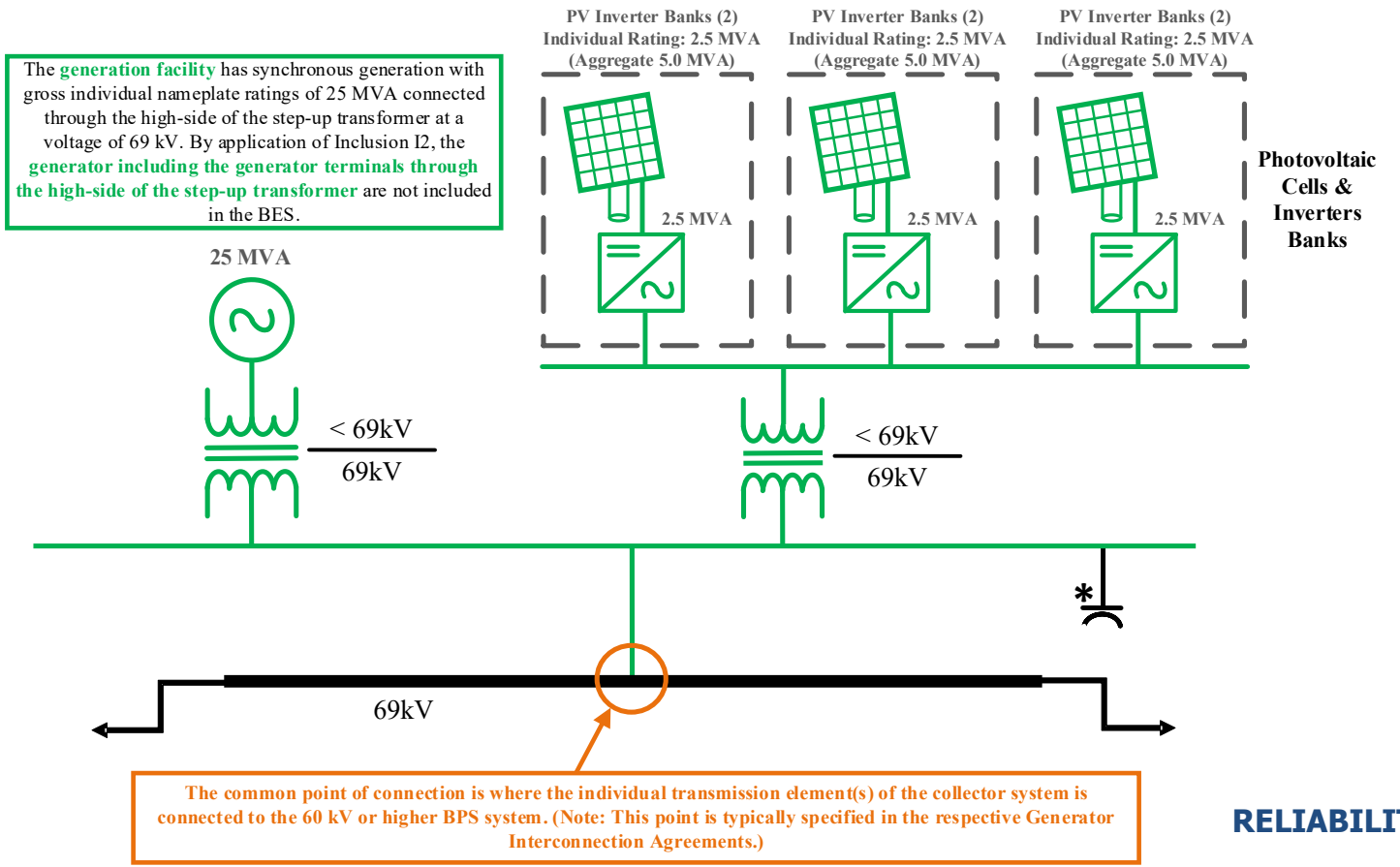



*Figure 11*

# Synchronous Generation (BES) & BESS (non-Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of < 75 MVA (Actual: Synchronous (25 MVA) + BESS (15 MVA) = 40 MVA).
By application of 'gross individual nameplate rating' provision in Inclusion I2 the synchronous generator, including the generator terminals through the high-side of the step-up transformer, is included in the BES.
By application of 'gross aggregate nameplate capacity' provision in Inclusion I2 and I4 the Battery Cells (BESS) & associated Inverter Banks are excluded from the BES.
By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the Battery Cells (BESS) & associated Inverter Banks are NOT candidates for registration as a Category 2 GO and/or GOP.

**Blue identifies the BES synchronous generator, including the generator terminals through the high-side of the step-up transformer, and the BES Elements to the common point of connection.**

**Green identifies the non-BES IBRs that do NOT have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

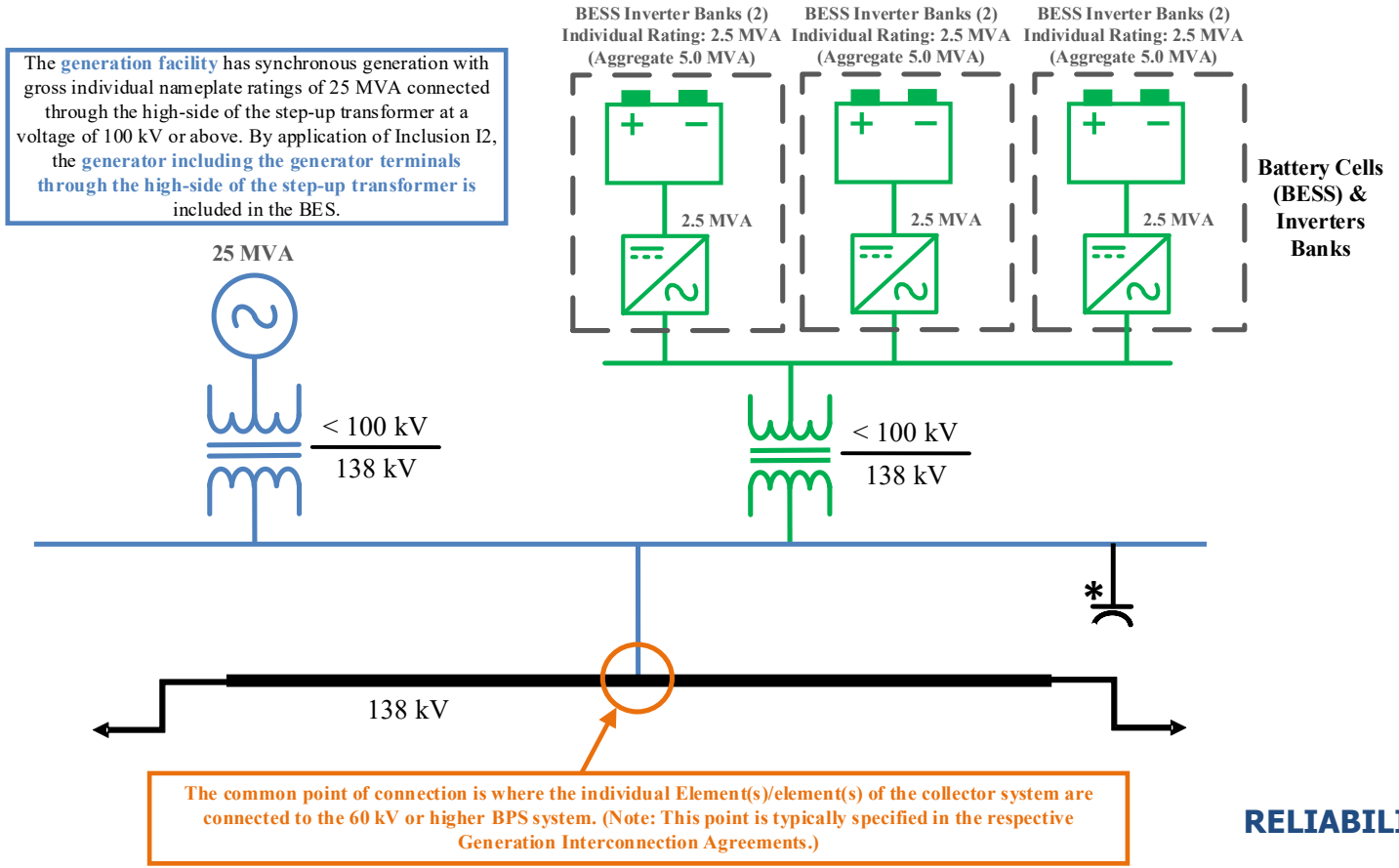



*Figure 12*

# Synchronous Generation (non-BES) & BESS (Category 2)

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of < 75 MVA (Actual: Synchronous (25 MVA) + BESS (25 MVA) = 50 MVA).
By application of Inclusion I2 the synchronous generator, including the generator terminals through the high-side of the step-up transformer, is excluded from the BES.
By application of 'gross aggregate nameplate capacity' provision in Inclusion I2 and I4 the Battery Cells (BESS) & associated Inverter Banks are excluded from the BES.
By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the Battery Cells (BESS) & associated Inverter Banks are candidates for registration as a Category 2 GO and/or GOP.

**Green identifies non-BES synchronous generators, including the generator terminals through the high-side of the step-up transformer(s).**

**Purple identifies the non-BES IBRs that have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.**

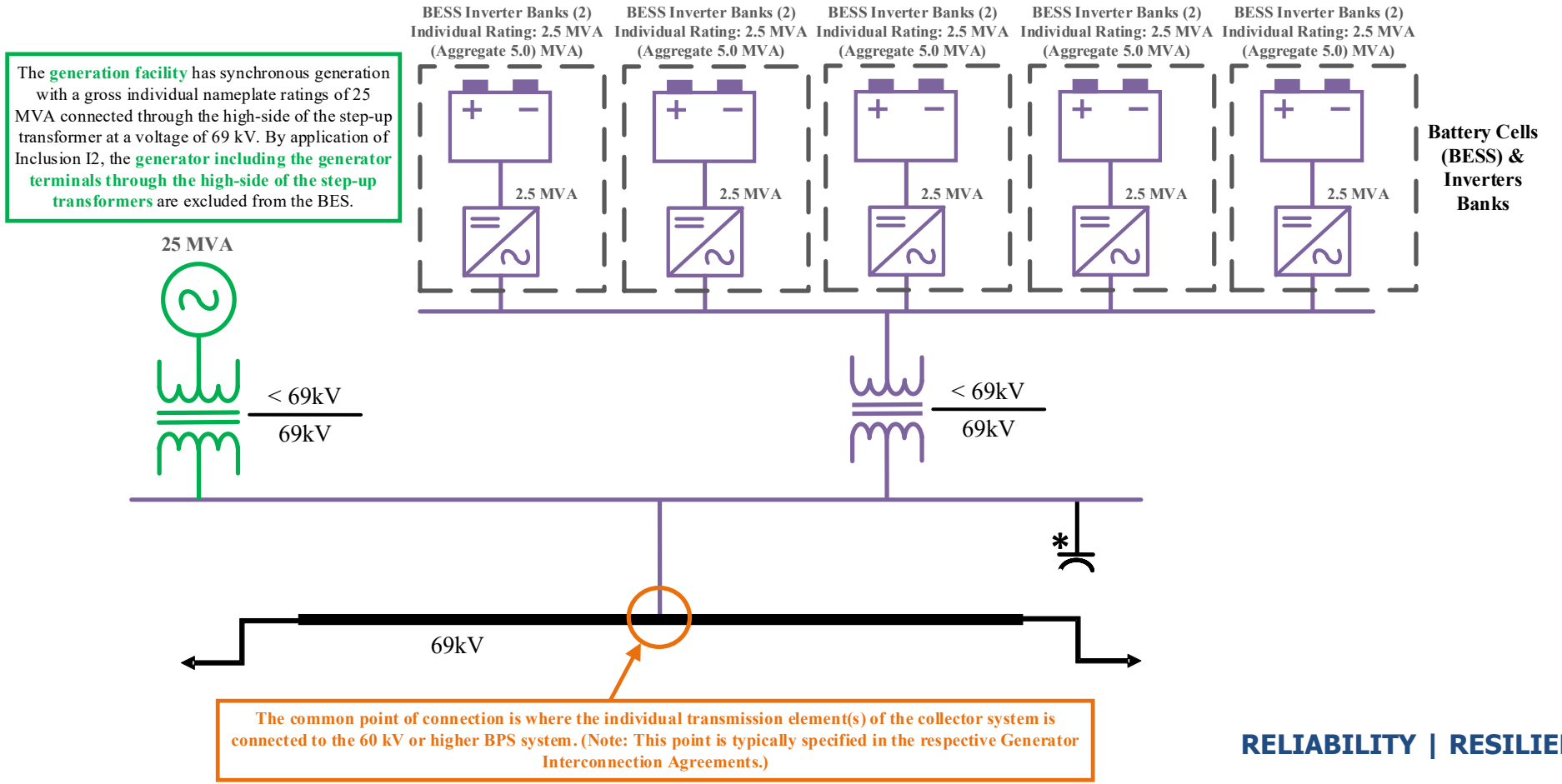


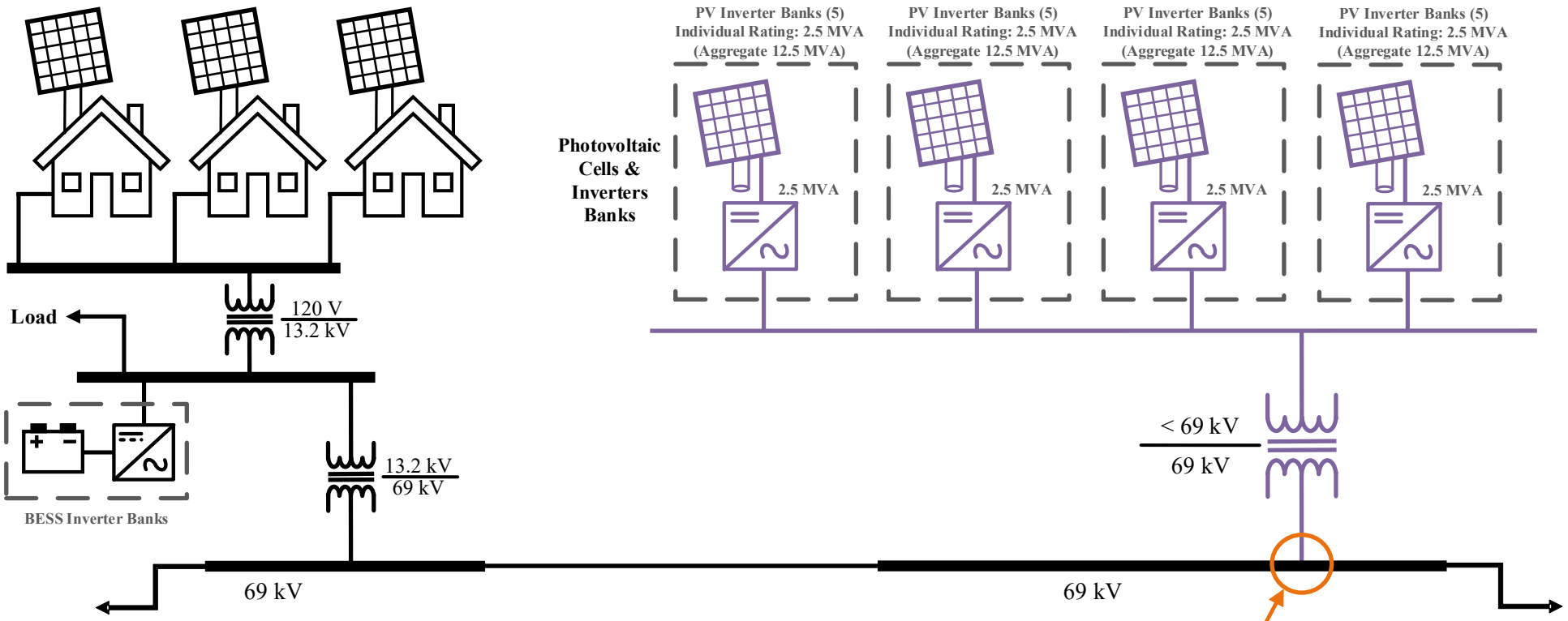

*Figure 13*

# Solar PV (Category 2) – Aggregation Example

Photovoltaic (Solar) generation resource and substation design with a gross aggregate nameplate capacity of ≥ 20 MVA (Actual: 50 MVA). By application of Generator Owner (GO) and Generator Operator (GOP) functional type definitions (i.e., Category 2 Criteria) the Owner and Operator of the Photovoltaic Cells & the associated Inverter Banks are candidates for registration as a Category 2 GO and/or GOP.

Purple identifies the non-BES IBRs that either have or contribute to an aggregate nameplate capacity of greater than or equal to 20 MVA, connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.

**(Note: This diagram was developed to emphasize that generation interconnection facilities operated at < 60 kV that serve a dual purpose of aggregating generation and serving Load, do not impact the application of the gross aggregate nameplate capacity provision in the GO and GOP Category 2 Registration Criteria.)**




**Black indicates Elements/elements that are not evaluated based on the Generator Owner (GO) and Generator Operator (GOP) Category 2 Registration Criteria.**

**The generation interconnection facilities at the < 60 kV (Actual: 13.2 kV) voltage level serve a dual purpose of aggregating generation and serving Load. Therefore the generation resources (Photovoltaic Cells & the associated Inverter Banks (roof-top solar generator units) and the Battery Cells & associated Inverter Banks (BESS generator units)) are NOT included in the aggregation of the Category 2 non-BES Inverter Based Generating Resources.**

**The common point of connection is where the individual element(s) of the collector system are connected to the 60 kV or higher BPS system. (Note: This point is typically specified in the respective Generation Interconnection Agreements.)**

*Figure 14*

# Questions and Answers

Join at **slido.com**
with the code**#2942388**
and passcode **IBRPractice**
**or Scan the QR Code.**

NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

IBR REGISTRATION INITIATIVE

# Closing Remarks