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.

Effective May 15, 2026, entities must register with NERC that own and operate non-Bulk Electric System (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. The purpose of this CMEP Practice Guide is to provide guidance to ERO Enterprise staff with respect to the consistent application of the revised Registration Criteria thresholds for Category 2 GOs and GOPs.

Bulk Electric System Review

For consistent application of registering Category 2 GOs and GOPs, it is important to review the criteria for registering Category 1 (i.e., BES resources) owners and operators. BES is a NERC defined term and foundationally includes Real Power and Reactive Power resources connected at 100 kV or higher, individual resources greater than 20 MVA and resources that aggregate to greater than 75 MVA. The BES definition contains a set of Inclusions and Exclusions relevant to IBRs which are characterized as "dispersed power producing resources." Inclusion I4 establishes criteria for what constitutes dispersed power producing resources within the scope of the BES Definition as:

> "*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[8] provides the following guidance on which resources are applicable to Inclusion I4:

> *"Dispersed power producing resources are small-scale power generation technologies that use 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."*

This highlights that Inclusion I4 applies to IBRs such as battery energy storage systems (BESS) and solar photo-voltaic (PV), as well as wind resources (which may or may not be inverter-based) connected at a common point of connection at a voltage of 100 kV or above. Owners and Operators of IBRs that meet the BES Inclusion I4 are required to register with NERC as GO Category 1 and GOP Category 1.

[8] https://www.nerc.com/pa/RAPA/BES%20DL/bes_phase2_reference_document_20140325_final_clean.pdf

Application of the NERC Registry Criteria for Category 2 GOs and GOPs

The revised GO and GOP Definitions in ROP Appendix 5B include functional criteria for Category 2 GOs and GOPs of non-BES IBRs in part 2 of the Definition as follows:

Function Type	Acronym	Definition/Discussion
Generator Operator	GOP	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 that 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 that or equal to 60kV (Category 2 GOP).
Generator Owner	GO	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 60kV (Category 2 GO).

The application of the new non-BES IBR registration criteria (GO Category 2) is very similar to the application of the BES Inclusion I4 for BES dispersed power producing resources as noted above in Bulk Electric System Review. The primary difference is the voltage and nameplate capacity thresholds. The voltage threshold for GO Category 2 is greater than or equal to 60 kV and the aggregate nameplate capacity threshold is greater than or equal to 20 MVA. Further, the generating resources must interface with the BPS via an inverter- based technology.

In addition, many of the principles highlighted in the ERO Enterprise CMEP Practice Guide: Application of the Bulk Electric System Definition to Battery Energy Storage Systems and Hybrid Resources[9] are also applicable to the Category 2 IBRs. However, one different aspect is related to aggregation of nameplate capacity with synchronous resources. BES hybrid resources may include combinations of technologies with different types of dispersed power producing resources, such as solar PV and battery storage, as well as synchronous generating resources. Since the Category 2 criteria is limited to IBRs, hybrid resources with Category 2 IBRs do not include synchronous resources.

Accordingly, ERO Enterprise staff should ensure an aggregate of the gross nameplate ratings of all IBRs at the facility is used to determine the total nameplate capacity of the hybrid resource. If the total nameplate capacity at the facility is greater than or equal to 20 MVA and connected at 60 kV or above, including all of the IBRs but not including synchronous resources, then all the IBRs at the facility are Category 2 non-BES IBRs.

ERO Enterprise staff shall consider the following key points when evaluating IBRs and hybrid resources:

[9] https://www.nerc.com/pa/comp/Pages/Registration.aspx

- Non-BES IBRs are connected at a common point of connection of 60 kV or above
- Gross nameplate rating refers to the apparent power rating (MVA)
- In the determination of aggregate gross nameplate rating:
  - 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

For further consideration, refer to the Attachments for examples of different configuration diagrams of IBRs.

NERC Registration Considerations for Category 2 GOs and GOPs

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

The following figures are intended to provide ERO Enterprise staff examples of possible configurations and include both text and diagrams explaining how to apply the Registry Criteria for non-BES IBRs for the specific configuration shown. These examples are not to be considered all-inclusive and are provided for illustrative purposes only.

For the purpose of this practice guide, examples of different plant configurations will be limited to various combinations of IBRs, focusing on the application of the Category 2 criteria for solar PV, BESS, and wind, or combinations of these resources with synchronous generation[10].

Figure 1: Solar PV, Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Category 2
Figure 2: Solar PV, Aggregate Nameplate Rating 15 MVA (Connection 69 kV), non-Category 2
Figure 3: Solar PV (15 MVA) & BESS (15 MVA), Aggregate Nameplate Rating 30 MVA (Connection 115 kV), Category 2
Figure 4: Solar PV & BESS (DC Coupled), Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Category 2
Figure 5: Solar PV (Company A (15 MVA)) & BESS (Company B (15 MVA)), Aggregate Nameplate Rating 30 MVA (Connection 115 kV), Category 2
Figure 6: Wind (Type 3-4), Aggregate Nameplate Rating 100 MVA (Connection 69 kV), Category 2
Figure 7: Wind (Type 3-4), Aggregate Nameplate Rating 15 MVA (Connection 69 kV), non-Category 2
Figure 8: Wind (Type 3-4) (50 MVA) & BESS (20 MVA), Aggregate Nameplate Rating 70 MVA (Connection 138 kV), Category 2
Figure 9: Wind (Type 3-4) (Company A (15 MVA)) & BESS (Company B (10 MVA)), Aggregate Nameplate Rating 25 MVA (Connection 138 kV), Category 2
Figure 10: Synchronous Generation (50 MVA) & BESS (20 MVA), Aggregate Nameplate Rating 70 MVA (Connection 115 kV), Synchronous Generation – BES, BESS – Category 2
Figure 11: Synchronous Generation (25 MVA) & Solar PV (15 MVA), Aggregate Nameplate Rating 40 MVA (Connection 69 kV), Synchronous Generation – non-BES, Solar PV – non-Category 2
Figure 12: Synchronous Generation (25 MVA) & BESS (15 MVA), Aggregate Nameplate Rating 40 MVA (Connection 138 kV), Synchronous Generation – BES, BESS – non-Category 2
Figure 13: Synchronous Generation (25 MVA) & BESS (25 MVA), Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Synchronous Generation – non-BES, BESS – Category 2
Figure 14: Solar PV, Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Category 2 – Aggregation Example

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/element is NOT included in the BES and/or non-BES IBRs that do NOT meet the GO Category 2 criteria.

[10] Resources that are connected at greater than or equal to 100 kV should first be evaluated under the BES Definition to determine if the resource(s) are BES (and possibly classified as Category 1).

- **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 rating.

Version History

Version	Date	Action	Change Tracking
1	January 31, 2025	CMEP practice guide for "Application of the Registry Criteria for Category 2 Generator Owner and Generator Operator Inverter-Based Resources"	New

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.

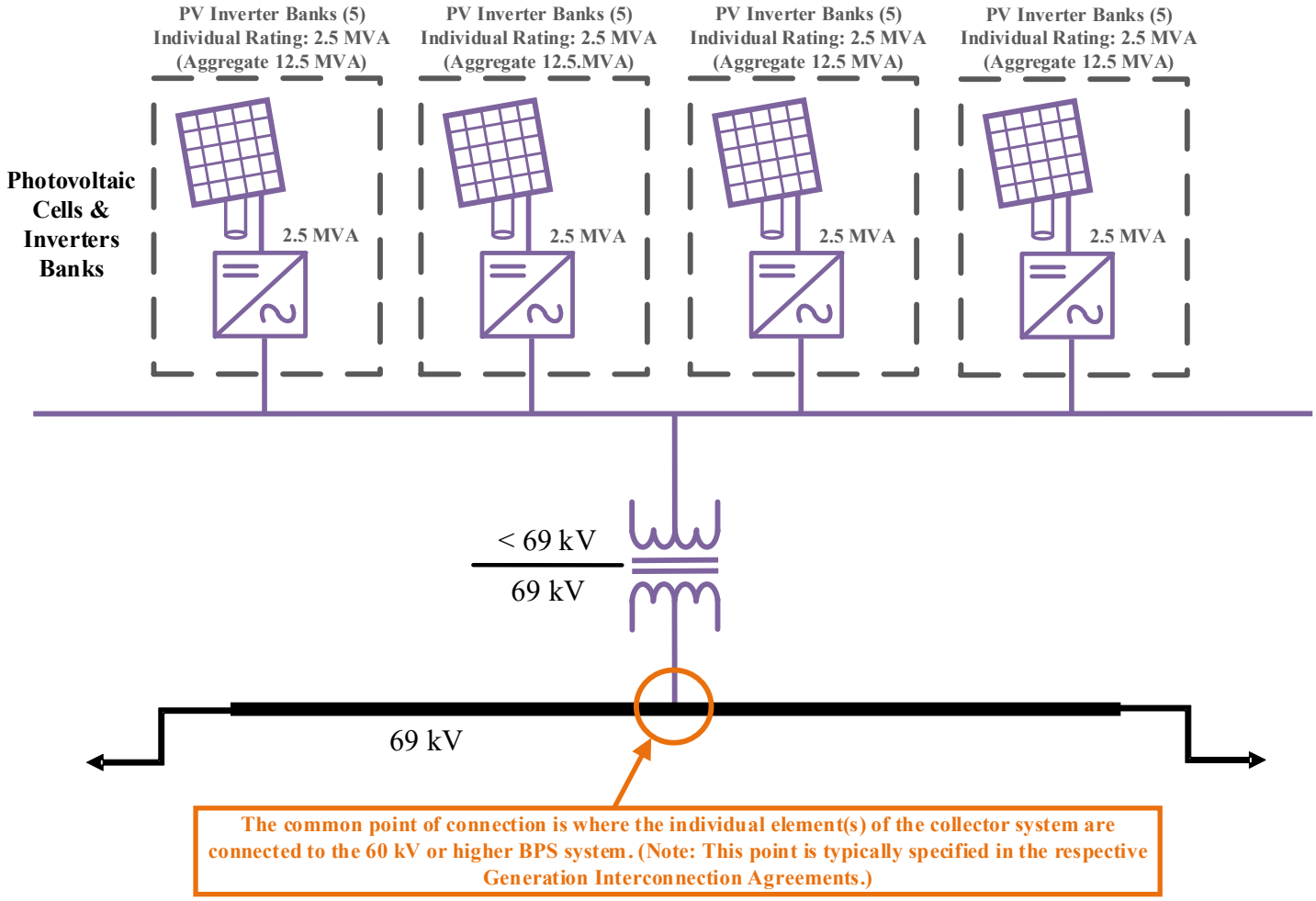

Figure 1: Solar PV, Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Category 2

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.

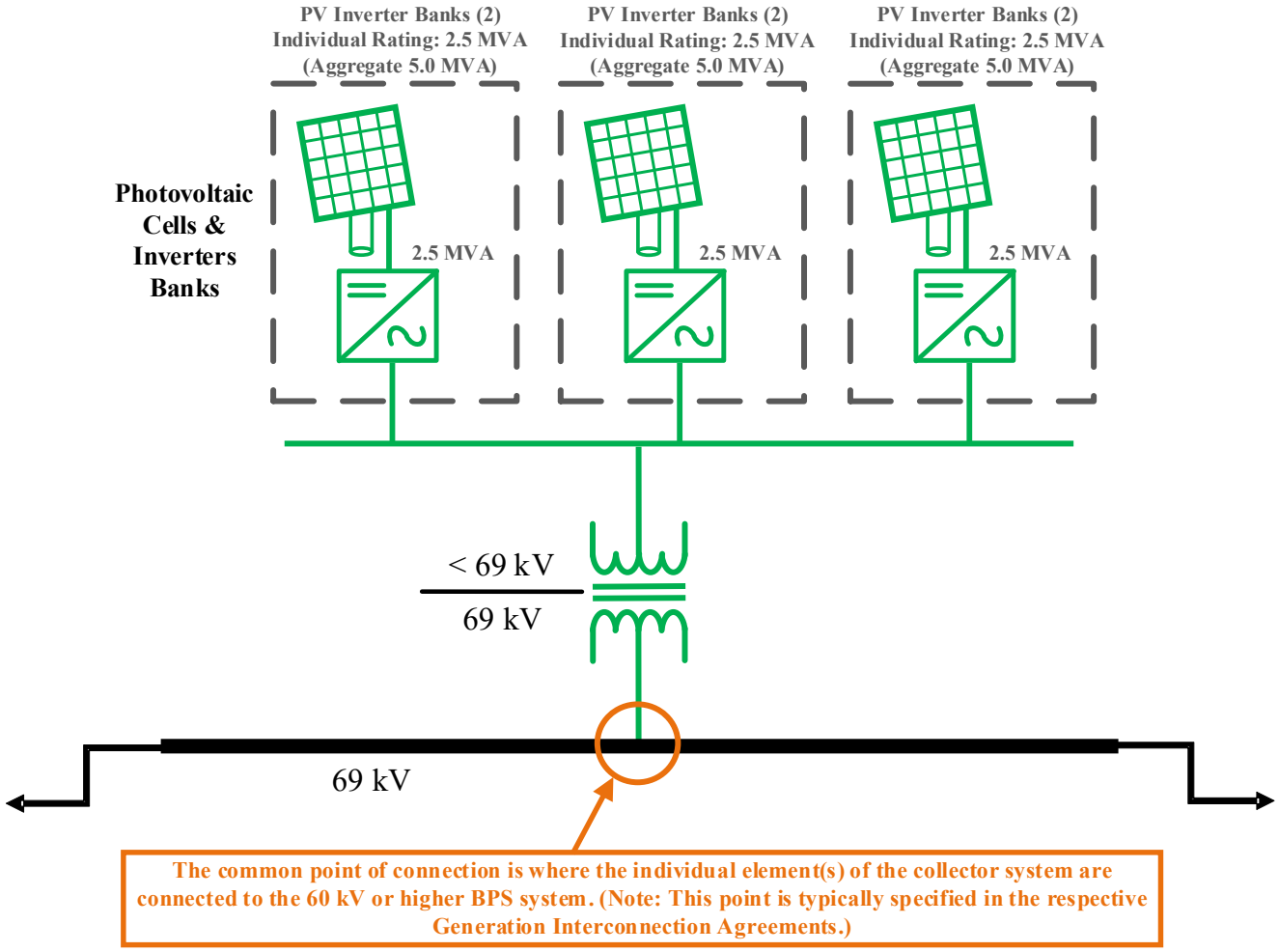

Figure 2: Solar PV, Aggregate Nameplate Rating 15 MVA (Connection 69 kV), non-Category 2

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.

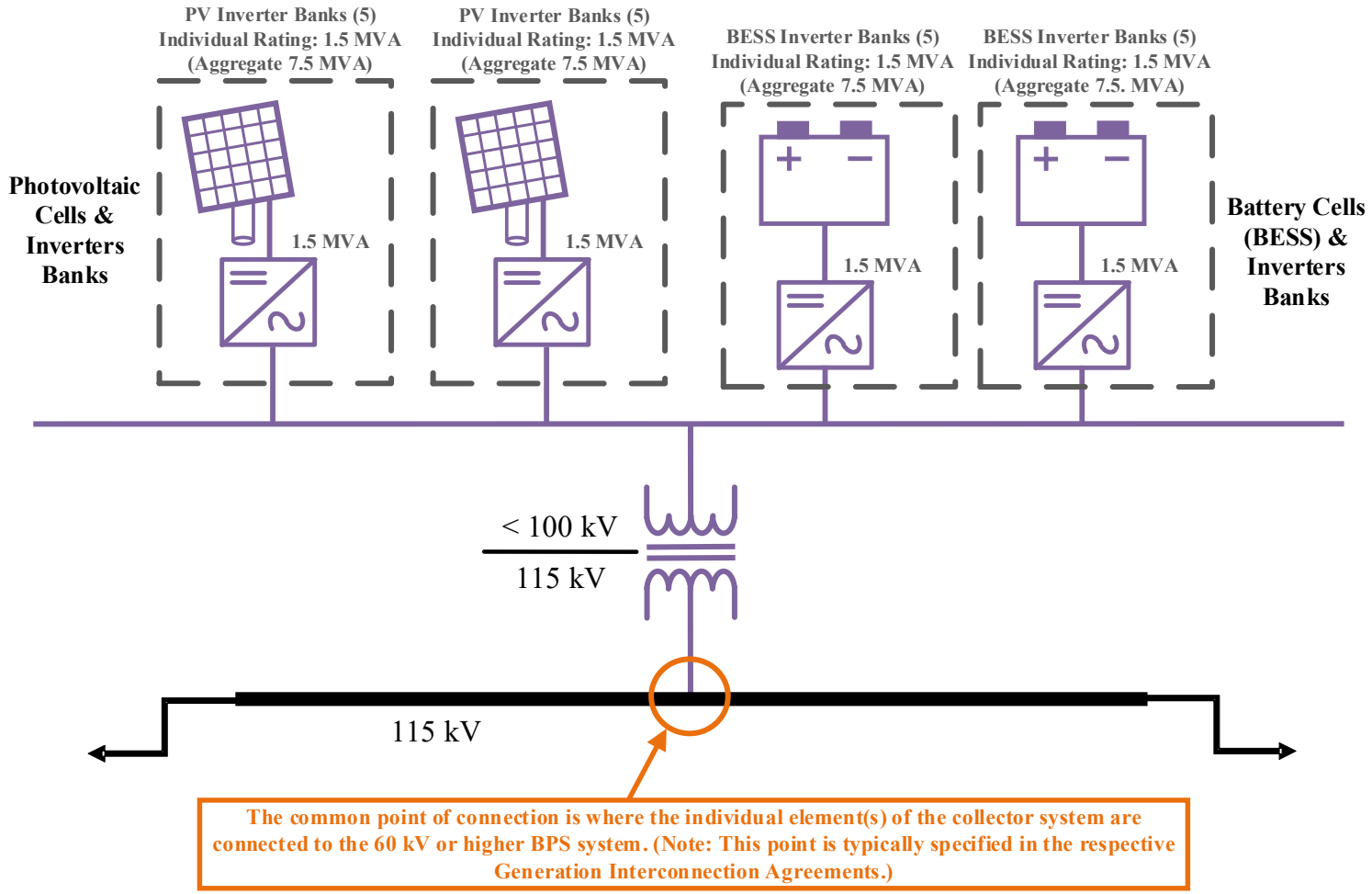

Figure 3: Solar PV (15 MVA) & BESS (15 MVA), Aggregate Nameplate Rating 30 MVA (Connection 115 kV), Category 2

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.

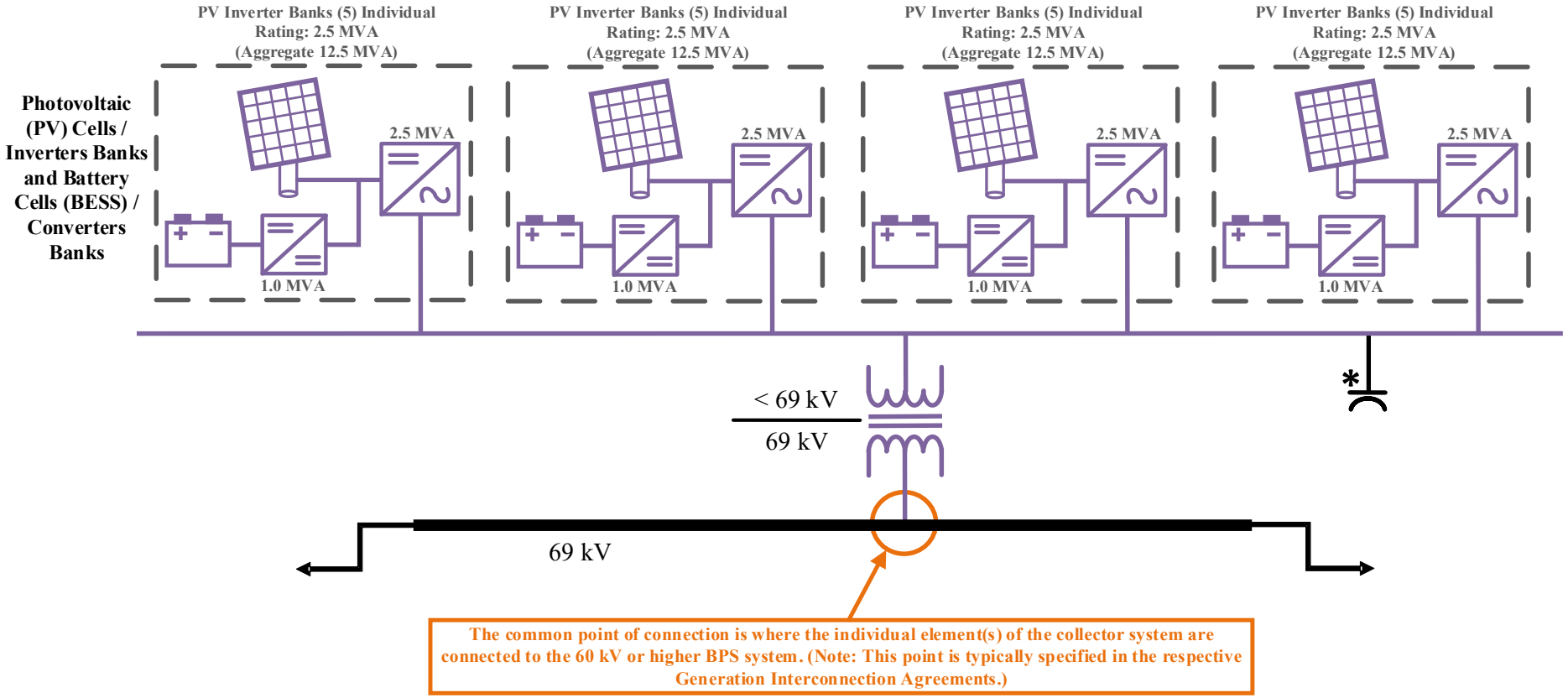

Figure 4: Solar PV & BESS (DC Coupled), Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Category 2

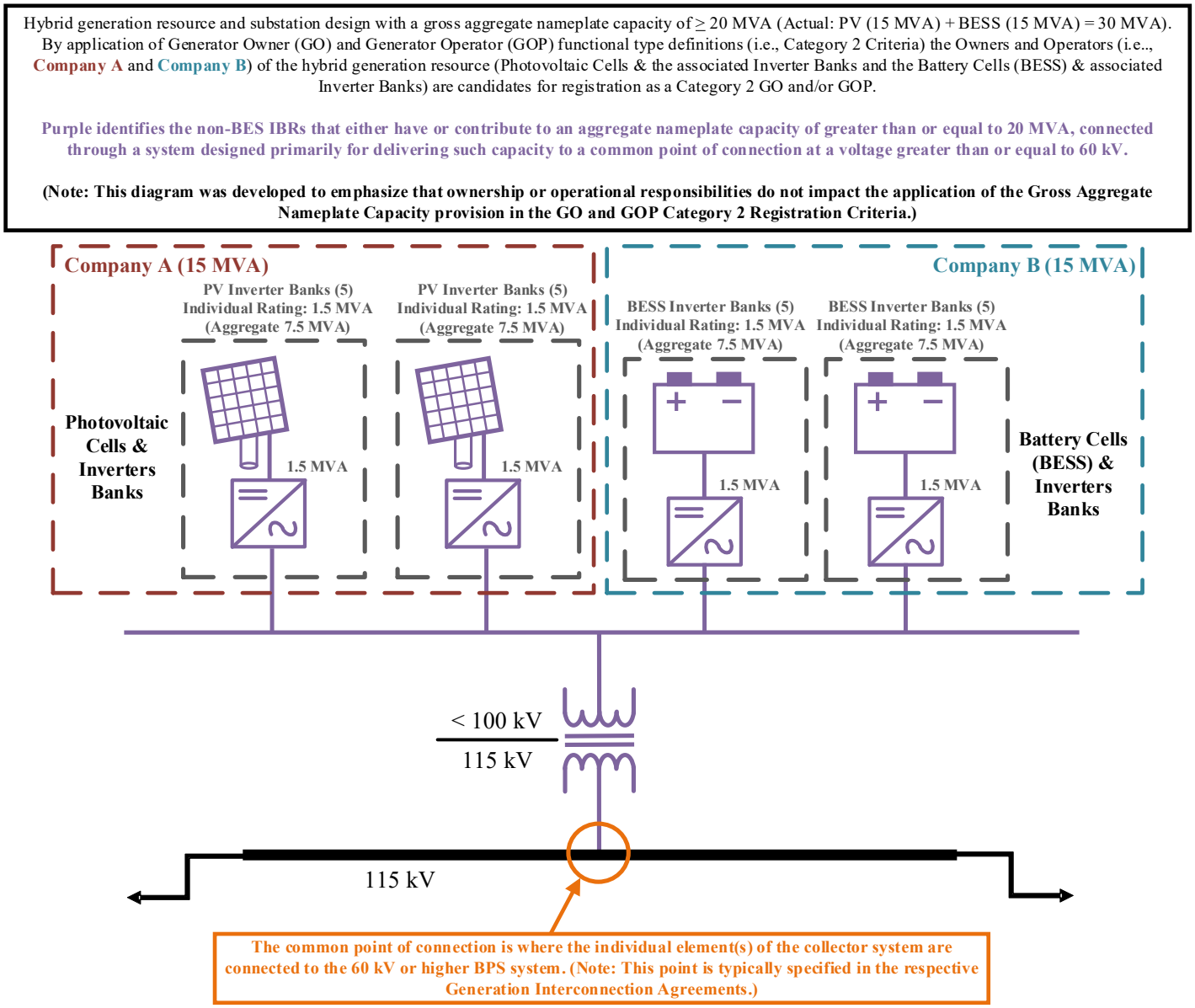

Figure 5: Solar PV (Company A (15 MVA)) & BESS (Company B (15 MVA)), Aggregate Nameplate Rating 30 MVA (Connection 115 kV), Category 2

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.

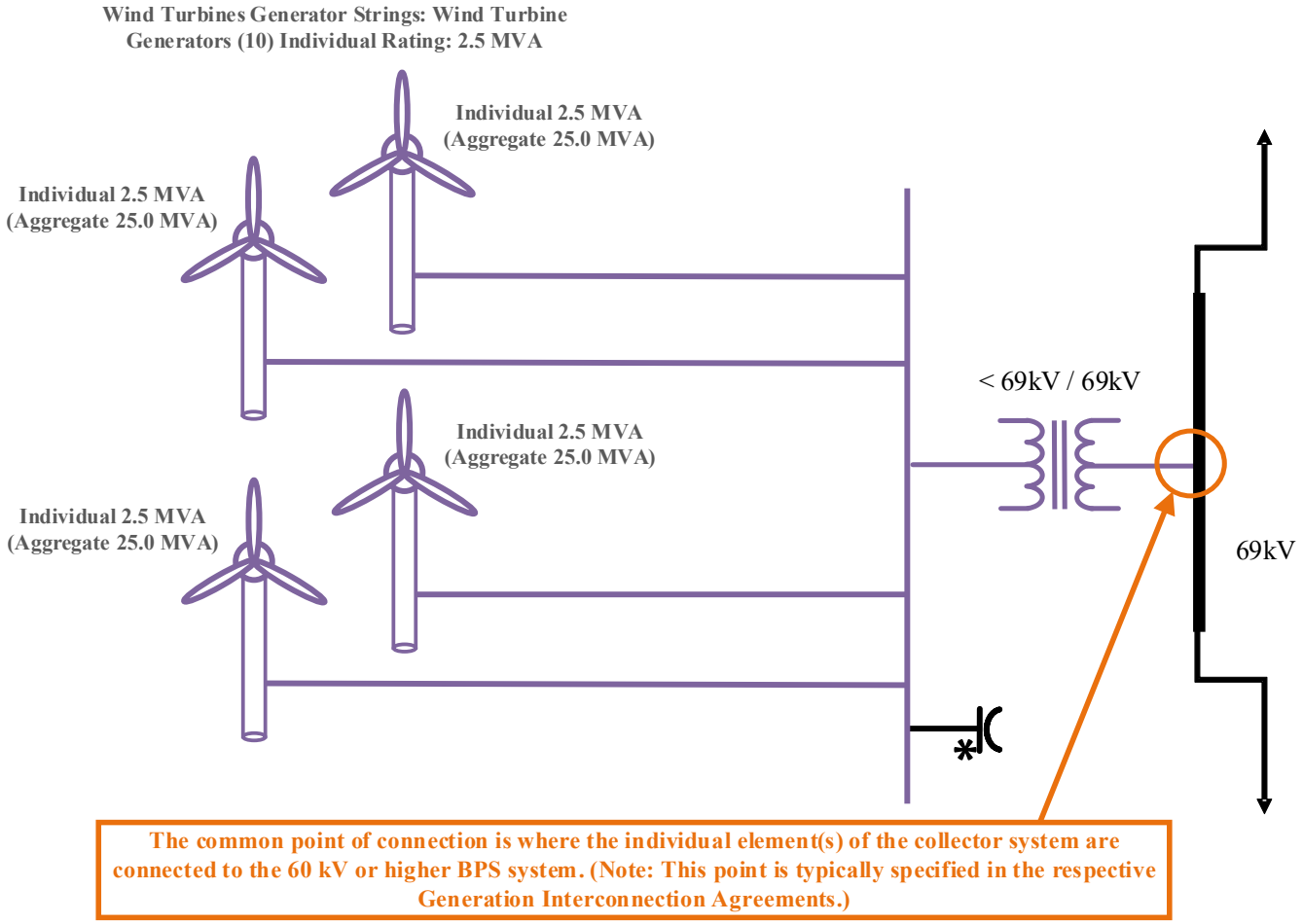

Figure 6: Wind (Type 3-4), Aggregate Nameplate Rating 100 MVA (Connection 69 kV), Category 2

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.

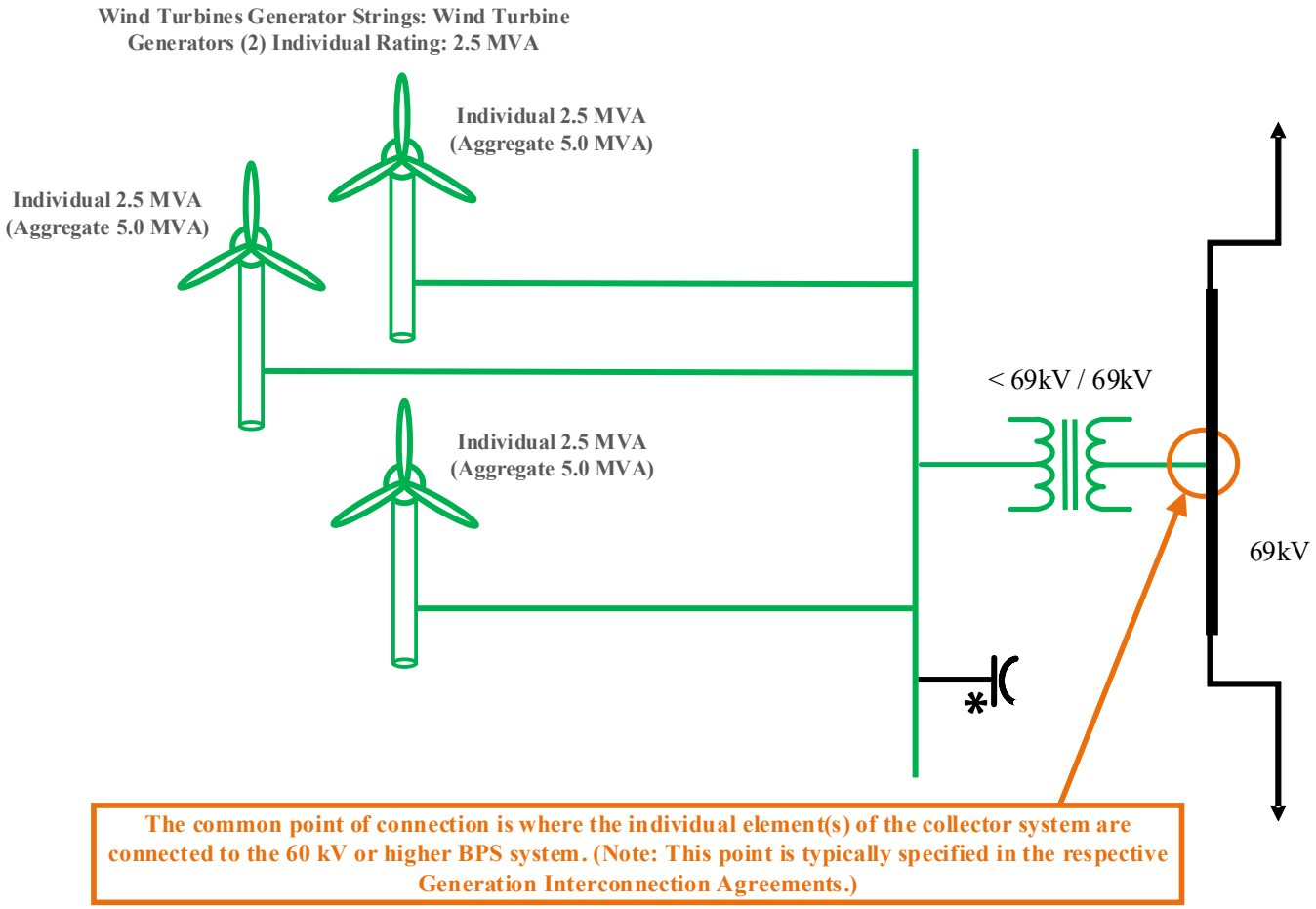

Figure 7: Wind (Type 3-4), Aggregate Nameplate Rating 15 MVA (Connection 69 kV), non-Category 2

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.

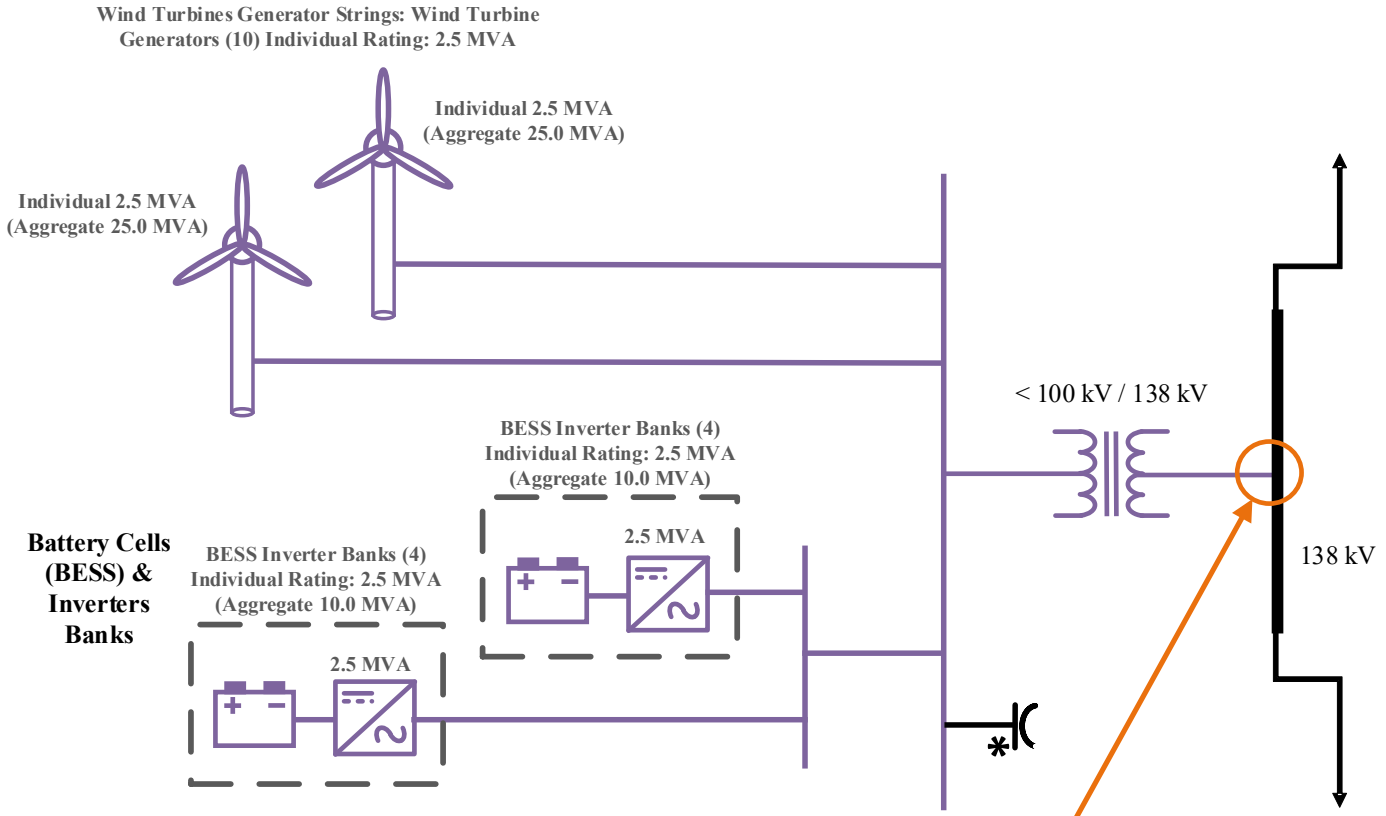

Figure 8: Wind (Type 3-4) (50 MVA) & BESS (20 MVA), Aggregate Nameplate Rating 70 MVA (Connection 138 kV), Category 2

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.)

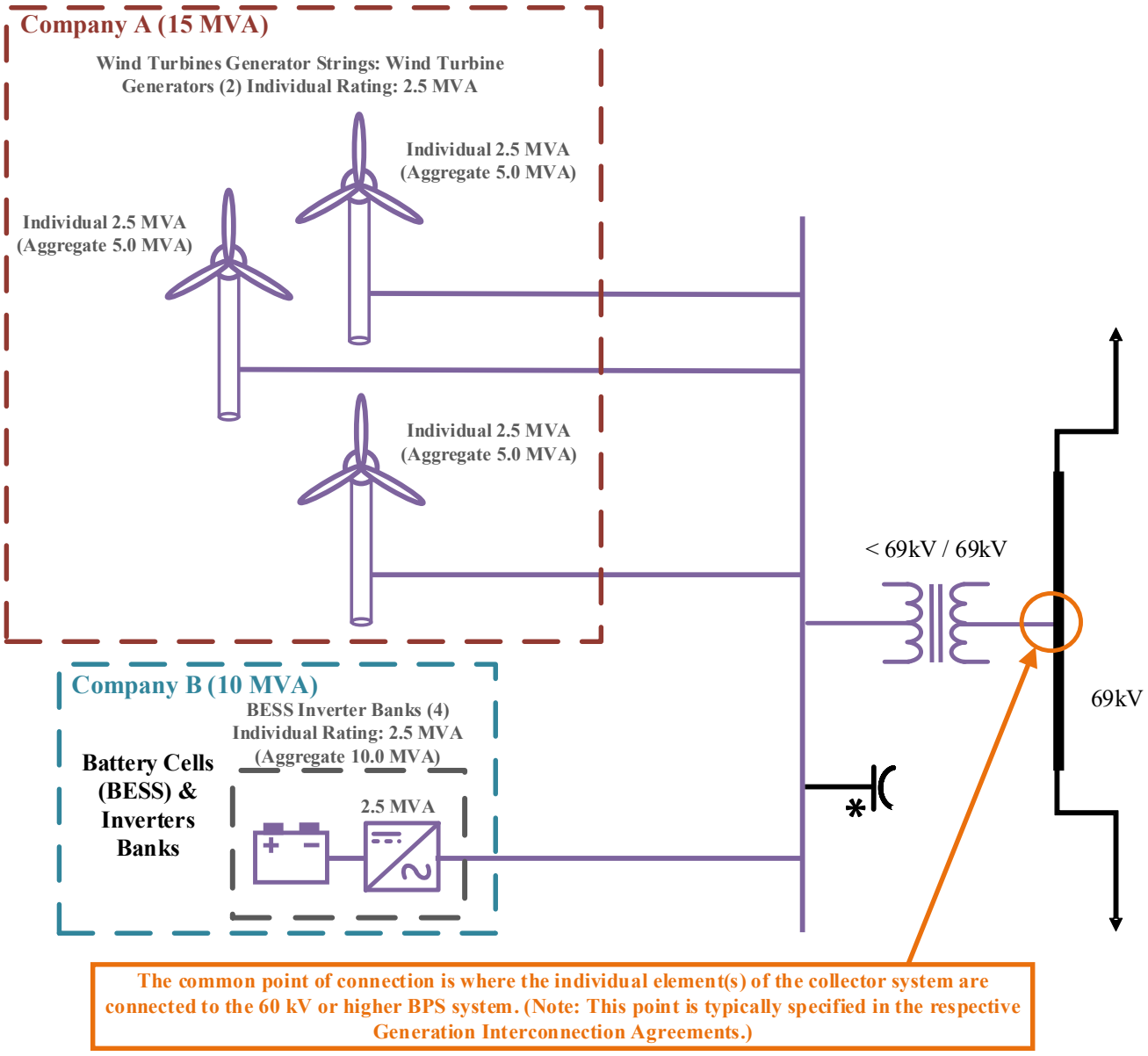

Figure 9: Wind (Type 3-4) (Company A (15 MVA)) & BESS (Company B (10 MVA)), Aggregate Nameplate Rating 25 MVA (Connection 138 kV), Category 2

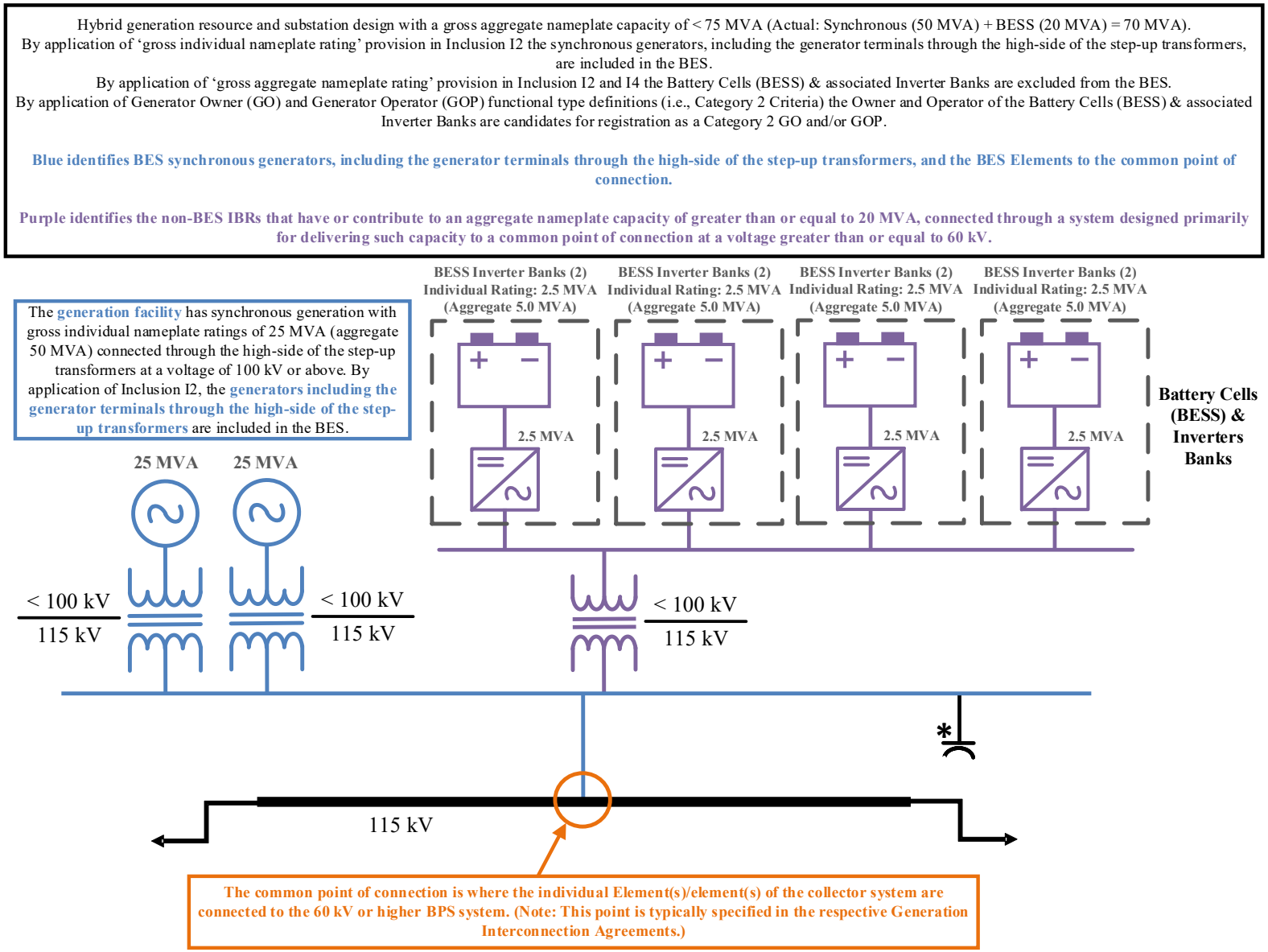

Figure 10: Synchronous Generation (50 MVA) & BESS (20 MVA), Aggregate Nameplate Rating 70 MVA (Connection 115 kV), Synchronous Generation – BES, BESS – Category 2

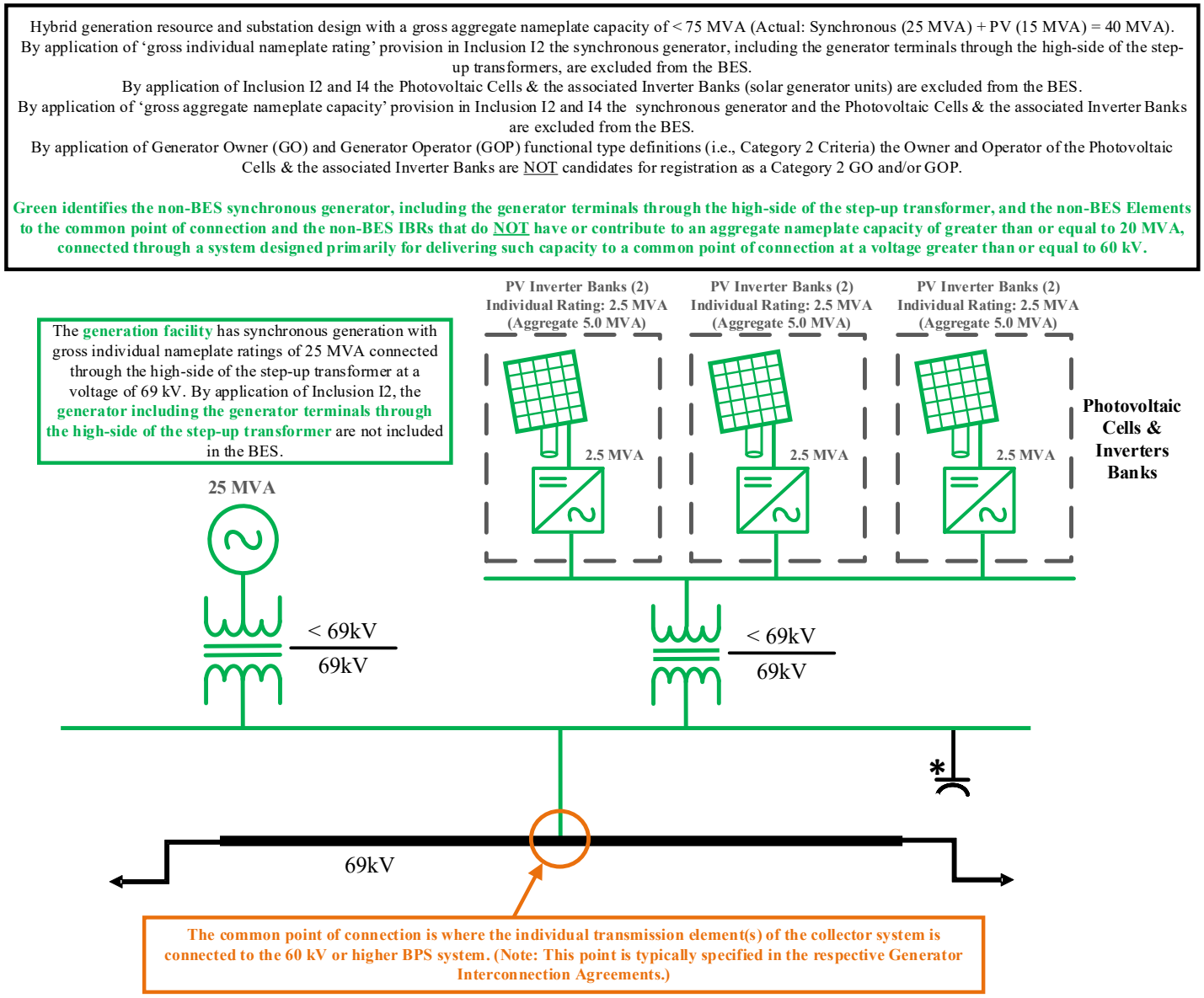

Figure 11: Synchronous Generation (25 MVA) & Solar PV (15 MVA), Aggregate Nameplate Rating 40 MVA (Connection 69 kV), Synchronous Generation – non-BES, Solar PV – non-Category 2

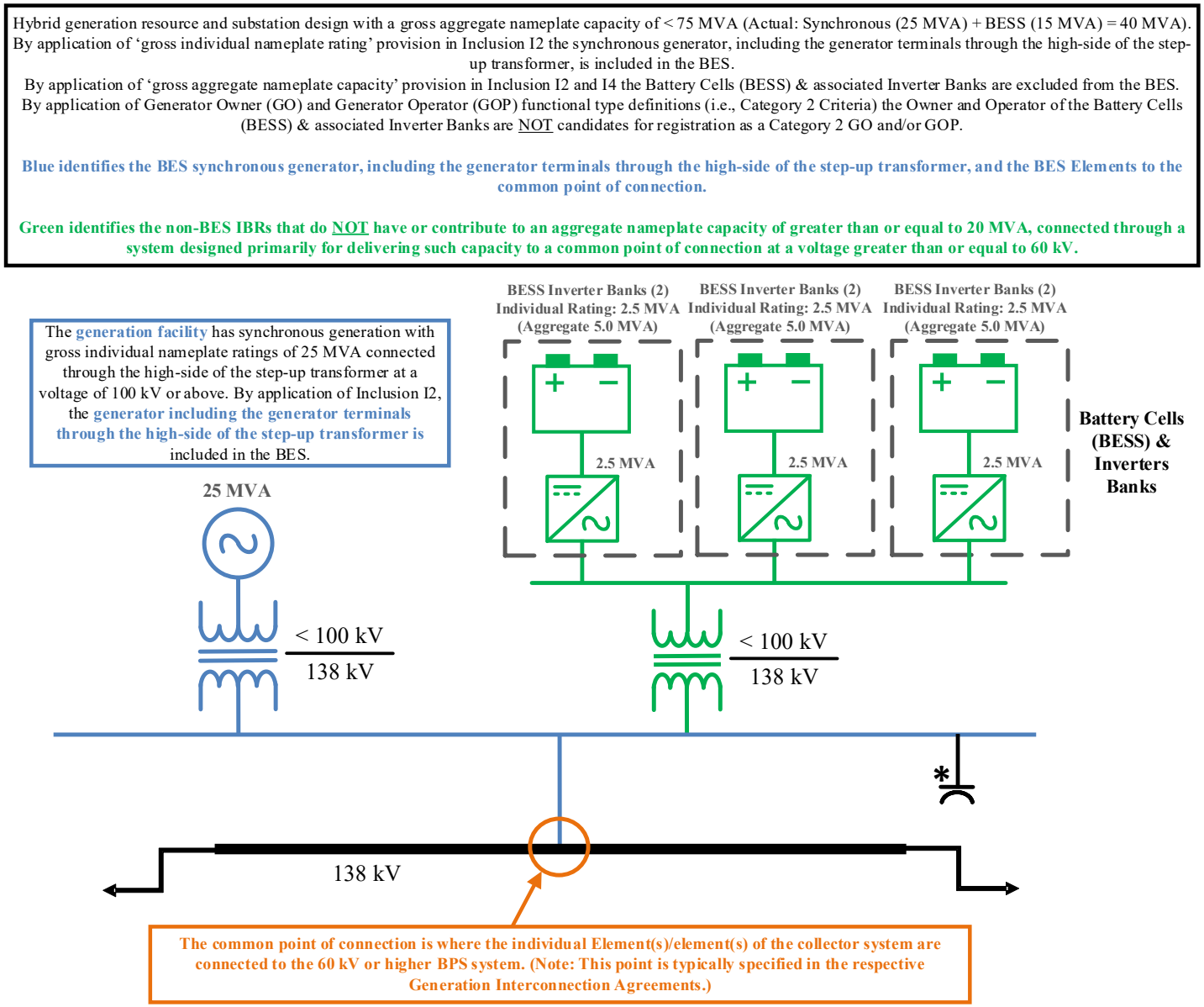

Figure 12: Synchronous Generation (25 MVA) & BESS (15 MVA), Aggregate Nameplate Rating 40 MVA (Connection 138 kV), Synchronous Generation – BES, BESS – non-Category 2

Hybrid generation resource and substation design with a gross aggregate nameplate capacity of < 75 MVA (Actual: Synchronous (25 MVA) + BESS (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.

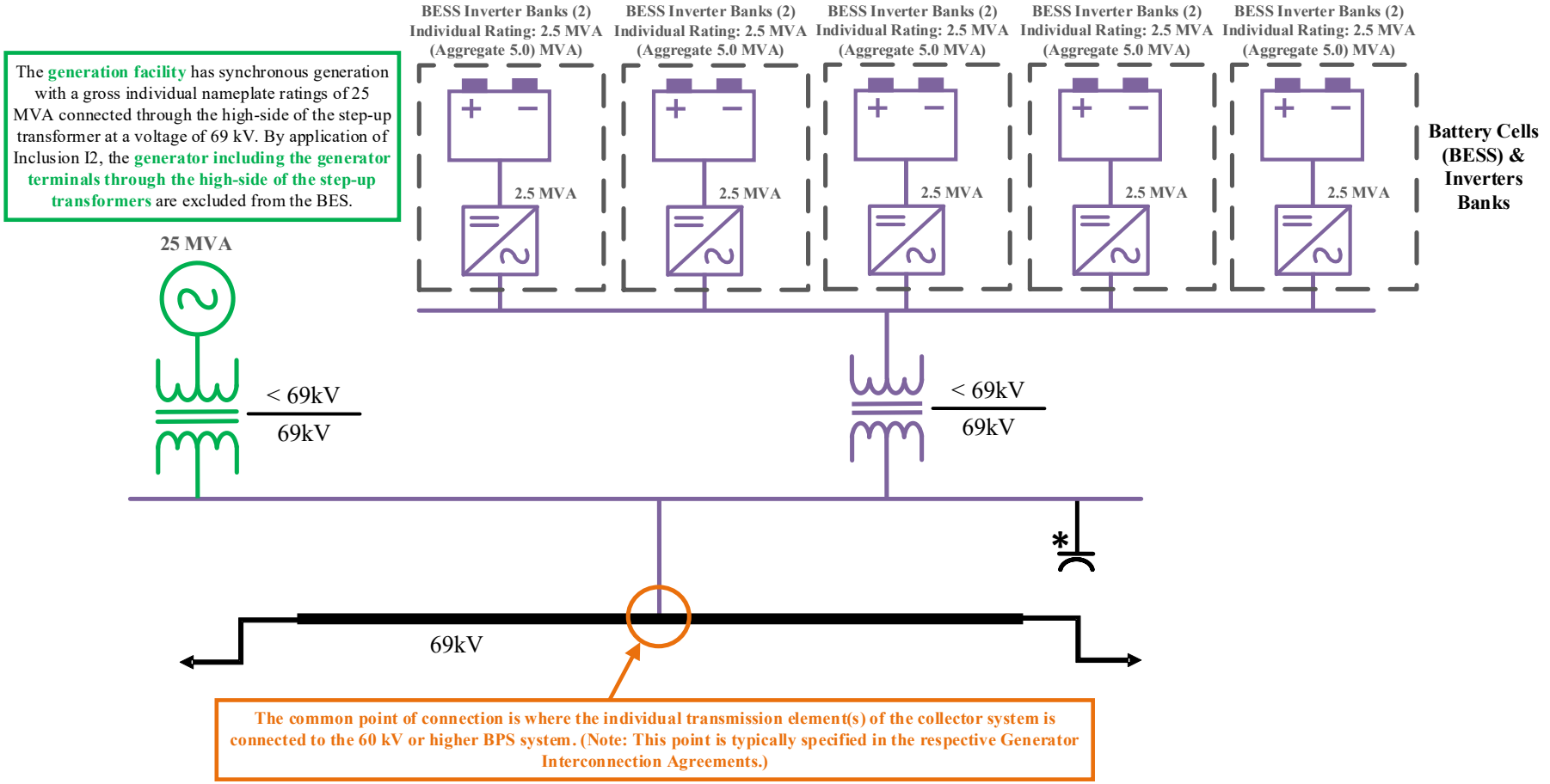

Figure 13: Synchronous Generation (25 MVA) & BESS (25 MVA), Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Synchronous Generation – non-BES, BESS – Category 2

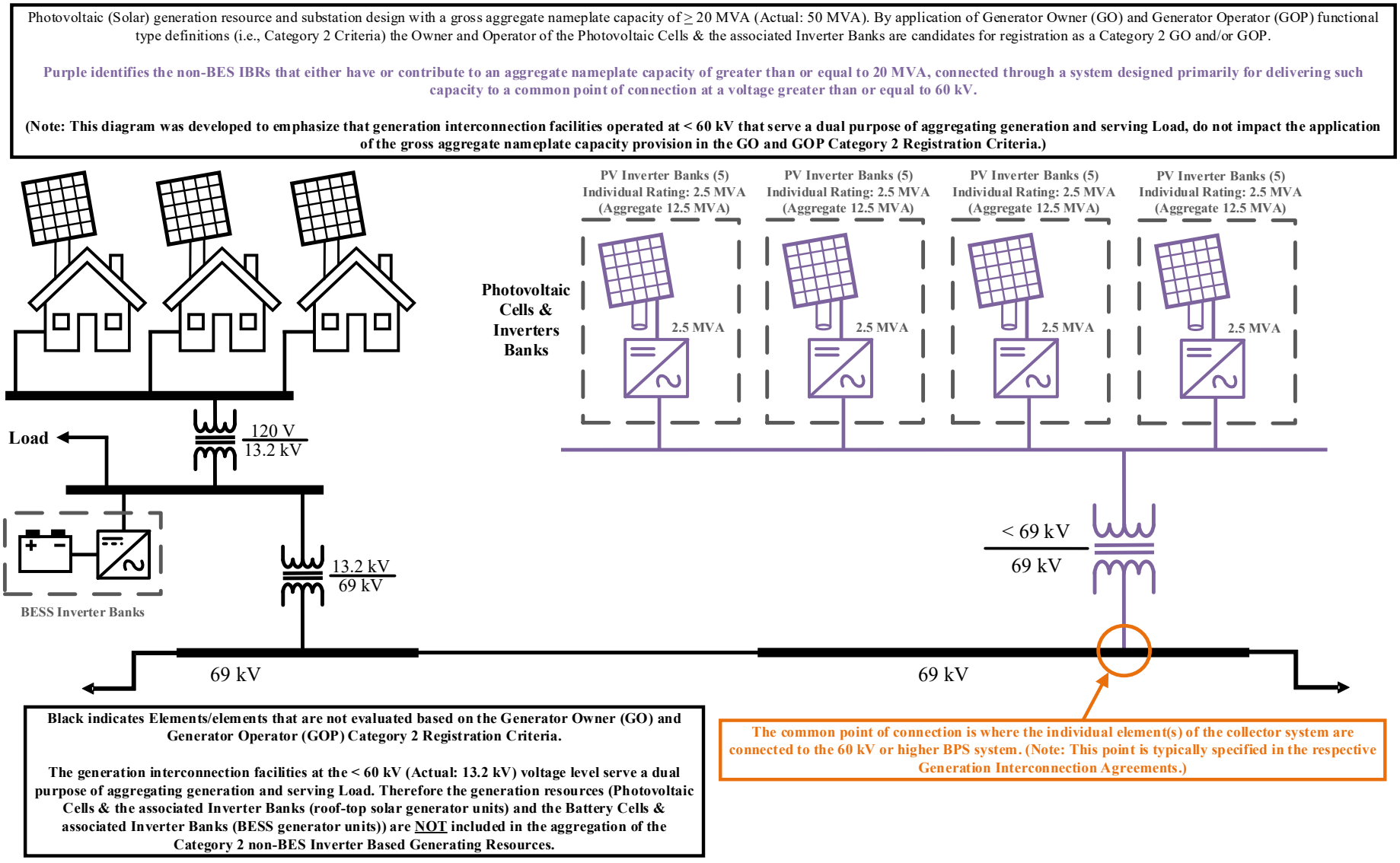

Figure 14: Solar PV, Aggregate Nameplate Rating 50 MVA (Connection 69 kV), Category 2 – Aggregation Example