Protection of Embedded Generation

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Endeavour Energy

POWER together

Revision History

Nil.

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Contents

1. Introduction

1.1 Purpose of Document

This Company standard details the electrical protection requirements for the high voltage connection of privately owned embedded generation to the Endeavour Energy high voltage network.

"Embedded Generation" refers to generators connected solely to the distribution network and not directly interfaced with the sub-transmission or transmission networks. This document serves Endeavour Energy employees and generator proponents to ensure consistent application of protection schemes for integrating private generation into the Endeavour Energy network., whether embedded or connected at the sub-transmission or transmission levels.

It specifies the minimum protection requirements for embedded generation connected to the Endeavour Energy network. While these protection measures are intended to safeguard the Endeavour Energy network, they do not address the protection of the generation equipment itself. Endeavour Energy assumes no responsibility for the protection of the generation equipment.

For additional information regarding connection processes and timeframes, please contact the Endeavour Energy Customer Network Solutions team.

This document focuses solely on protection requirements and does not cover additional technical aspects related to connections, such as metering, power quality, inverter response modes, or communication systems. For advice on any topics not included in this document, consult the Endeavour Energy Customer Network Solutions team.

1.2 Scope

This standard applies to new connections, modifications to existing high voltage[1] (HV) embedded generation (EG) systems, or temporarily connected HV EG systems using generating technologies including, but not limited to, Inverter Energy Systems (IES), Energy Storage Systems (ESS), synchronous generators, asynchronous generators, or any combination of these technologies. The conditions for applicability are:

- The EG units are intended to be connected to and capable of operating in parallel with the HV Network.
- All other technical requirements set out in this document are met.

A HV EG connection is categorised as detailed in the following Table 1, which outlines the applicable processes and protection requirements and references to the Australian Energy Market Operator (AEMO) and National Electricity Rules (NER) requirements.

[1] – HV connection refers to the connection point voltage, an installation which for example has HV connected IES systems with 230/400Vac inverters but supplied directly from the HV Endeavour Energy network is covered by this standard, not PDI5000 Part a – LV EG Systems.

Table 1: HV EG Connection and Protection Requirements

Generation Capacity	Connection Process	Protection Requirements
≥30kW to <5MW	Connections automatically exempted from AEMO registration - NER Chapter 5A	PDI5000
≥5MW to <30MW	Connections can be exempted from AEMO registration- NER Chapter 5 shall be applicable regardless of exemption status.	PDI5000 and NER chapter 5

≥30MW	Connections must register with AEMO - NER Chapter 5 regardless of exemption status.	PDI5000 and NER chapter 5

This Standard does not apply to:

- EG units covered by Endeavour Energy Micro embedded generator connection service requirements.
- EG units covered by Endeavour Energy protection requirements for Low Voltage (LV) connected generators.
- Electric vehicles, unless the on-board battery storage system is capable of exporting to the MV/HV network (in which case the requirements shall apply).
- Distributed Energy Resource (DER) systems that do not generate electricity, including demand response/demand management systems, unless they impact on the ability of the high voltage EG system to meet the technical requirements.
- The protection requirements outlined in this document do not apply to system that are connected via synchronise, close, transfer trip operation (SCTT) and do not operate in parallel with the network (e.g. standby generators with break before making connections). Please refer section 4.7.5 and 4.7.6 for the technical requirements for such connections.

1.3 Obligations

Embedded Generation Proponents and Endeavour Energy have certain obligations for embedded generator connections.

The general obligations for proponents include:

- To comply with the technical requirements as well as relevant national standards, industry codes, legislation and regulations. In the event of inconsistency, legislation and regulations, followed by the technical requirements, followed by national standards and industry codes shall prevail.
- Do not connect additional inverters, make modifications, or install additional HV EG units, including ESS, without prior written agreement from Endeavour Energy.
- To comply with the Endeavour Energy connection agreement.
- To meet the requirements in the design, installation and operation of the High Voltage Embedded Generation System.
- To meet the connection and commissioning requirements to the HV network.

Endeavour Energy has an obligation to ensure the safe and reliable operation of the distribution system for operating personnel, customers, and the general public.

1.4 Statement of Compliance

The protection requirements adhere to the National DER Connection Guidelines for High Voltage EG connections. This document mainly addresses protection requirements, and any deviations from the ENA guidelines are detailed in the Appendix A.

2. References

There are a range of applicable standards and industry codes which define connection types and applicable requirements, as set out below.

External Regulations
Electricity Supply Act 1995 (NSW)
Electricity Supply (Safety and Network Management) Regulation 2014
Work Health and Safety Act 2011 (NSW)
Work Health and Safety Regulation 2017 (NSW)
National Electricity Rules (NER)

External Standards		
Standard No.	Year	Title
AS 2067	2016	Substations and high voltage installations exceeding 1 kV a.c.
AS 3000	2018	Wiring rules
AS 5139	2019	Electrical Installations – Safety of battery systems for use with power conversion equipment
AS 5033	2021	Installation and safety requirements for photovoltaic (PV) arrays
AS 3010	2017	Electrical Installations – Generating sets
AS 4777.1	2024	Grid connection of energy systems via inverters part 1: Installation requirements
AS 4777.2	2020	Grid connection of energy systems via inverters part 2: Inverter requirements
AS 6100.2.12		Electromagnetic compatibility (EMC)
IEC 60255 (BS142)		Electrical relays
ENA DOC 001	2019	National Electricity Safety Code
ENA DOC 041	2019	Technical Guidelines for Medium and High Voltage EG Connections
-	2024	Technical Requirements for 200kW to 5MW DER connection- AEMO

Company Policies and Procedures
Company Policy (Network) 9.2.2 – Network Protection

3. Definitions and Abbreviations

Definitions	
CB Fail	Circuit breaker fail
Connection Agreement	An agreement between Endeavour Energy and the proponent (Generation Company) by which the proponent is connected to the transmission or distribution network and/or receives transmission services or distribution services.
Connection point	As defined in the NSW Service and Installation Rules. For this document, an agreed point of supply established between Endeavour Energy's network and the proponent's premises.
Distributed Energy Resources (DER)	Power generation or storage units that are connected directly to the distribution network.
EE Network	The Endeavour Energy network.
Embedded generator	According to the NER; a generator connected within a distribution network and not having direct access to the transmission network.
Energy storage system (ESS)	A system comprising one or more batteries that store electricity generated by distributed energy resources or directly from the grid, and that can discharge the electricity to loads.
HV	High Voltage (AC voltages greater than 1 kV nominal).
Islanding	Islanding occurs when a private generator or generating system remains connected to a portion of the network and continues to supply electricity to that portion of the network but is disconnected from the general electrical network or main source of generation.
NER	National Electricity Rules
Proponent	The party proposing the generating scheme, responsible for ownership and operation of the scheme.
Synchronism	Synchronism occurs when two (2) A.C. voltages are of the same frequency and magnitude and have zero phase difference.
LV	Low voltage (AC voltages less than 1 kV nominal)

Abbreviations	
AEMO	Australian Energy Market Operator
AS/NZS	A jointly developed Australian and New Zealand Standard
CEC	Clean Energy Council
CT	Current transformer
DER	Distributed Energy Resources
EF	Earth fault protection (51)
EG	Embedded generation

HV	High Voltage
IEC	International Electrotechnical Commission
IES	Inverter energy system
LV	Low Voltage
NER	National Electricity Rules
NVD	Neutral voltage displacement protection (59N)
OC	Overcurrent protection (51)
PU	Per unit
ROCOF	Rate of Change of Frequency
SCADA	Supervisory Control and Data Acquisition
SCTT	Synchronise, close, transfer trip operation

4. Technical requirements

4.1 Labelling and Signage

The labels and signs on the installation, including cables, shall be as per AS 2067, AS/NZS 3000, AS/NZS 5033 and AS/NZS 4777.1.

4.2 Maximum System Capacity

The maximum generating capacity shall be verified by Endeavour Energy at the time of assessment.

4.3 Generation Control

4.3.1 Export Limit at Connection Point

Export limitations may be required for specific HV EG connections, as determined by Endeavour Energy. Factors considered in setting an export limit include, but are not limited:

- Network connection voltage
- Thermal and fault ratings of network plant and equipment
- Proximity and capacity of adjoining loads and generating systems
- Existing protection system capabilities and performance
- Configuration and status of upstream network assets

Export limits at connection point may be either static or dynamic.

- **Static Export Limits**: These are fixed limits that apply consistently at all times. For static export limits, the export limiting functionality may include both "soft" and "hard" limitation types, as defined in AS/NZS 4777.1.
- **Dynamic Export Limits**: These limits may vary based on time of day, daily fluctuations, or seasonal changes. For dynamic export limits, the connection point's net export limit should be considered a 'soft' limit, which prompts the Inverter-based Energy System or rotating machine to reduce output to avoid exceeding the limit in response to network conditions. A 'hard' limit is required only if the total EG rating exceeds the maximum allowed export of the system.

In all cases, if a fault or loss of operability is detected with the soft limit, hard limit control function or if an independent external device is used, the output from the HV EG must be reduced to zero or operate the automatic disconnection device within 15 seconds.

Where the soft limit is exceeded, the export limit control function shall operate to reduce the power output for the IES, multiple IES or rotating machine to the export limit of the electrical installation within 15 seconds. Similarly, if the hard export limit is exceeded, the control function shall operate to disconnect the IES, multiple IES or rotating machine within 15 seconds.

The export limit is to be interpreted by the customer as a maximum. The ability of the customer's EG system to export at the export limit is not guaranteed.

For systems requiring SCADA as outlined in Section 4.9, a control system with appropriate metering at the connection point must be provided to ensure compliance with the site's export limit.

4.3.2 Site Generation Limit downstream of Connection Point

Endeavour Energy does not assess site generation limits downstream of the connection point.

4.4 Inverter Energy System

IES EG units connected at Endeavour Energy's HV network shall comprise of inverters that are:

- Type tested and certified as being compliant with an accreditation number or certificate of suitability as evidence of compliance to IEC 62116 for anti-islanding protection.

IES shall comprise of inverters that have following power quality modes available:

- Reactive power control
- Central control
- Volt response (i.e. Volt-Var and Volt-Watt)
- Fixed power factor or reactive power
- Power rate limit (i.e. ramp rate control)

4.4.1 Energy Storage System

An ESS, such as batteries, that is capable of supplying electricity to an electrical installation or the Distribution System is considered Grid Connected, unless the inverter is installed behind a break-before-make switch compliant with AS/NZS IEC 60947.6.1.

For ESS systems deemed to be Grid Connected:

a. The ESS shall adhere to the requirements set forth in this Standard.
b. Inverters for the ESS shall be installed in accordance with Section 4.4 of this Standard.
c. The installation of the ESS shall comply with AS/NZS 5139.
d. The following requirements apply to ESS inverters:
    a. The inverter capacity of the ESS will be included in the aggregated nameplate rating of inverters located within the premises behind the Connection Point (as part of the Proponent's installation).
    b. The export limit for the ESS inverter will be considered as part of the aggregated export limit at the Connection Point.
e. If the ESS has the capability to charge from the network, the proposed system may be subject to specific limits for charging and constraints on the amount discharged back into the network. Endeavour Energy will determine these limits based on the connection study, asset ratings, and other relevant factors. Should dynamic control of the charging limit be deemed necessary, SCADA connectivity as per section 4.9 is required.

4.5 Network Connection and Isolation

Network connection and isolation requirements shall be as per the following:

a. A grid isolation device shall consist of a HV automatic recloser or a HV circuit breaker within a switchboard and its associated protection and control equipment. This should be installed as close as possible to the connection to Endeavour Energy's network.
b. The protection and control system of the installation at the network connection point and downstream of the network connection point as agreed upon with Endeavour Energy.
c. The specific requirements for network connection and isolation will be determined by Endeavour Energy and communicated to the proponent in the connection application stage.

4.6 Earthing

a. For IES, earthing requirements shall be as per AS 2067, AS/NZS 3000.
b. For ESS, shall be earthed as per as per AS/NZS 5139 and AS 3011.
c. For rotating machines, shall be earthed as per AS 2067, AS/NZS 3000 and AS/NZS 3010.

The generator connection must be arranged such that the generator or connection transformer does not contribute earth fault current to the Endeavour Energy network. This could be achieved using a transformer with a delta-wye configuration, with the delta connection situated on the Endeavour Energy side of the transformer.

Where the generating units are connected to the Endeavor Energy network via a wye-delta transformer, with the wye connection situated on the Endeavour Energy side, the proponent shall provide the facility to switch the transformer neutral to avoid the parallel earth paths when connected to Endeavour Energy network.

For LV system neutral earthing, solid earthing principals must be applied, unless the specific application, such as some central inverter, necessitates a non-grounded system. In such applications NVD protection is required to detect earth faults within the embedded generation network due to wye-delta or ungrounded configuration of transformer on the embedded generation side. In some cases, the NVD installation is not possible due to the limitation of design or limitations of the available equipment. In such cases, the proponent shall provide some type of earth fault monitoring device to detect and isolate the faults.

When operated within an electrical island separated from the network, the generating system must be installed with an earthing system that can provide adequate earthing independent of that normally provided by the distribution network.

The neutral busbar must be continuously connected to the source of supply as well as being locally earthed. The provision of the Wiring Rules and NSW Services and Installation Rules must be applied.

4.7 Protection

To ensure the safe and reliable operation of the distribution and transmission network, embedded generating systems must be equipped with appropriate protection schemes.

Protection System Design

Protection systems for HV EG must incorporate both main and backup protection elements. Depending on the connection configuration, duplication of protection systems may be required. Proponents will be informed of these requirements when they submit a connection request to Endeavour Energy.

Primary and backup protection relays must operate separate isolation devices. Since faults on the generator side may not be detected by Endeavour Energy's upstream protection, all faults within the generating plant must be cleared by local protection.

It is essential for generator circuit breakers (CBs) to include Circuit Breaker Failure (CBF) protection. CBF protection can be implemented in two ways and must operate after a maximum of 500msec after a trip operation unless a different time is required under NER:

1. Dedicated CBF Scheme: This involves a dedicated CBF scheme designed to trip upstream circuit breakers, thereby disconnecting the generator from the Endeavour Energy network.
2. Independent Circuit Breakers: Alternatively, primary and backup protection schemes may be configured to trip independent circuit breakers.

Both approaches ensure that faults within the generating plant are isolated effectively, maintaining the integrity of the network.

Anti-Islanding Protection

Passive Anti-Islanding: All EGs must be fitted with passive anti-islanding protection, which includes under and over frequency, under and over voltage, and rate of change of frequency (ROCOF) protection. In some cases, passive anti-islanding protection may need to be duplicated at the connection point based on specific connection requirements.

Active Anti-Islanding for IES: All IES must be equipped with active anti-islanding protection compliant with IEC 62116. If active anti-islanding protection is not implemented, the proponent must demonstrate, in accordance with the requirements of Section 4.8.1.8 of this standard, that the formation of a viable island is not possible.

Protection Requirements for ≥5 MW EG Systems:

Protection system of embedded generator shall be in accordance with NER. Sufficient redundancy needs to exist in the protection system so that the protection scheme is able to operate with any single component out

of service. This also applies to the DC systems, including batteries, chargers and distribution boards that power the scheme.

HV embedded generators with a capacity of 5 MW or greater must provide primary, backup, and circuit breaker fail protection at the connection point in accordance with the NER automatic standards. This ensures that the protection system is robust and reliable, minimising impact on the rest of the power system. The protection system for such connection shall be compliant to the following NER requirements.

Table 2: NER Protection system requirements for ≥5MW connections

Technical Requirements	NER Reference
Protection of generating systems from power system disturbances	S5.2.5.8
Protection system that impacts on power system security	S5.2.5.9
Protection to trip plant for unstable operation	S5.2.5.10

The Proponent is to ensure the compliance to all performance requirements specified under the NER chapter 5 for connection greater than or equal to 5 MW and discuss the Endeavour Energy's Customer Network Solutions team.

HV Incomer / Connection Point Protection requirement:

a. **Coordination with Upstream Protection**: The protection scheme at the connection point must be coordinated with the existing upstream protection provided by Endeavour Energy for short circuits.
b. **Complete Local Protection**: The generation installation must have complete protection independent of Endeavour Energy's protection, unless otherwise negotiated. The protection scheme at the connection point should act as backup only and must operate if the local downstream protection or circuit breaker fails to operate, or for faults within the proponent's installation, before the downstream protection. Endeavour Energy requires that any fault within the embedded generating system be detected and isolated from the Endeavour Energy network as quickly as practical, without reliance on Endeavour Energy's network protection. The proponent is responsible for assessing and managing the risks associated with potential failure of their connection point CB.

HV Embedded Generator protection requirements:

The Proponent shall adhere to relevant Australian standards, regulations, and industry best practices for the protection of generators and associated equipment. All protection systems for the generating system must be designed with fail-safe principles, ensuring that affected generating units, or the entire generating system, are automatically disconnected from the network if any protection element (including its backup system, where applicable) fails.

Endeavour Energy does not assume responsibility for the Proponent's internal generation protection requirements unless these affect the network and potentially impact other customers. However, the following level of protection must be provided as part of the embedded generation connection:

Table 3: HV EG Protection Requirements

Protection	Protection Location
IES Systems	
Primary	Active and Passive anti islanding protection integrated within the inverter
Central/ Backup Protection	As per section 4.7.3
Non-IES System	

Primary	Passive anti islanding protection either at generator level or connection point based on connection type, Additionally, Synch check and generator protection etc at generator level
Central/ Backup Protection	As per section 4.7.3

4.7.1 Inverter Integrated Protection

Inverters connected at HV shall be compliant with the principles of AS/NZS 4777, unless agreed otherwise with Endeavour Energy.

Passive anti- islanding settings for inverters connected at HV shall be selected as per Table 4. Active anti islanding protection shall be enabled in the inverters.

Table 4: HV EG IES Inverter Integrated Protection

Protection Function	Protection Setting and Trip delay
Undervoltage 2 (V<<)	- For HV connected IES system with 230/400Vac inverters with aggregate rating <1.5MW with LV Load, AS4777.2: 2020 in accordance with AEMO Technical requirement for 200kW to 5MW DER connections For system <5MW, Site-specific setting in accordance with AEMO Technical requirement for 200kW to 5MW DER connections. For System ≥5MW, To be proposed by proponent based on the ensure IES fault ride through capability for remote network faults and reliable operation for islanding events.
Undervoltage 1 (V<)	
Overvoltage 1 (V>)	
Overvoltage 2 (V>>)	
Under Frequency 1 (F<)	
Over Frequency 1 (F>)	
Active Anti-Islanding	ON, Method: Frequency shift/Frequency Instability/ Power Variations/ Current Rejection
Reconnection	No sooner than 60 seconds after the grid supply restored.

Notes:

1. ROCOF and Vector shift shall comply with the withstand requirements of AS4777.2:2020 section 4.5.5 and section 4.5.6 i.e.
    a. Vector Shift – Inverters shall remain in continuous operation for a single-phase vector shift of 60 degrees and three phase vector shift of 20 degrees.
    b. ROCOF – inverters shall maintain continuous operation for ROCOF that do not exceed 4HZ/s for a duration of 0.25s.
2. Sustained over voltage setting for the inverter is optional as voltage regulation within the HV customer electrical reticulation is the responsibility of the customer.
3. For HV connected IES EG system, LV inverters with LV connected load, the AS2777.2:2020 requirement to cease power for voltage above 260V and below 180V within 200msec shall be retained to avoid risk of damage to LV load equipment.

4.7.2 HV non IES Integrated Protection

HV non-IES EG integrated protection refers to protection configured directly on the non-IES EG. For example, for a diesel generator, this is the protection directly programmed on the diesel generator controller.

In some cases, it is proposed at the same location as central/backup protection location as duplicate protection.

In some schemes, the connection point may include duplicate passive anti-islanding and short circuit protection, while the generator itself will only have generator-specific protection functions. Both approaches are acceptable. If duplicate central protection is provided at the connection point, the fail-safe arrangements are not required.

The settings for HV non-IES EG shall be calculated by proponents based on the generator characteristics and shall be submitted to Endeavour Energy for review and approval during the detailed design process.

Non-IES rotating type systems are normally divided into two categories,

a. Synchronous
b. Asynchronous

Asynchronous machines normally draw reactive energy for excitation from the electricity network and therefore cannot sustain operation and island. It is noted however that some asynchronous machines may self-excite from power factor correction capacitors and/or adjacent capacitance within the electricity network. Therefore, is such application anti-islanding protection in the form of ROCOF, vector shift or inter trip is required as per section 4.8.1.8.

Table 5: HV EG non-IES Integrated Protection

Protection Function	Protection Setting and Trip delay
Undervoltage 2 (V<<)	For system <5MW, Site-specific setting in accordance with AEMO Technical requirement for 200kW to 5MW DER connections.
Undervoltage 1 (V<)	
Overvoltage 1 (V>)	
Overvoltage 2 (V>>)	For System ≥5MW, To be proposed by proponent based on the ensure generator fault ride through capability for remote network faults and reliable operation for islanding events.
Under Frequency 1 (F<)	
Over Frequency 1 (F>)	
ROCOF Note1	
Vector Shift Note1	
Synch Check	To be proposed by proponent as per manufacturer's specifications and synchronising method
Generator unbalance protection (Voltage, current)	To be proposed by proponent as per manufacturer's specifications
Generator Pole Slip	To be proposed by proponent as per manufacturer's specifications
Auto reconnection	No sooner than 60 seconds after the grid supply is restored and correct synchronised. Not allowed for Systems >22kV.

Note 1: The customer must accept that ROCOF and Vector Shift protection may trip for system disturbances and fault events within and external to the local network that the generator is connected to. Experience has shown that it is difficult to set these schemes to avoid nuisance tripping whilst providing adequate protection

4.7.3 Central/Backup Protection

The central/backup protection must be compliant with IEC60255. Operation of any central/backup protection element must result in disconnection of the generator from the Endeavour Energy network via a suitable CB/ CBs or isolation device as required, preferably embedded generation common coupling breaker to avoid site load interruption.

The central/backup protection for parallel generators shall be designed as a minimum:

a. Voltage sensing shall be located as close to the grid isolation device as practicable.
   Location of central/backup protection at LV for HV connection point customer are only acceptable either
   - for a single point IES EG system for a size <500KW of IES EG system capacity, or,
   - Where Customers who are exporting only to their LV network with reverse power protection installed at LV, the voltage and current sensing devices of the centre/backup relay can be located at LV and upstream of all IES.

b. Shall Coordinate multiple IES or non-IES EG installation for one connection point. Where there are both IES and non-IES EG Systems connected at a single connection point, two central/backup protections are allowed to be installed where one central/backup protection relay shall coordinate all IES and one central/backup protection relay shall coordinate all non-IES EGs.
c. Preserving safety of grid personnel and general public.
d. Open the isolation device at either the grid connection point or EG system.
e. If the trip/open signal is not hard wired to the disconnection device (i.e. circuit breaker or contactor), a dedicated wireless trip scheme may be used.
f. Be integrated in a way that it is fail safe, and the EG system do not generate while the central/backup protection is out of service .
g. Voltage transformer shall be of protection class with either three single phase VT or 3phase 5 limb VT.
h. Applications where the IES EGs are installed at different locations within customer network, the following options can be explored:

   - <u>Centralised approach</u>:

     - This approach is Endeavour Energy preferred approach with central/backup protection at connection point.
     - Short circuit protection shall trip the connection point CB.
     - Islanding protection shall trip the relevant embedded generation CB/ isolation device via fail safe inter-tripping within the embedded network.
     - Inter-tripping within embedded network is not required if the customer accept tripping the connection point CB with site load interruption.

   - <u>De-Centralised approach</u>

     Where installation of one Central/backup protection is not suitable due to the proponent's network, multiple central/backup protection relays within proponents' network can be considered. However, the voltage and current sensing devices for central/backup protection relays are to be located at HV.

     In such cases, where multiple central/backup protection relays are allowed within the proponent's network, the Proponent is to ensure that the voltage measurement at designated central/backup protection location shall not deviate from connection point as per NER chapter 5 clause S5.2.5.4

The functional requirements for Central protection are highlighted below

Table 6: Central/backup Protection

Protection Requirements	HV EG IES		HV EG Non-IES		HV EG Non-IES	
			Synchronous		Asynchronous	
	Non-Exporting	Exporting	Non-Exporting	Exporting	Non-Exporting	Exporting
Passive anti-islanding protection (27U/O, 59 U/O, 81U/O, 81R)	✓	✓	✓	✓	- Note 2	- Note 2
Overcurrent facility fault, grid fault and earth fault protection (50/51)	✓ Note 4	✓ Note 4	✓	✓	✓	✓
Grid Reverse power (32R)	✓	×	✓	×	✓	×
Synchronising Check (25)	- Note 3	- Note 3	✓	✓	×	×
Generator phase balance protection	×	×	- Note 1	- Note 1	- Note 1	- Note 1
Generator pole slip protection	×	×	✓	✓	✓	✓
Neutral voltage displacement (59N)	-	-	✓	✓	- Note 2	- Note 2
Grid Low Forward Power	✓	×	✓	×	✓	×
Inter-trip	-	-	✓	✓	-	-
DC System or UPS Integration protect	✓	✓	✓	✓	✓	✓
Fail Safe Tripping	✓	✓	✓	✓	✓	✓
Interlocking	-	-	-	-	-	-
Grid Isolation Device	✓	✓	✓	✓	✓	✓

Symbols are used to denote protection requirements where:
✓ Represents protection shall be required
- Represents protection may be required

× Represents protection shall not be required

Note 1: For non-IES EG units.

Note 2: ROCOF & NVD is not required for asynchronous generators provided it can be determined that the generator is not capable of self-exciting and continuing to run without generator protection operating.

Note 3: IES systems shall comprise of inverters with internal synchronising facilities. Synchronisation check is required for IES systems configured to operate in island mode when disconnected from Endeavour Energy network.

Note 4: For IES installation, over current & earth fault protection can be part of separate device based on case-by-case basis and may not need to be in fail safe arrangement. However, when overcurrent and earth fault protection is deemed necessary to detect network faults, voltage-controlled overcurrent protection in a fail-safe configuration must be utilized.

For Non IES installation, directional overcurrent protection is required if HV incomer protection is not sensitive to detect fault contribution from HV non-IES EG for faults on the network.

4.7.3.1 Passive Anti Islanding

Passive anti islanding protection shall be implemented for HV EG systems as per Table 7.

Table 7: HV EG Passive Islanding Setting

Protection Function	Protection Setting and Trip delay	
HV EG IES		
Over voltage (V>)	For HV connected IES system with 230/400Vac inverters with aggregate rating <1.5MW with LV Load, AS4777.1: 2024 in accordance with AEMO Technical requirement for 200kW to 5MW DER connections For system <5MW, Site-specific setting in accordance with AEMO Technical requirement for 200kW to 5MW DER connections. For System ≥5MW, To be proposed by proponent based on the ensure IES fault ride through capability for remote network faults and reliable operation for islanding events	
Under voltage (V<)		
Under voltage (V<<)		
Over frequency (F>)		
Under frequency (F<)		
RoCoFhi		
RoCoFlo		
Reconnection	No sooner than 60 seconds after the grid supply restored.	
HV EG rotating machine		
Over voltage (V>)	For system <5MW, Site-specific setting in accordance with AEMO Technical requirement for 200kW to 5MW DER connections. For System ≥5MW, To be proposed by proponent based on the ensure generator fault ride through capability for remote network faults and reliable operation for islanding events.	
Under voltage (V<)		
Under voltage (V<<)		
Over frequency (F>)		
Under frequency (F<)		
RoCoFhi		
RoCoFlo		
Vector Shift Note1		
NVD (Neutral Voltage displacement)	20% (of nominal phase to earth voltage)	< 2sec
Reconnection	No sooner than 60 seconds after the grid supply is restored and correct synchronised	

Note 1: The customer must accept that ROCOF and Vector Shift protection may trip for system disturbances and fault events within and external to the local network that the generator is connected to. Experience has shown that it is difficult to set these schemes to avoid nuisance tripping whilst providing adequate protection

4.7.3.2 Overcurrent Facility Fault, Overcurrent Grid Fault and Earth Fault Protection

Overcurrent and earth fault protection must be installed at the HV Incoming of the connection point. This protection is used to detect faults within the customer's installation and trip the connection point HV incoming circuit breaker. For Sub-transmission and transmission connection, the incoming protection shall comply with PDI1000 protection scheme requirements.

For non-IES EG system, the Overcurrent and earth fault protection is required to detect faults within the Proponent's site and for faults on the network. Directional protection may be advised by Endeavour Energy based on the connection study. This shall be part of central/backup protection or separate relay but shall be in fail-safe arrangement.

For IES EG systems, the requirement for Overcurrent and earth fault protection within central/backup protection is not mandatory and may not need to be in fail safe arrangement. Overcurrent and earth fault protection is only required to detect the fault within customer installation and grade with upstream protection. There is no requirement for overcurrent and earth fault to detect faults external to generating system for IES EGs. For applications where the IES system is designed for islanded operation and may supply the Endeavour Energy network while the grid supply is disconnected, the overcurrent and earth fault protection is mandatory. A voltage-controlled / restrained overcurrent and earth fault protection shall be employed in fail-safe arrangement, unless the standard overcurrent and earth fault protection is sufficiently sensitive to detect and isolate the short circuit on the network.

The settings shall be determined by the proponent during the system design stage and shall grade with Endeavour Energy's existing protection system.

4.7.3.3 Grid Reverse Power or Grid Low Forward Power Protection

Grid Reverse Power Protection

Reverse power protection must be configured to monitor power flow towards the network, where required. This protection should be set as low as practicable, considering the accuracy of the protection relay, current transformers (CTs), and the generating system's synchronisation characteristics. The design of control systems should aim to minimise reverse power flow immediately following synchronisation.

The specific settings for grid reverse power protection shall be determined through a connection-specific technical assessment conducted by the proponent.

Table 8: Grid Reverse Power Protection

System	Protection	Pickup Setting	Trip Delay
No Export EG	Grid Reverse Power (32R)	To be finalised during connection technical assessment	

Grid Low Forward Power Protection

No export generating systems are designed to ensure that all generated electricity is consumed within the Proponent's premises and are not intended to export power to Endeavour Energy's distribution or transmission networks.

Grid low forward power protection can be used as an alternative to Inter-trip protection to detect islanding events. In cases where a no export generation system is designed to operate in island mode, this protection can trigger the connection point circuit breaker in the event of a loss of network supply, while still allowing the

generation system to supply power to the Proponent's premises. The specific circuit breaker to be tripped should be nominated by the Proponent.

The low forward power function must also be configured to operate in conjunction with reverse power protection.

Table 9: Grid low forward Power Protection

System	Protection	Pickup Setting	Trip Delay
No Export EG	Low forward Power (32F)	To be finalised during connection technical assessment	

Grid reverse power protection or grid low forward power protection shall be installed in fail-safe arrangement unless duplicated.

4.7.3.4 Synchronising facilities

Synchronising equipment must be provided for non-IES HV synchronous generators so that the generator supply and Endeavour Energy supply are within limits with regards to voltage, phase angle and phase rotation prior to the generator circuit breaker being closed.

The generator must parallel with the Endeavour Energy network without causing a voltage fluctuation at the network connection point greater than +/-5% of the prevailing voltage level at the connection point.

Requirements:

a. **Automatic Reconnection**:
   - Synchronous generators connected at 11kV or 22kV may use synchronising facilities to automatically reconnect the generation plant following a system disturbance no sooner than 60 seconds after the main supply is restored.
   - Automatic reconnection for generators connected to 33kV network and above is prohibited unless specifically approved by Endeavour Energy in the "Negotiated Connection Agreement"; otherwise, reconnection must be approved by Endeavour Energy system operators.

b. **Protection Against Dead Bus**:
   - For synchronous generators, protection must be provided to prevent the generator circuit breaker closing on to a de-energised (dead) bus. The generator circuit breaker may be closed onto a dead bus provided that mechanical interlocks are used to prevent the generator output energising the Endeavour Energy network without the correct synchronisation process occurring.
   - Blocking closing onto a dead bus is not required for asynchronous generators which cannot self-excite.

c. **Correct Synchronisation**: Under no circumstances is the generator circuit breaker allowed to be closed without being correctly synchronised.

d. **Supervision of Synchronising VTs**: Synchronising VTs must be supervised to prevent the generator circuit breaker from being closed during VT failure. Monitoring of VT supply fuses is considered adequate.

Synchronising facilities are not required for Asynchronous generators and/or inverter systems which are not configured for Islanding operation.

For IES EG systems designed for islanding operation (such as Battery Energy Storage Systems (BESS)), a synchronising check is required before closing to the Endeavour Energy network when transitioning from islanded operation to grid connection.

4.7.3.5 Phase Balance Protection

Endeavour Energy have no requirements for implementation of current or voltage unbalance protection at central / connection point protection for IES or non-IES systems. However, the proponent must ensure its generating system can meet the following performance standards:

Current Unbalance: The impact of the HV EG system on the Endeavour Energy network voltage shall not exceed the NER requirements S5.3.6.

Voltage Unbalance: The impact of the HV EG system on the Endeavour Energy network voltage shall not exceed the limits stipulated in Table S5.1a.1 of the NER S5.1a.7.

4.7.3.6 Generator Pole Slip

Pole slip protection shall be required to be installed for synchronous HV EG Systems to disconnect the generating system upon detection of a loss of synchronism. The settings for pole slip protection shall be proposed by the proponent via a connection-specific technical assessment.

Table 10: Generator Pole Slip Protection

Protection	Pickup Setting	Trip Delay
Generator Pole Slip Protection	To be finalised during connection technical assessment	

4.7.3.7 Neutral Voltage Displacement

The Neutral voltage displacement protection is required for fast detection of earth faults should the Endeavour Energy supply be lost whilst the non-IES EG is in service. In such instances, the power system will be operating without being tied to earth.

A suitable protection class VT is required such as a 3 phase, 5 limb broken delta VT or three single phase VTs.

NVD is also required for all IES EG HV systems for a connection point voltage of 22kV or below except the following:

- Aggregate generator output is <200kVA, or
- Aggregate generator output is >200kVA but IES system is not configured for islanding mode operation, or
- Aggregate generator output is <50% of the customer's minimum demand.

For sub transmission and transmission level IES EG system, either NVD or Inter-tripping is required.

For no export and export generators that have a HV connection point, NVD protection is required unless equipped with grid low forward power protection.

NVD protection shall disconnect all embedded generating units without disturbing the site load.

NVD is not required for asynchronous generators provided it can be determined that the generator is not capable of self-exciting.

Endeavour Energy's typical NVD settings are listed below. The proponent shall produce the site-specific settings based on the network technical study.

Table 11: NVD Typical Setting

Protection	Pickup Setting	Trip Delay
NVD (Neutral voltage displacement)	20% (of nominal phase to earth voltage)	≤ 2 s

4.7.3.8 Inter-Tripping

For HV export rotating generators of any size or IES EG system ≥5MW, inter-trip is preferred unless the proponent can demonstrate the adequate reliance on active or passive islanding protection as an alternative

in the form of duplicate or a primary/backup protection arrangement. The same is applicable for IES EG system <5MW where active anti- islanding cannot be used due to the network limitation.

The proponent shall demonstrate, including but not limited to, the following:

1. **Generator fundamental behaviour:** Prove to Endeavour Energy that by inherent generator design that the unit is not capable of sustaining an island.
2. **Anti-islanding protection system**: Prove to Endeavour Energy by way of a comprehensive study that the unit will trip should the connection to the Endeavour Energy network be lost. The study should cover a comprehensive range of scenarios including high, medium and low levels of generator output, and a range of realistic loads aligned with the generation profile.
3. **Generator controller system:** Prove to Endeavour Energy by way of a comprehensive study that the unit will trip should the connection to the Endeavour Energy network be lost.
   The study should cover a comprehensive range of scenarios including high, medium and low levels of generator output, and a range of realistic loads aligned with the generation profile.

If the study outcome for options 2 or 3 above, indicate the load and generation in the islanded section of the network can achieve equilibrium such that load demand is balanced by generation capability and cannot isolate the generation within the Endeavour Energy's automatic recloser dead time (generally 10 seconds), then an inter-trip scheme is required.

Alternatively, a SCADA based scheme that ensures isolation within the feeder automatic recloser dead time can be considered, subject to the site feasibility.

4.7.3.9 DC System or UPS Integration protection

The circuit breaker associated with generator central protection must be tripped immediately if the protection control voltage (DC or AC) drops below a level that cannot guarantee the reliable operation of protective devices and CB tripping. This may necessitate the installation of undervoltage coils or capacitor tripping units to ensure the relevant CB trips as required.

Where there is a failure in the DC system supply or UPS supply to the HV incomer protection relay, an alarm shall automatically be issued and the EG system should not be disconnected.

4.7.3.10Failsafe tripping

Central/backup protection relay shall be integrated in a way that it is failsafe. In case of protection relay failure, protection relay supply failure or protection control voltage (AC or DC) dropping below a level at which point the protection operation or CB tripping cannot be guaranteed, the generating system must be disconnected and prohibited from reconnection until the issue is resolved.

If the central/ backup protection for IES EG or non-IES protection is part of the connection point protection, one option is to trip the connection point CB, but it will have the consequence of interrupting the site load. Therefore, it is the proponent's responsibility to implement a failsafe scheme for Central/backup protection.

Failsafe tripping may not be required when fully duplicate protection schemes have been implemented and will be assessed on a case-by-case basis.

After the disconnection of embedded generation CBs on a failsafe scheme, customer installations shall be treated as a HVC without generation. Endeavour Energy's standard practice to deal with high voltage customer connection point protection relay failure shall apply.

4.7.3.11Interlocking

Depending on the connection configuration, HV IES and non-IES systems may require interlocking of generation sources and earth switches.

4.7.3.12 Grid isolation device

Endeavour Energy requires a circuit breaker or automatic recloser to be installed as close as practical to Endeavour Energy's network. Where duplicate protection is required, the grid isolation CB must be fitted with a second trip coil.

Where multiple generators are installed, only one grid isolation CB needs to be installed.

Where a switching station is provided for the connection of generating plant and it is possible to provide hardwired intertripping between the generating plant and the switching station, the CB feeding the generating plant at the switching station may be deemed to be the grid isolation CB. Such a decision is at the discretion of Endeavour Energy.

4.7.4 Runback Schemes

A runback scheme may be required on specific connections in certain locations on the network to mitigate all overloads and impacts to the network due to the generator connection. Where a credible network constraint has been identified, a runback scheme may be required on the network conditions and the EG system will receive a signal to either ramp down or disconnect, within an acceptable response time, until the network constraint has been lifted.

The cost of the required runback scheme and/or network augmentation shall be borne by the proponent and shall be designed and implemented by Endeavor Energy.

4.7.5 Requirements for non-parallel operation generators

Operating aspects for non-parallel (alternative) operation include:

- inadvertent parallel connection to Endeavour Energy network cannot be made under any circumstances.
- mechanical interlocks and suitable deliberate time delays are required between the opening and closing of the change-over circuit breakers;
- provision of a fail-safe design so that one circuit breaker cannot possibly be closed if the other circuit breaker in the change-over sequence is closed;
- connection must be made on the load side of metering equipment
- switchgear to allow manual or automatic changeover must be located on or adjacent to the switchboard supplying the electrical load; and
- where automatic switch-on and connection of the generator system is possible, suitable warning hazard notices must be displayed at appropriate locations.

4.7.6 Requirements for standby operation (SCTT or DRUPs) generators

Usually, the conditions that apply to this arrangement are:

- a written assurance that the generator will be used for standby supply only;
- the generator will run only in parallel with Endeavour Energy's network when switching the generator on and off for generator testing for changeover purposes;
- the period for operation in parallel with the network for any circumstance must be no longer than 1 second as per the NSW Service and Installation Rules;
- a blocking scheme must be provided to prevent the generator circuit breaker closing onto a de-energised network while the Grid isolation device or another suitable switch) is closed;
- manual synchronisation, where employed, must be supervised by a check synchronisation relay; and
- a 60 second timer must be included to prevent the installation load from being transferred back to the network following loss of network voltage and to confirm the network is stable before load is returned to the network from the generation system.

The 1 second period must include: synchronising with the electrical network; increasing the generator load to the desired test level; and isolation from the network.

DRUPs systems are normally treated as a standby system where a flywheel stores the energy and releases it like a UPS, to support load before it engages the diesel engine.

DRUPS systems will be considered standby operation system only if the period for operation in parallel with the network for any circumstance is no longer than 1 second. This includes the return to the normal supply scenario. Failing to fulfil this requirement, DRUPS systems shall be treated as continuously parallel operation systems and the protection and connection requirements specified under this document shall apply.

The period for reconnection includes: synchronising the generator with the network; removing the generator load; and disconnecting the generator.

Other aspects of standby operation are:

- the installation must be approved before commissioning ;
- switching times must be scheduled with Endeavour Energy System Operations where the generator capacity is 5 MW or greater;
- the transfer process must not adversely affect the quality of the supply to other customers; and
- the requirements of the NSW Service and Installation Rules must be met.

4.8 Operating Voltage and frequency

Operating Voltage and frequency range requirements can be found in Table 3 and Table 4.

Endeavour Energy's Customer Network Solutions teams shall be consulted by proponent for voltage rise, frequency withstand and frequency response limits applicable to the connection.

4.9 Remote monitoring and Control System

Remote monitoring and control requirements, where applicable, must comply with Endeavour Energy's ADI 002 Customer Connection SCADA standards.

4.10 Technical Studies

Generators in parallel with the network may raise fault levels beyond the fault rating of existing installed equipment. Calculations of the contribution of the generation plant to fault levels on the network may be required to determine:

- contribution to fault levels by the generator.
- the impact on neighbouring installations and customers; and
- the level of protection required because of changed fault levels.

The customer will be responsible for all costs associated with:

- the required system studies.
- upgrading of Endeavour Energy protection facilities where required primarily because of the connection of generation; and
- changes to their protection settings when required.

The proponent must ensure that the HV EG system, regardless of type, coordinates with Endeavour Energy's upstream protection.

The proponent should consult with Endeavour Energy's Customer Network Solutions team to determine the studies requirements for power quality, power flow, dynamic studies or other related aspects.

5. Exclusion from Scope

The following items are excluded from the scope of this standard. For guidance or inquiries regarding these matters, please consult Endeavour Energy's Customer Network Solutions team:

- Power factor control
- Metering
- Power quality
- Data and information
- Fee and charges
- Model connection agreement

6. Testing and Commissioning

Endeavour Energy's Customer Network Solutions team shall be consulted for advice regarding the testing and commissioning requirements for connection.

All protection equipment associated with the generator must be tested and verified on site prior to connection to the network. The commissioning test results must be forwarded to Endeavour Energy's Customer Network Solution team five working days before the connection of supply is required.

7. Operation and Maintenance

All protection equipment associated with the generator must be tested at least once every three (3) years, or as specified by the Generator Connection Agreement.

Settings of the protection relays and control equipment or associated wiring must not be altered unless written authorisation is received from Endeavour Energy.

Protection equipment must comply with the relevant parts of IEC 60255 or equivalent.

8. Responsibilities

Head of System Operations has the authority and responsibility for:

- Approving this standard.

Secondary Systems Manager has the authority and responsibility for:

- Endorsing this Standard

Delivery Manager Secondary Systems has the authority and responsibility for:

- Keeping this Standard up to date in accordance with Company Procedure GAM 0001 – Network Standards Framework: Preparation and Amendment of Network Standards.
- Overseeing the implementation of this standard within the Secondary Systems Delivery section.
- Approving exceptions to this standard, provided that the exceptions are compliant with Company Policy 9.2.2 – Network Protection.

Senior Protection Engineer

- As is applicable for a Protection Engineer (listed below).

- Approving designs which are compliant with this standard.

Protection Engineer/Specialist and Secondary Systems Development Specialist/Engineer

- Maintaining familiarity with and for complying with the requirements of this Standard with respect to Protection work.

Customer Network Solutions Employees

- Maintaining familiarity with and complying with the requirements of this standard.

Appendix A: Deviations from National DER Connection Guidelines

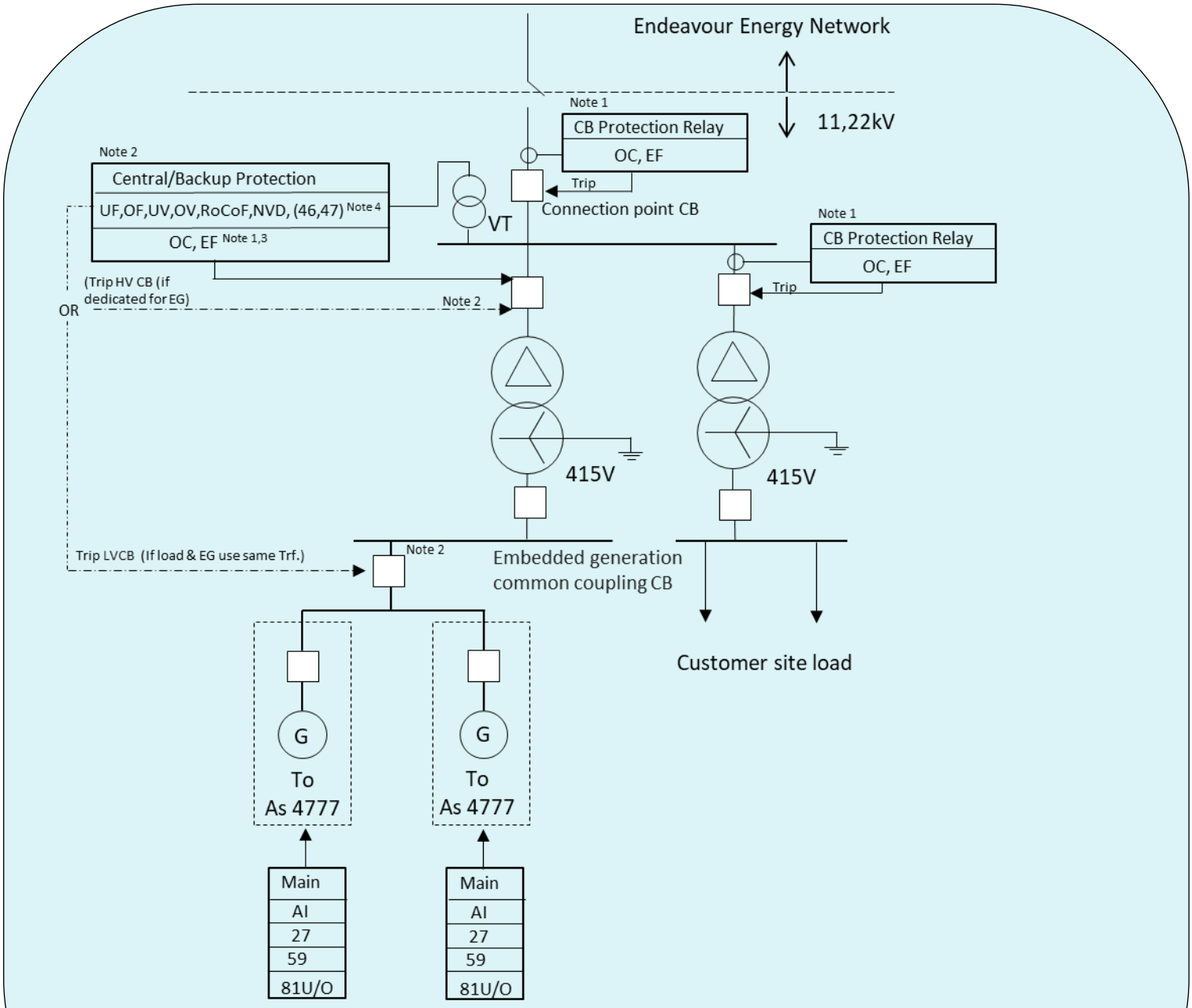
Table 12: Table of Deviations from National DER Connections Guidelines

Section	Description of deviation	Type of deviation	Justification
1.1	Addition of sub-transmission and transmission	Administrative	To use the same protection guidelines for sub-transmission and transmission level connection.
2.3.1	Subcategories section not included	Administrative	To improve readability
3	Endeavour Energy documents included	Administrative	Identification of documents applicable to Endeavor Energy
4.4.1	Addition of section 'Energy Storage Systems'	Improvement	Endeavour Energy requirement
4.7.1	Inverter settings included	Improvement	To improve readability
4.7.2, 4.7.2.5, 4.7.2.6	Non-IES phase balance & pole slip are not required at a Central Protection level.	Improvement	Duplication of generating unit level protection for central protection is not required for Grid Protection. A Proponent can avoid additional costs by only having to design and locate this protection at the generating unit level.
4.7.2.1	Settings included for IES EG	Improvement	To improve readability
4.7.2.2	PDI1000 is referred for HV incomer protection requirements for sub-transmission and transmission feeders.	Administrative	To use the same protection guidelines for sub-transmission and transmission level connection.
4.7.7	Addition of section for non-parallel generators	Improvement	Endeavour Energy requirement
4.7.8	Addition of section for SCTT generators	Improvement	Endeavour Energy requirement

Appendix B: Connection Arrangement Requirements

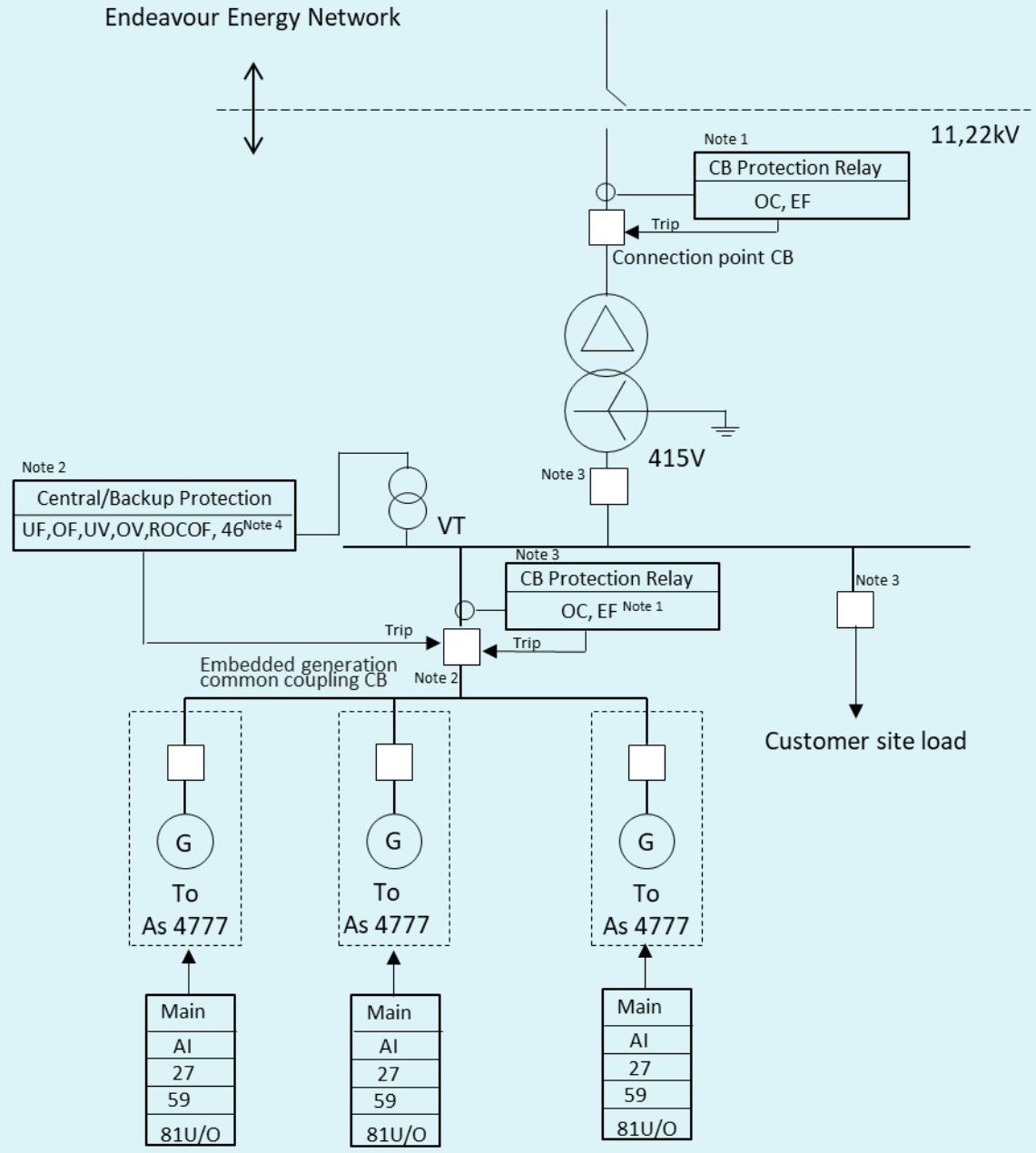
The following are examples of typical connections which meet the requirements of this standard. These are examples only. The specific design will be a function of the proponent's network and may require different arrangements.

Example 1: Export inverter connected at 11,22kV



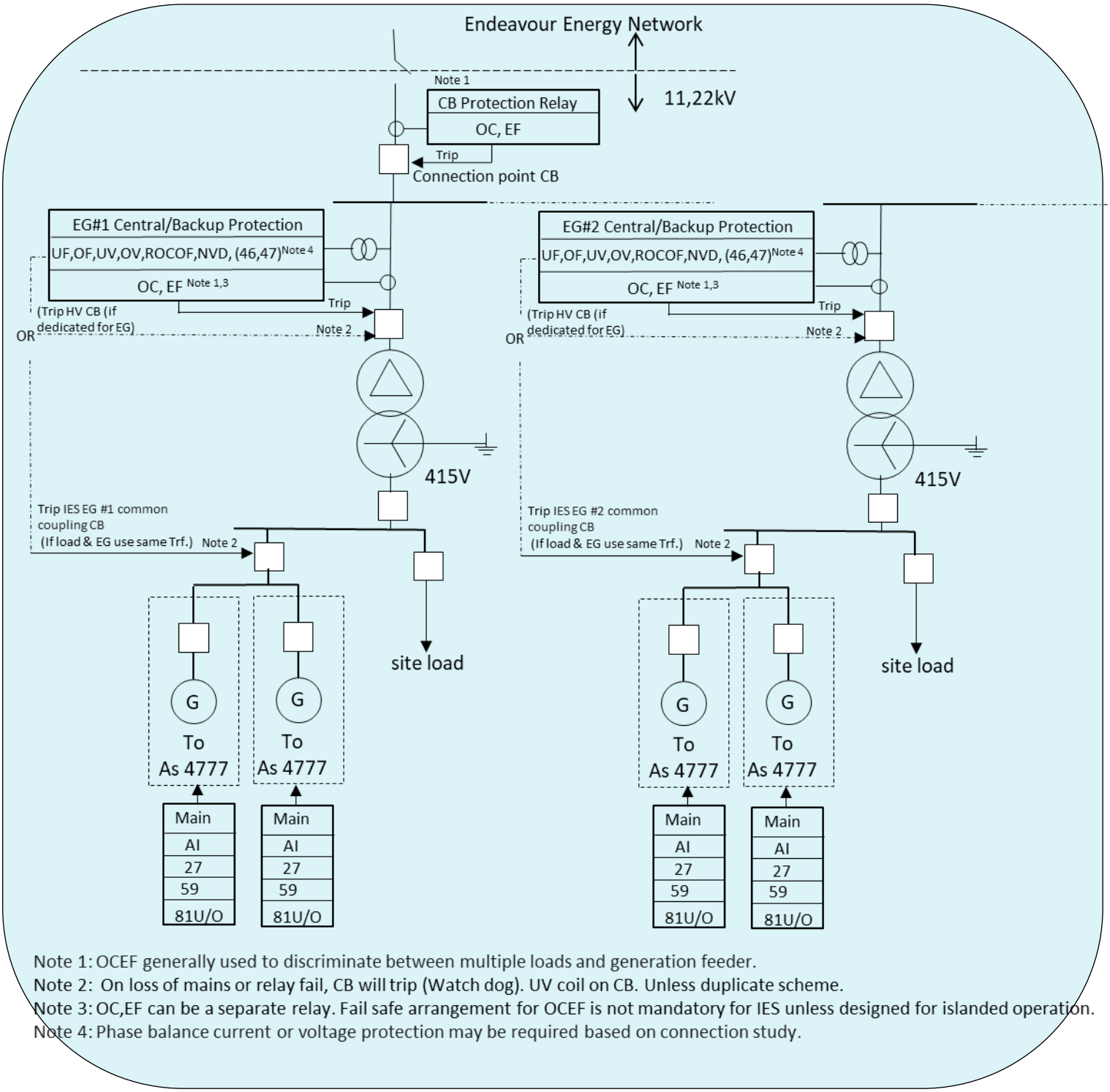
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: OCEF can be a separate relay. Fail safe arrangement for OCEF is not mandatory for IES unless designed for islanding operation.
Note 4: Phase balance current or voltage protection may be required based on connection study.

Example 2: Export inverter connected at 11,22kV (<500kW EG system)



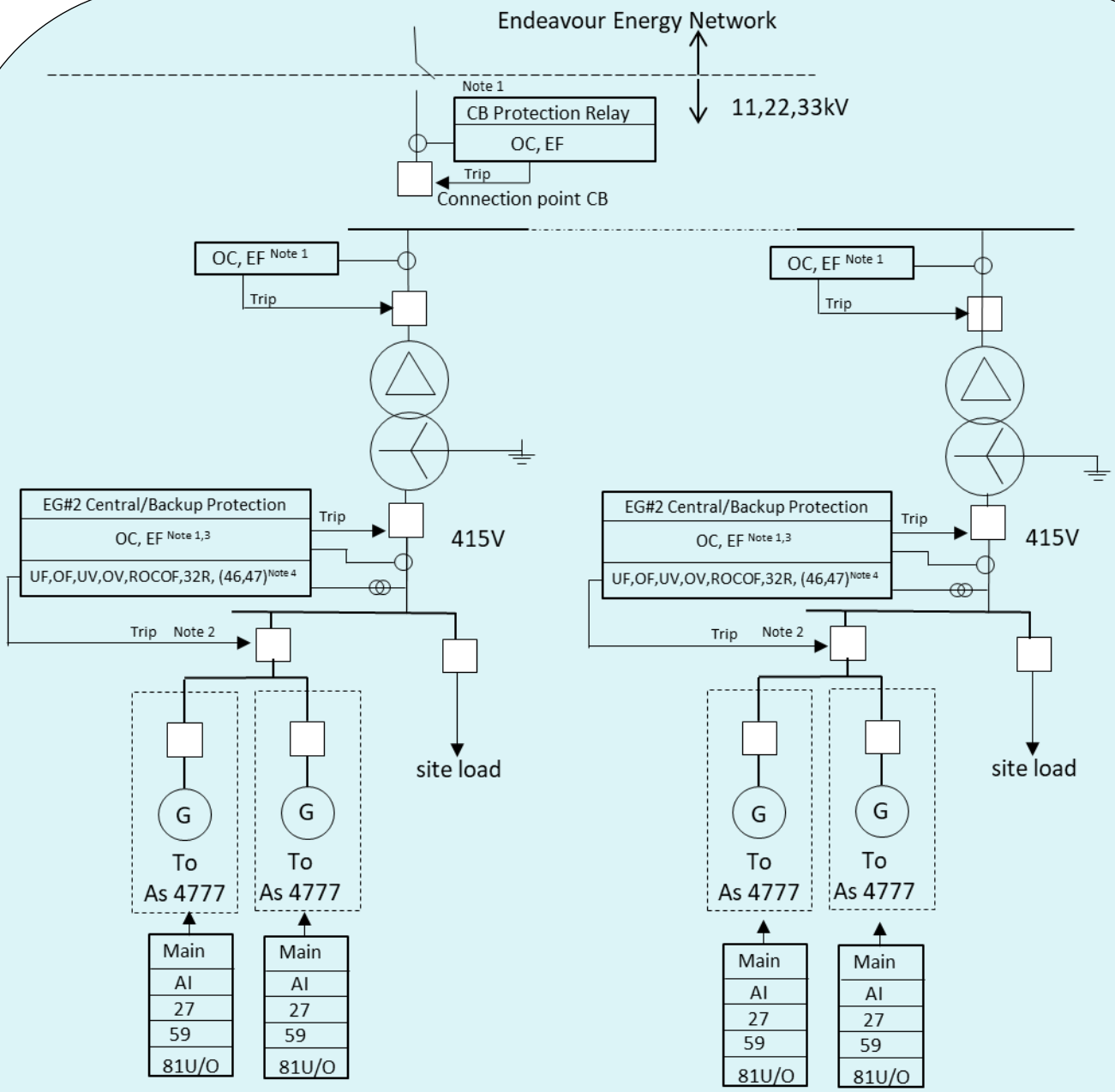
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains or relay fail, CB will trip (Watch dog). UV coil on CB
Note 3: OC, EF can be integrated in circuit breaker.
Note 4: Phase balance current protection may be required as per the connection study.

Example 3: Export inverter connected at 11,22kV (Multiple Central/backup protection relays)



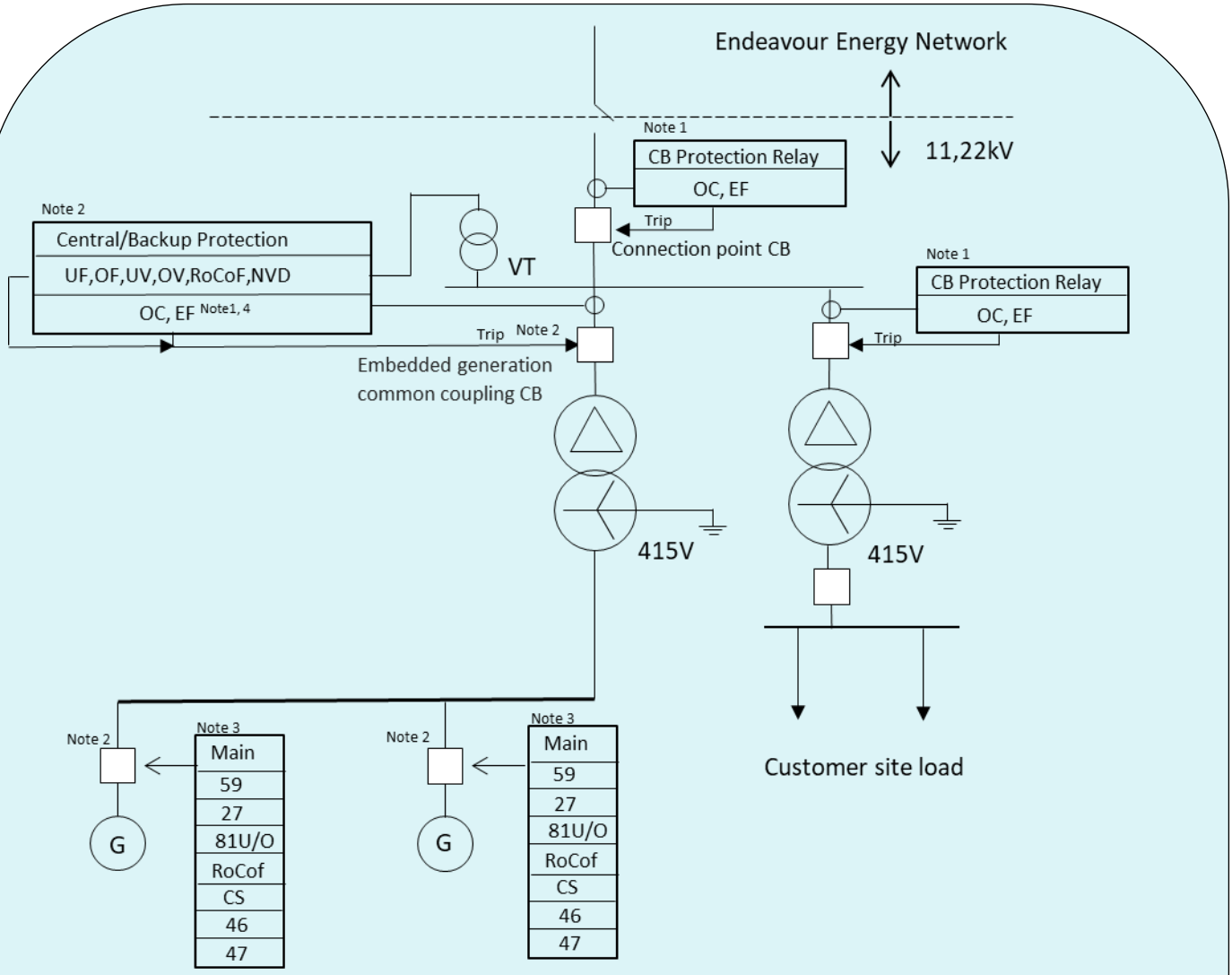
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: OC,EF can be a separate relay. Fail safe arrangement for OCEF is not mandatory for IES unless designed for islanded operation.
Note 4: Phase balance current or voltage protection may be required based on connection study.

Example 4: Export inverter connected at 11,22kV(Zero Export limit at LV)



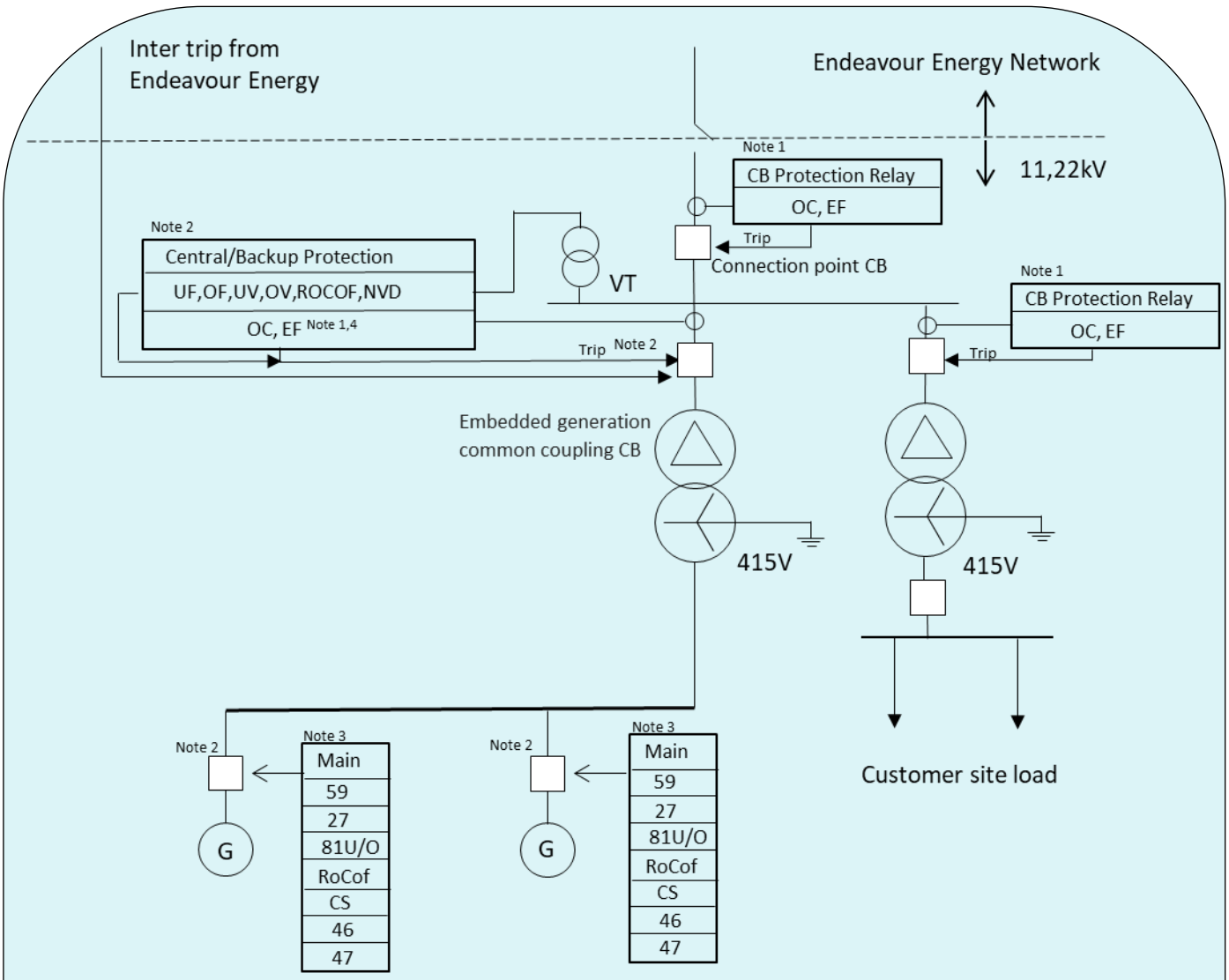
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: OC,EF can be a separate relay. Fail safe arrangement for OCEF is not mandatory for IES unless designed for islanded operation.
Note 4: Phase balance current or voltage protection may be required based on connection study.

Example 5: Export rotating generator (Without Inter-trip)



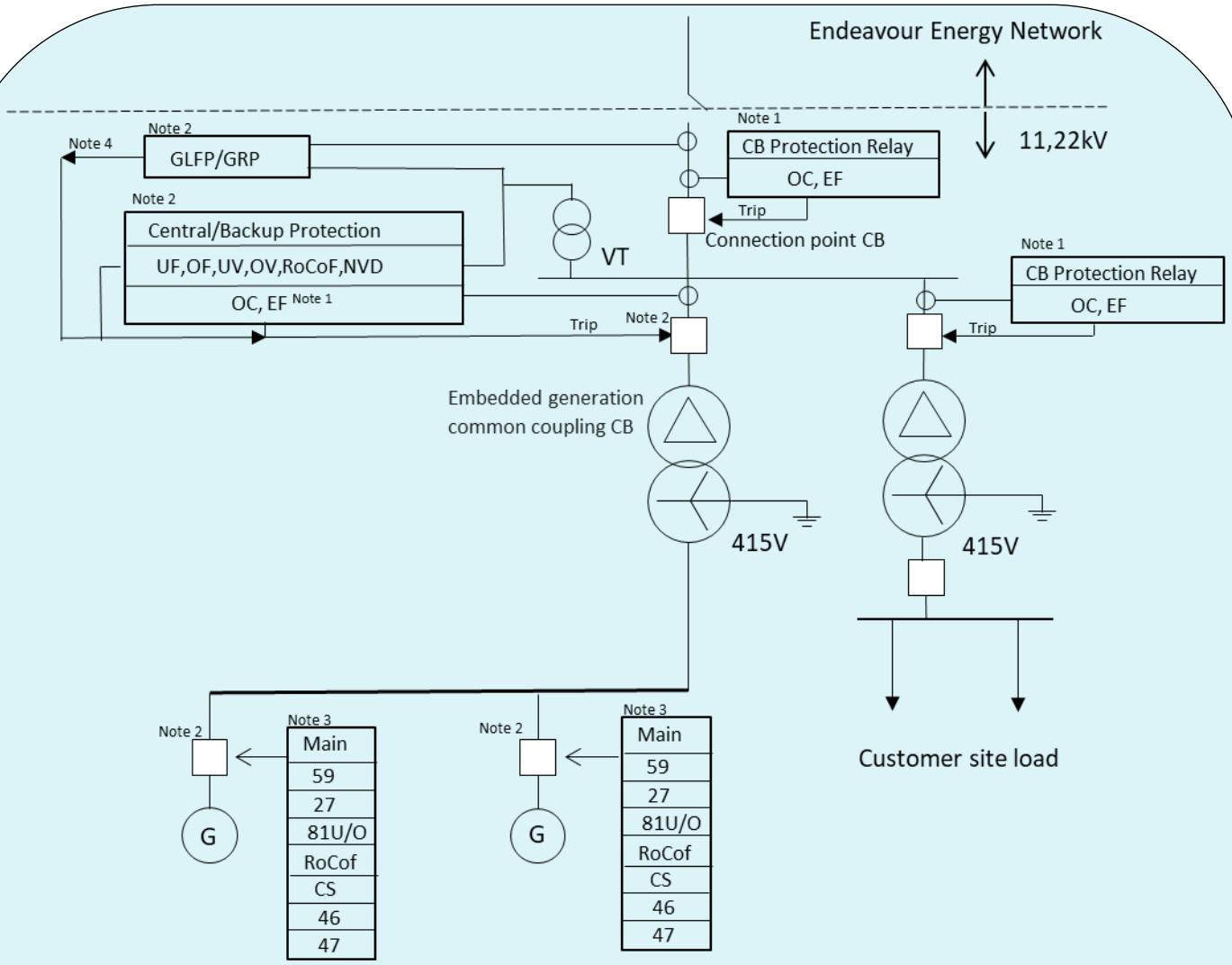
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains, OCEF or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: CBF either by CBF scheme or back up clearance by upstream relays.
Note 4: OCEF shall detect the fault on Endeavour Energy Network.

Example 6: Export rotating generator (With Inter-trip)



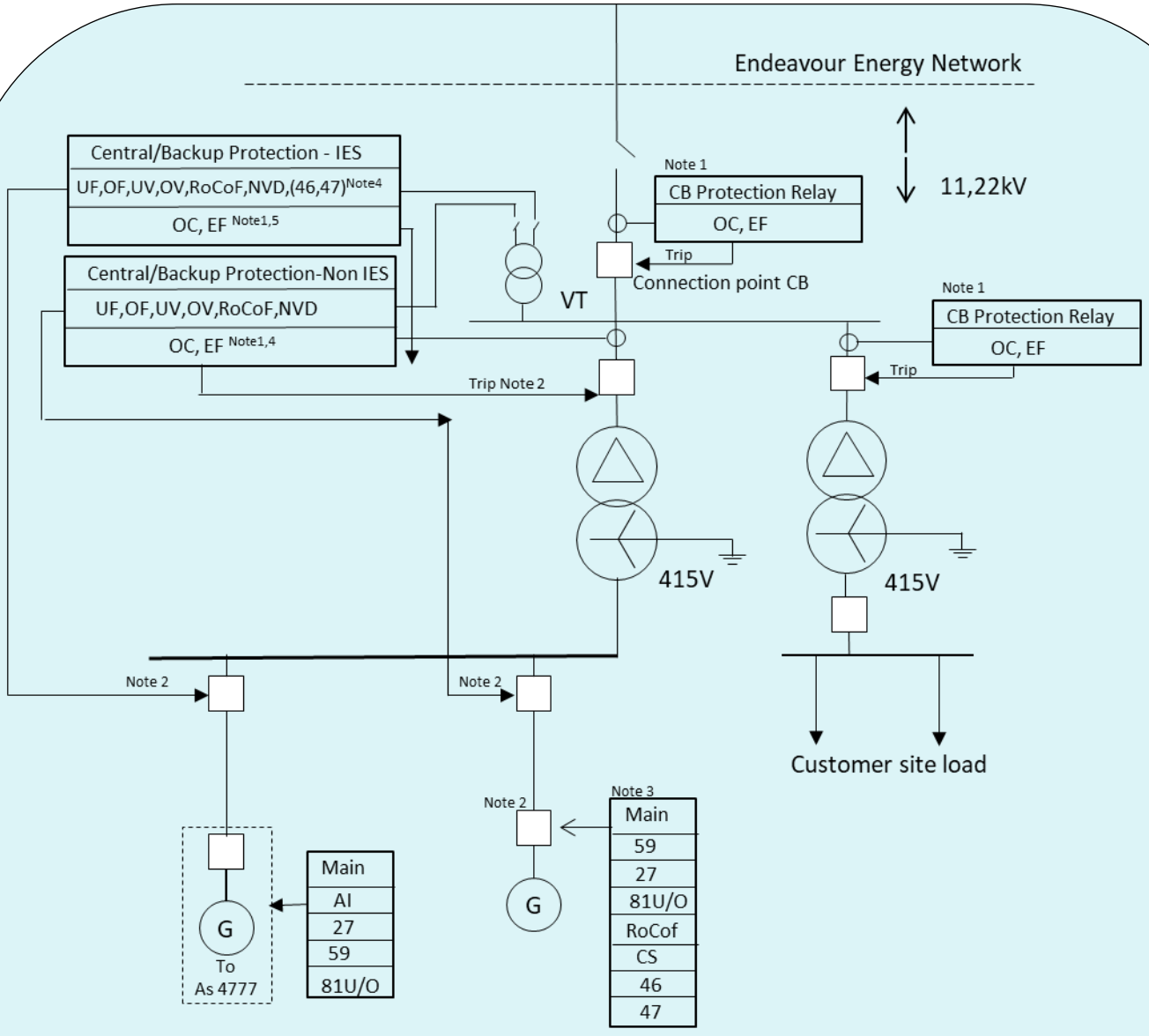
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains, OCEF or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: CBF either by CBF scheme or back up clearance by upstream relays.
Note 4: OCEF shall detect the fault on Endeavour Energy Network.

Example 7: No export rotating generator



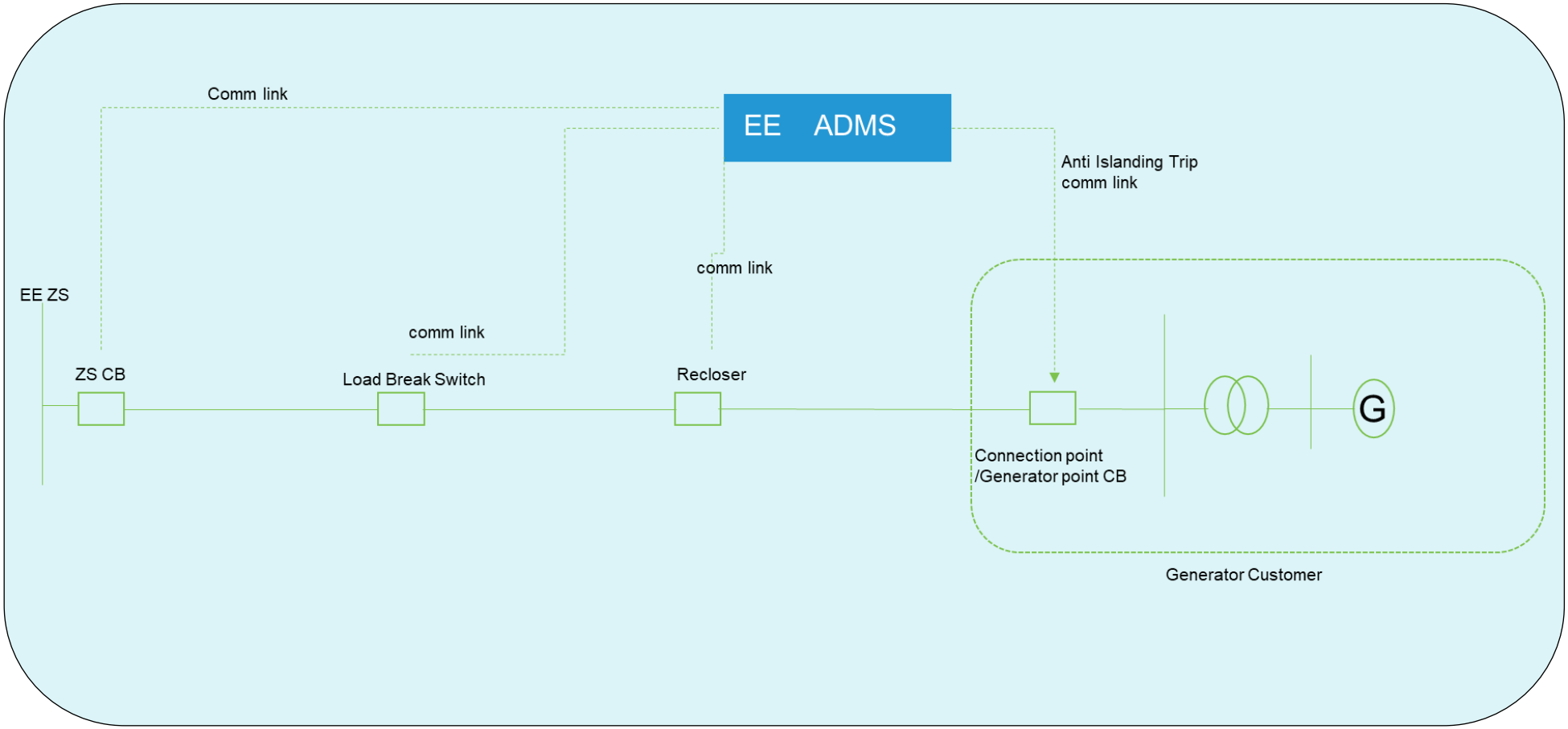
Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains, OCEF or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: CBF either by CBF scheme or back up clearance by upstream relays.
Note 4: GLFP, GRP trip signal is representative only. The circuit breaker to be tripped by GLFP/GRP relay is to be nominated by Proponent

Example 8: Export rotating generator and Inverter generator (Different ride through capabilities)



Note 1: OCEF generally used to discriminate between multiple loads and generation feeder.
Note 2: On loss of mains, OCEF(non-IES) or relay fail, CB will trip (Watch dog). UV coil on CB. Unless duplicate scheme.
Note 3: CBF either by CBF scheme or back up clearance by upstream relays.
Note 4: OCEF shall detect the fault on Endeavour Energy Network.
Note 5: OCEF can be a separate relay. Fail Safe arrangement for of OCEF function is not mandatory for IES unless designed for islanded operation.

Example 9: SCADA based inter-tripping



Appendix C: Static data and information

Refer to the latest version of Endeavour Energy static data and information checklist generator connection.

Endeavour Energy

POWER together