The future and evolving nature of distributed energy resources

Emergency Backstop Mechanism
Standards and installation requirements
24 January 2023

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Manager Generation & Customer Standards
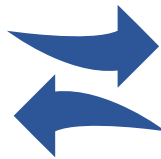Renewables and Distributed Energy

CANDICE HORIG
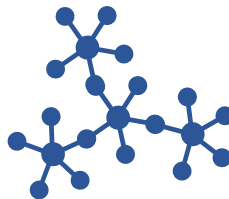
Senior Standards Officer
Generation and Customer Standards

A quick reminder… what the future holds

	Now	2025	2030	2035
Solar PV	4.3 GW	🔴 6.7 GW 🟠 6.3 GW 🟢 5.9 GW	🔴 10.5 GW 🟠 9.3 GW 🟢 8.1 GW	🔴 11.9 GW 🟠 10.3 GW 🟢 8.6 GW
Battery	0.2 GWh	🔴 0.8 GWh 🟠 0.5 GWh 🟢 0.4 GWh	🔴 2 GWh 🟠 1.4 GWh 🟢 1.5 GWh	🔴 2.6 GWh 🟠 1.9 GWh 🟢 1.6 GWh
Electric Vehicle	10,000	🔴 124,000 🟠 25,000 🟢 14,000	🔴 1 M 🟠 268,000 🟢 34,000	🔴 2.2 M 🟠 1.3 M 🟢 278,000

Scenarios: 🟢 Slow 🟠 Medium 🔴 Fast

Customers are active participants
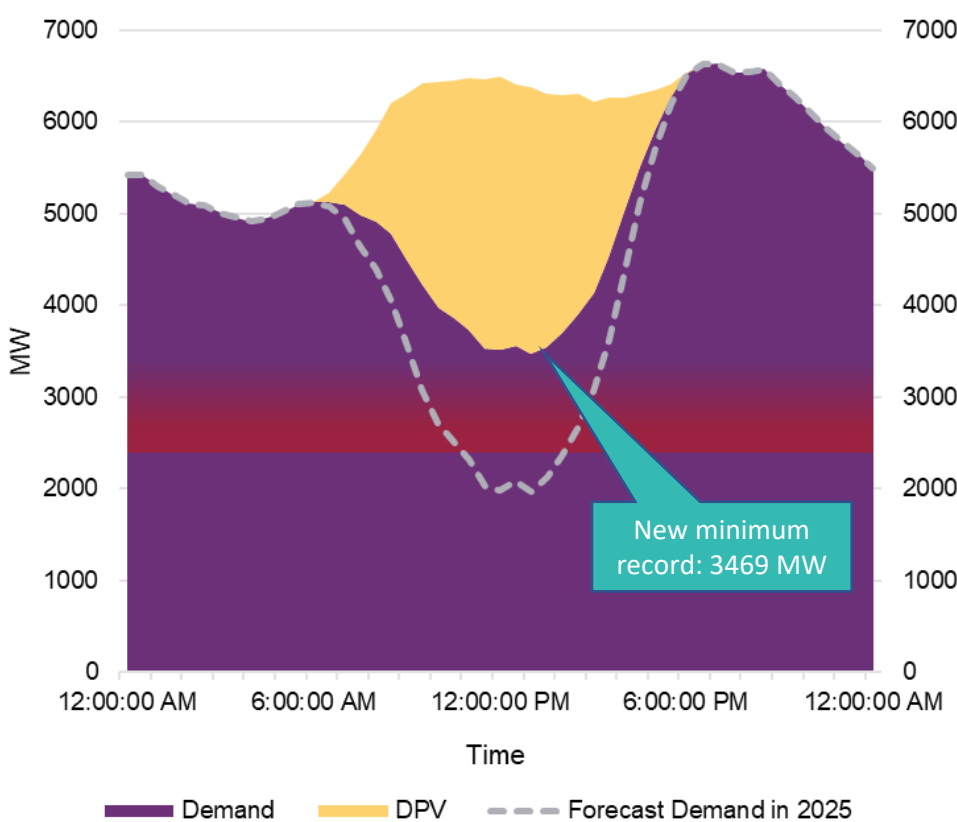
Multi-directional
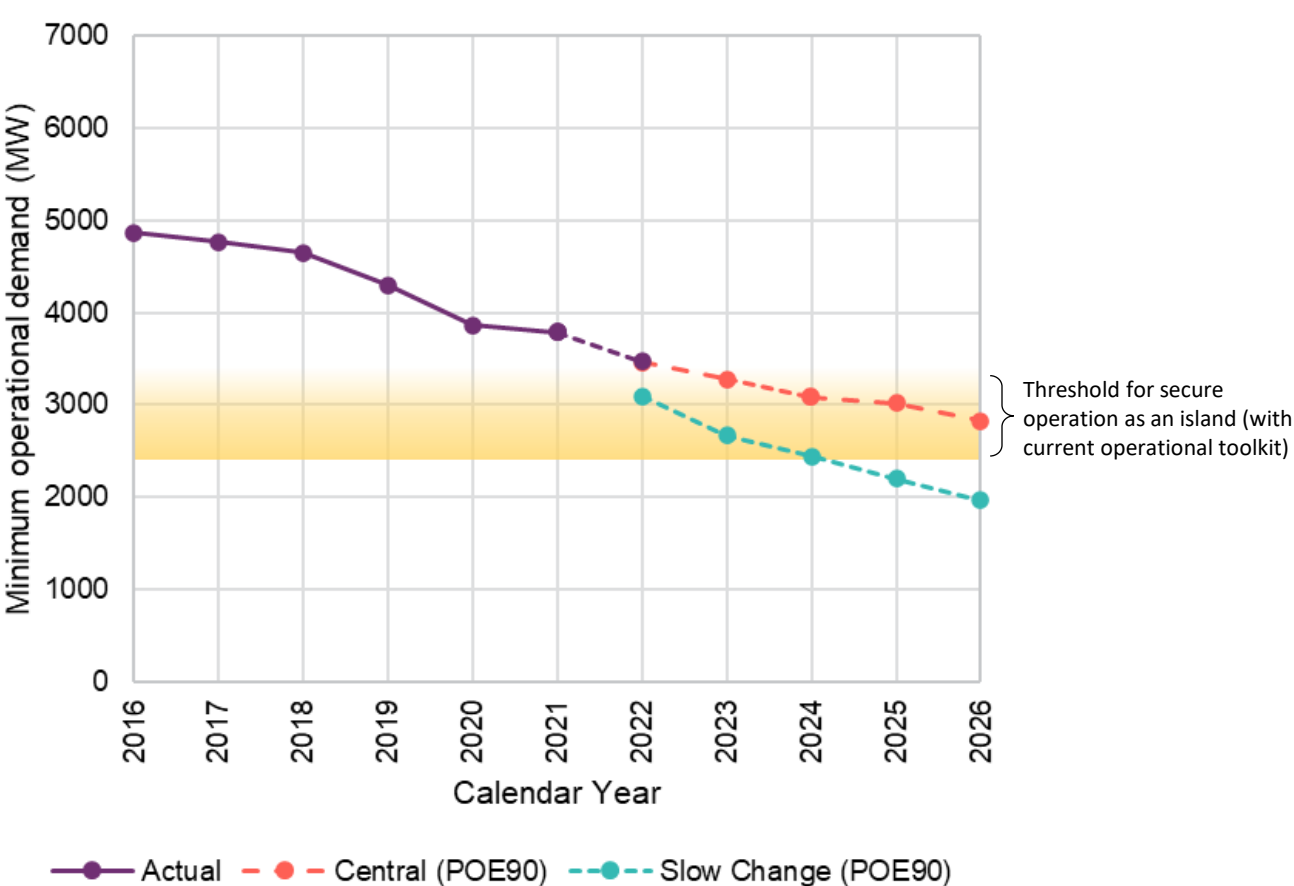
Decentralised

Market-driven regulation

Intelligent Grid

Many renewable energy producers

Qld's forecast of minimum demand

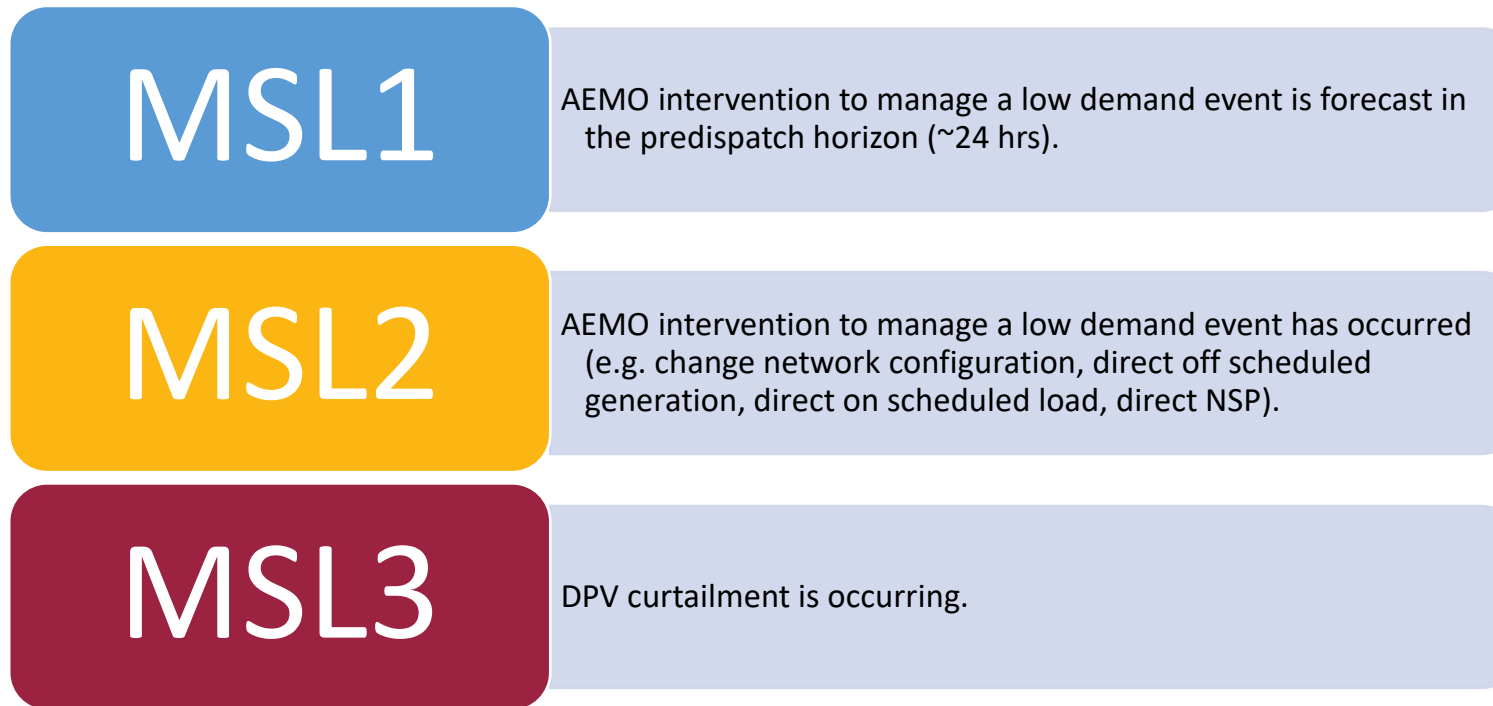**QLD Daily Demand Profile (Sunday 11th Sep, 2022)**

Legend: Demand | DPV | Forecast Demand in 2025

New minimum record: 3469 MW

QLD Annual Minimum Demand

Threshold for secure operation as an island (with current operational toolkit)

Legend: Actual | Central (POE90) | Slow Change (POE90)

Source: AEMO, 2022 ESOO

Emergency Backstop is MSL3

AEMO has implemented a new market notice framework for Minimum System Load (MSL) to improve transparency and to elicit a market response where possible. The Emergency Backstop mechanism – as part of MSL 3 – is only triggered where actions under MSL 1 and MSL 2 have not sufficiently reduced the risk to network security.

MSL1
AEMO intervention to manage a low demand event is forecast in the predispatch horizon (~24 hrs).

MSL2
AEMO intervention to manage a low demand event has occurred (e.g. change network configuration, direct off scheduled generation, direct on scheduled load, direct NSP).

MSL3
DPV curtailment is occurring.

See AEMO Factsheet, https://aemo.com.au/-/media/files/learn/fact-sheets/pv-rooftop-solar-consumer-fact-sheet.pdf

Backstop on a page

Connection Standards for LV Generation systems, requiring new and selected replacement / upgraded inverter energy systems, 10kVA and above, to install a generation signalling device (GSD), applying from 6th Feb 2023.

- Utilises demand response (DRM0) functionality as per AS/NZS 4777.2:2020 (Section 3.2).

- GSD designed as per AS/NZS 4755.1 to work with inverters which comply with ASNZS 4777.2, regardless of its make or model.

- Communication with the GSD via our Audio Frequency Load Control (AFLC) technology. This is a cyber secure communication approach, with no ongoing cost (for the device, OEM or communications) to the consumer.

- Backstop **only** initiated at the request of AEMO reinforced through the Distribution Authority, as a last resort to prevent wide scale network outages, under minimum system load environment.

Focus for today

- Overview of Emergency Backstop Mechanism
- Backstop requirements within Connection Standards
- Guidance on wiring options
- Where to purchase Generation Signalling Devices
- Compliance inspections
- Discussion

Emergency Backstop Mechanism
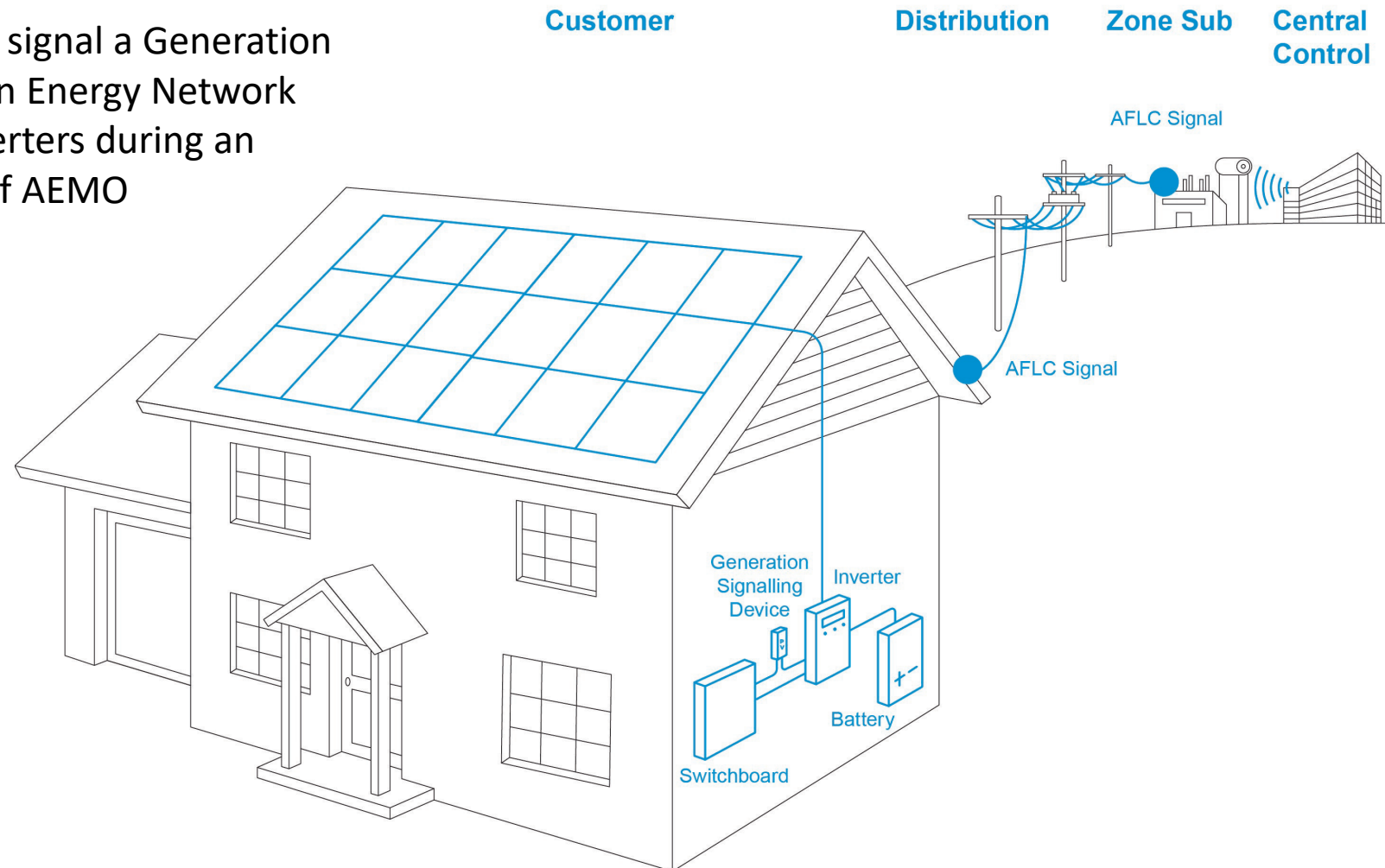
Audio Frequency Load Control:
Using our tried and tested AFLC system to signal a Generation Signalling Device (GSD), Energex and Ergon Energy Network can deliver real time on/off control of inverters during an emergency event at the lawful direction of AEMO

A Generation Signalling Device (GSD)

Demand Response Mode (DRM) plug on inverter

Customer   **Distribution**   **Zone Sub**   **Central Control**

AFLC Signal

AFLC Signal

Generation Signalling Device

Inverter

Battery

Switchboard

Emergency Backstop Mechanism - Operation

- The generation signalling device operates via AS4755.1, utilising Demand Response Mode 0 (DRM0). Under DRM 0, the inverter will cease all generation (this includes export and self-consumption)

- Triggering the "off" signals to the inverter is instigated by Energex/Ergon Energy Network at the request of Australian Energy Market Operator (AEMO) - on receipt of signal, inverter will enter DRM 0.

- When the network event has 'passed' - a second signal will be sent to the GSD which will return the inverter to normal operation.

- The GSD has an in-built 'fail safe' mechanism that ensures that if the device does not received or respond to the second "turn on" signal, the inverter will return to normal operation after 4 hours

> **Operation**
> The GSD will only ever be activated at the direction of AEMO in line with its Minimum System Load market notification framework

Emergency Backstop Mechanism - Customer Impacts

- Likelihood of events is low – with the highest risk being days of high generation, lower network demand coupled with the Queensland network disconnecting from the national electricity grid; in recent times, Qld has 'islanded' for short periods of time around once every two years.

- Installation of a GSD is mandatory in compliance with relevant Connection Standards – failure to do so will be a breach of the customer's connection contract obligations, and subject to enforcement provisions.

- Whilst the inverter is in DRM 0 mode, electricity consumption from the grid will be charged at the customer's normal rates under their Retail contract.

> ## Compliance
>
> The installation of a GSD will be mandatory in compliance with the relevant Connection Standards. Failure to comply will breach the customer's connection contract obligations, and subject to enforcement provisions.
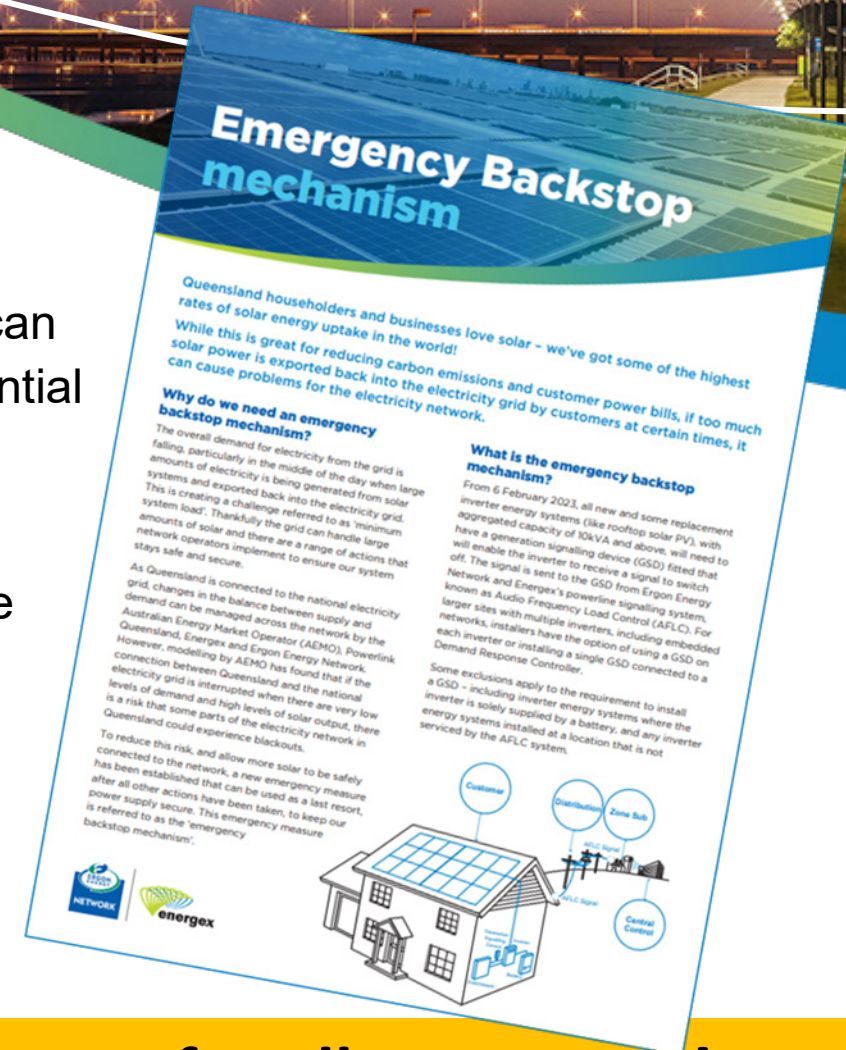>
> Inspection will be carried out by Energex and Ergon Energy Network

Emergency Backstop Mechanism
A simple message for your customers

- This measure is necessary to maintain wider system security

- AEMO, Powerlink, Energex/Ergon Energy Network are doing this so we can continue to connect customer owned generation, whilst avoiding the potential for wide scale system outages during certain highly abnormal network conditions.

- The cost of implementation is low and the frequency of events likely in the order of once per 1-2 years or less.

- Fact Sheet available on Energex and Ergon websites – to help with conversations about Backstop to customers

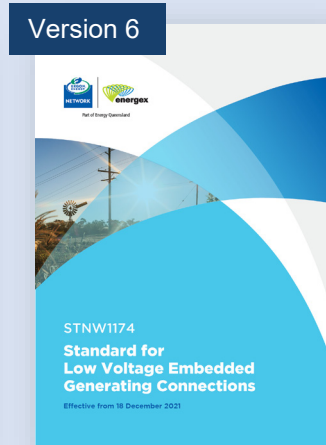**Having an emergency 'lever' helps keeps the lights on for all customers!**

LV EG Standards Updates

Fixed EG

Version 9

STNW1170
**Standard for
Small IES Connections**
Effective from 18 December 2021

Version 6

STNW1174
**Standard for
Low Voltage Embedded
Generating Connections**
Effective from 18 December 2021

Dynamic

Version 2

STNW3510
**Dynamic Standard for
Small IES Connections**
Effective from 18 December 2021

Version 2

STNW3511
**Dynamic Standard for
Low Voltage Embedded
Generation Connections**
Effective from 18 December 2021

New Emergency Backstop Mechanism Clause

4.3.3   Emergency Backstop Mechanism

4.3.3.1   Application

Small IES Fixed EG Connections that satisfy the following conditions shall comply with Section 4.3.3.2 of this Standard to enable the Emergency Backstop Mechanism:

a. the aggregated system capacity of all inverters[4] at the Premises is equal to or above 10 kVA; and

b. the Distribution System has AFLC service available at the Connection Point[5].

4.3.3.2   Configuration for an Emergency Backstop Mechanism

Subject to Section 4.3.3.1 of this Standard, a Proponent shall ensure that any Small IES Fixed EG Connection is configured to comply with the following requirements:

a. installation of a GSD in accordance with the QECM Supplement No.2 for all inverters that:

    1. are, or were, installed or altered pursuant to a Connection Contract dated on or from 6 February 2023; and

    2. are not connected exclusively with an ESS DC source;

b. the inverter is configured to enable functionality of the demand response mode DRM 0 in compliance with AS/NZS 4777.2.

c. where the inverter does not have an integrated device for the demand response mode, an external device is installed in accordance with clause 3.2.1 of AS/NZS 4777.2.

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[4] Including inverters with ESS DC sources.
[5] AFLC service availability can be checked for Energex at: https://www.energex.com.au/home/our-services/connections/low-voltage-generation/emergency-backstop-mechanism and Ergon Energy Network at: https://www.ergon.com.au/network/connections/low-voltage-generation/emergency-backstop-mechanism

*Sample clause from STNW1170 V9. Numbering in EG standards vary.

Who needs to install backstop?

Inverter systems ≥ 10 kVA

This is an aggregate of all inverters at site.

Contracted from 6th February

Any inverter contracted from 6th of Feb 2023. This may require a retrofit if more inverters are added later.
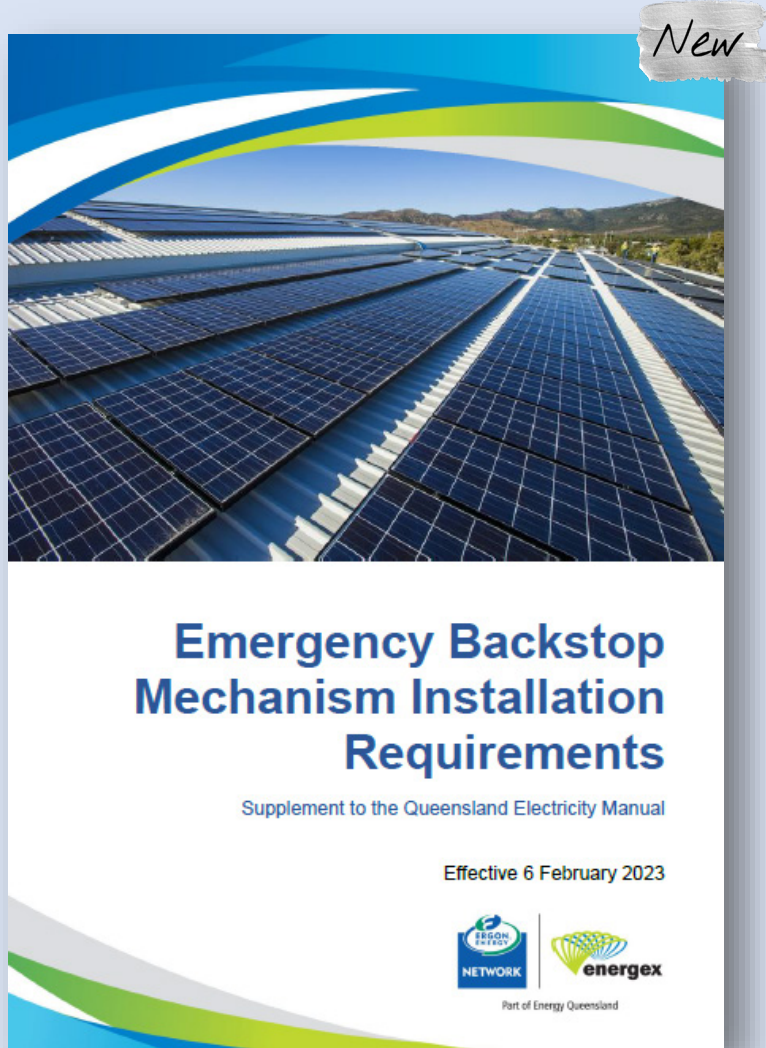
What about inverters contracted before 6th Feb 2023

A GSD is not required for these inverters.

Other exclusions

- Doesn't apply to battery only inverters (but they are in the aggregate calculation),

- needs to be an area with AFLC service,

- Isolated Networks are exempt.

QECM Supplement

New

Emergency Backstop Mechanism Installation Requirements

Supplement to the Queensland Electricity Manual

Effective 6 February 2023

ERGON ENERGY NETWORK | energex

Part of Energy Queensland

Available:
https://www.ergon.com.au/__data/assets/pdf_file/0008/1057256/Emergency-Backstop-Mechanism-Installation-Requirements.pdf

4 EMERGENCY BACKSTOP MECHANISM

4.1 General

Any IES that are required under a relevant Standard to be configured for the Emergency Backstop Mechanism, shall ensure that the GSD is installed in compliance with this QECM Supplement.
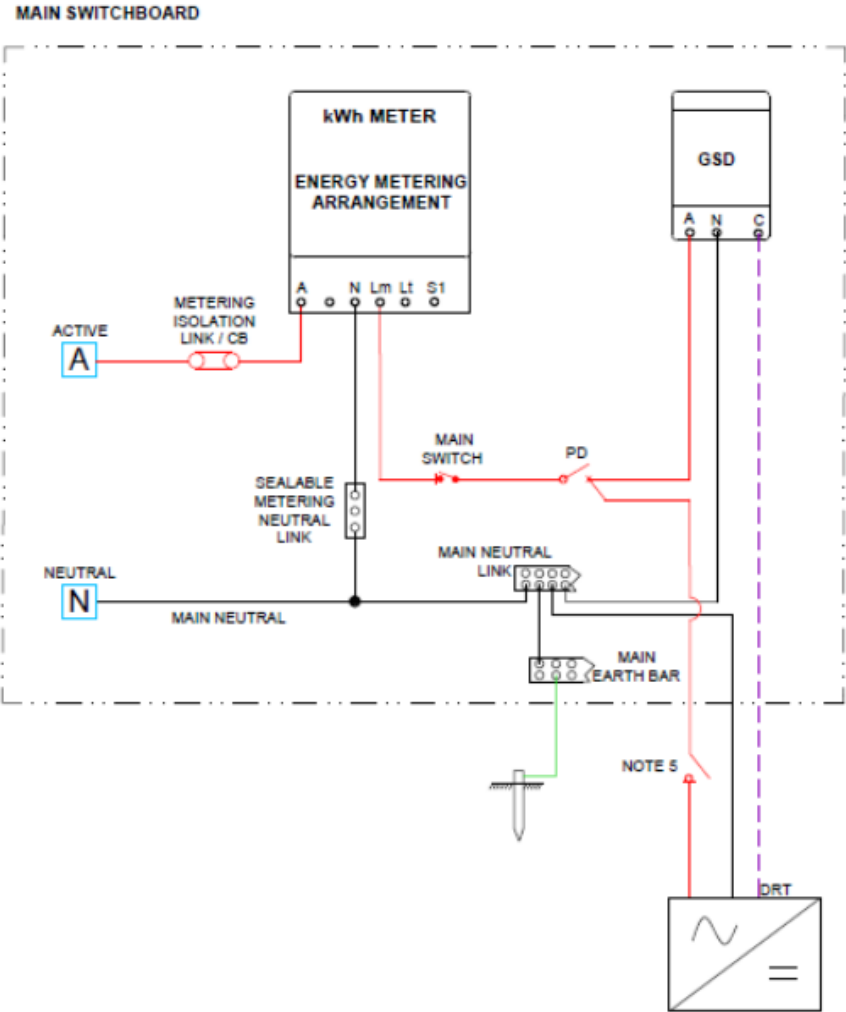
4.2 Installation Requirements

The following requirements apply to a GSD for EG Systems that are to have an Emergency Backstop Mechanism:
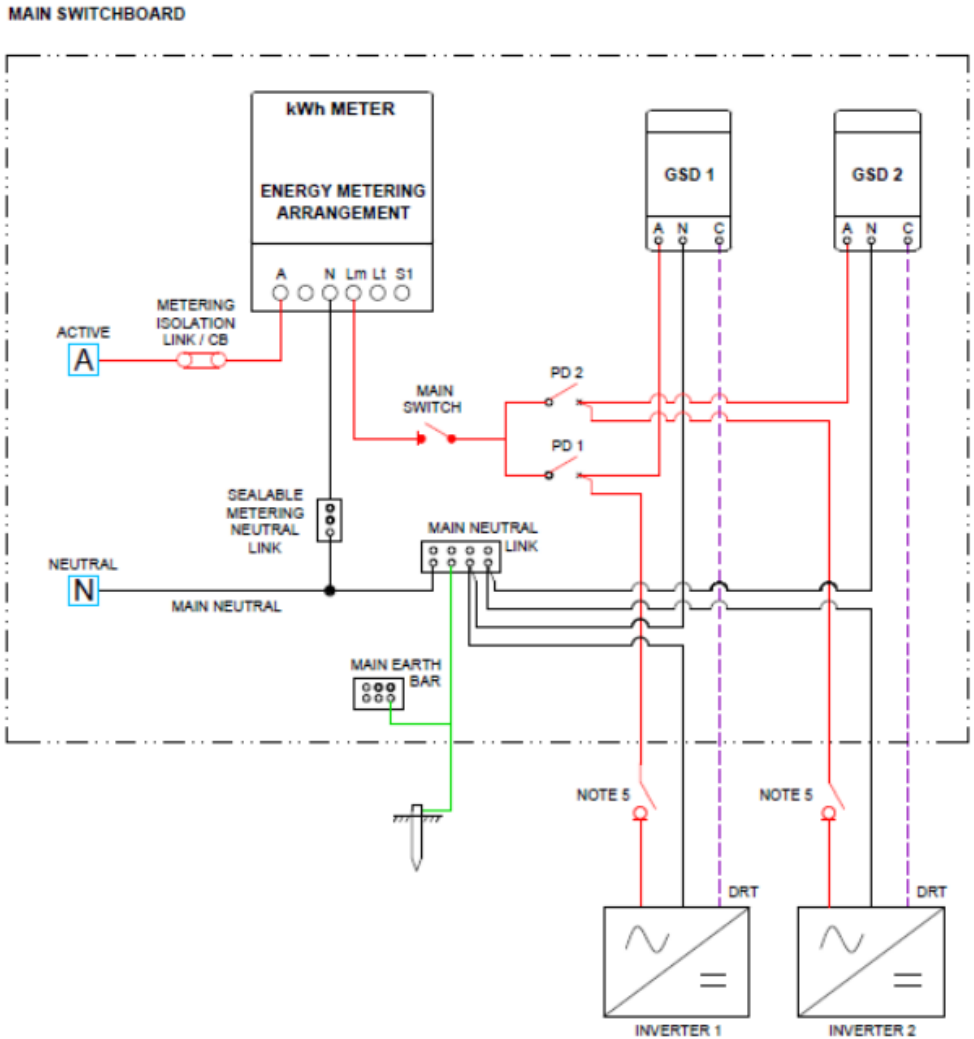
(a) The GSD shall be installed in compliance with AS/NZS 3000.

(b) A connection with an individual inverter that are required under a Standard to have a GSD shall meet the requirements of the G01 wiring diagrams in Section 4.3 of this QECM Supplement.

(c) A connection with multiple inverters that are required under a Standard to have a GSD shall meet the requirements of either G02 or G03 in Section 4.3 of this QECM Supplement.

(d) The conductor connected between the protective device for inverter supply and the GSD shall be:

    i. of a length that does not exceed three meters;

    ii. protected mechanically or otherwise protected so that the risk of short-circuit is reduced to a minimum; and

    iii. installed in such a manner so as to reduce to a minimum the risk of fire or other danger.

(e) The GSD shall be located in either:

    i. the main switchboard; or

    ii. the distribution board with the protective device for inverter supply.

(f) The GSD control cable may be extended as required.

(g) The GSD control cable shall connect:

    i. directly to the inverter; or

    ii. to the inverter via the external device used to provide demand response mode, where the inverter does not have an integrated device; or

    iii. where compliant with wiring diagram G03, to the inverter via a Demand Response Site Controller.

QECM Supplement – Wiring diagrams

QECM Supplement – Wiring diagrams

G03
GSD with Demand Response Site Controller for multiple inverters

Procuring a GSD

- See approved GSD list and listing process
- Currently only 1 device listed – TMAC
- Can procure directly (min order of 20) or from wholesalers / solar distributors
- Installation manual updated online to align with QECM supplement

Queensland statutory requirements for engineering services

QLD RPEQ

- Queensland Professional Engineers Act 2002
  (original legislation from 1929)

- Protecting the public by ensuring professional engineering services are provided by an RPEQ in a professional and competent way.

- Engineering services can be carried out by:
  - An RPEQ; or
  - A person under the direct supervision of an RPEQ

- Carrying out a professional engineering service when not an RPEQ in Queensland has a maximum penalty of $137,850

Direct supervision by an RPEQ

- To undertake engineering work a person must be an RPEQ in the appropriate field who has competence for the task; or
- The person undertaking the work must be directly supervised by an engineer who meets the criteria described above.
- Direct supervision requires the RPEQ to be able to influence the engineering task at all stages from the beginning through to the end. For compliance with legislation there must be evidence kept by both parties of this supervision for all tasks.
- Direct supervision is not about organisational structures, physical locations etc. so can effectively be managed with modern communication tools such as emails, webconferencing etc.

What is engineering work?

- Professional engineering service means an engineering service that requires, or is based on, the application of engineering principles and data to a design, or to a construction, production, operation or maintenance activity, relating to engineering, and does not include an engineering service that is provided only in accordance with a prescriptive standard.
- Undertaking tasks set out in, or required by, a document which meets the definition of 'prescriptive standard is not engineering work. Many industry standards including many Australian Standards do not meet the definition of 'prescriptive standard' because they may require the exercise of judgement and/or require advanced scientifically based calculations.

For more information visit BPEQ

Emergency Backstop Mechanism - Inspections

- Inspections will be carried out by Ergon / Energex field staff

- These will check for the presence, and correct installation of the GSD

- Non-compliance issues will be addressed directly with the premise occupant

- It is in all parties best interest to ensure correct installation to avoid having to return to site or manage customer complaints.

'In-flight' applications

Connection status	Backstop required?
Connection approval prior to 6th Feb	Not required
Connection application submitted prior to 6th Feb, but not approved and accepted til 6th Feb or later	Required to comply
Connection Approvals in place prior to 6th February, but not installed and Approval lapsed.	Required to comply
Connection Enquiry submitted before 6th February	Must comply with Standards in a place at time of when application is approved
Connections submitted in stages after 6th February	IES that meet the 10kVA threshold, or trigger the aggregate capacity to hit 10kVA, will require a GSD. This include adding a GSD to an IES that was approved for install from 6th February 2023, but did not meet the threshold at the time.

BESS applications

Application scenario	Backstop required?
Sites with a inverter fed by BESS only (no solar)	Not required, including for sites approved after 6th Feb. *However, adding PV to BESS only system, which was approved after 6th Feb, will trigger backstop requirement where total IES capacity on-site (including the BESS only IES) exceeds 10kVA.*
Sites with a hybrid inverter, fed by PV and BESS	Required
Sites with a standard PV inverter, fed by PV AND A separate inverter fed solely from a BESS	Requires a GSD to be installed on the solar fed inverter only, where the IES capacity, of all IES on site, including the BESS IES, is 10kVA and above.

Enabling dynamic CER connections

Moving to an advanced dynamic network

Jul 2023

4 - A national approach with CSIP-AUS
Growing industry compliance to the new Common Smart Inverter Protocol CSIP-AUS will support a move to this national standard.

Nov 2022

3 – Test environment available
Test environment for SEP2 utility server available for vendors seeking certification with Energex and Ergon Energy Network.

Oct 2022

2 – SEP2 Client Handbook released
Technical documentation detailing registration and test requirements with new EQL SEP2 Utility Server. Strong alignment to SAPN wherever possible.

Jul 2022

1 - A new way to connect – Dynamic connections available
With the standards released in December 2021, Ergon and Energex have contract options available for early adopters of dynamic connections.

SEP2 Client Handbook Available:
https://www.ergon.com.au/__data/assets/pdf_file/0007/1036591/SEP2-Client-Handbook.pdf

Thank you for attending

- Find out more via:

energex.com.au/emergencybackstop or

ergon.com.au/emergencybackstop

- Questions via:

emergencybackstop@energyq.com.au