

Jemena Electricity Networks (Vic) Ltd

Embedded Generation Emergency Backstop Requirements

Procedure



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Embedded Generation Emergency Backstop Requirements

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Glossary

The terms used within this document are defined as follows:

Term	Definition
CEC listed and approved AS 4777.2, CSIP- AUS compliant inverters/ systems	The Inverters with Software Communication Clients list includes inverters that are considered to have a communication channel that is compliant to IEEE 2030.5 CSIP-AUS, either hosted locally on the inverter or a gateway device, or via a certified cloud connection to the network operator Utility Server. This list is based on testing conducted by South Australia Power Networks. Refer to link: Approved Inverters Clean Energy Council
CSIP-AUS	The Common Smart Inverter Profile for Australia is an implementation guide for IEEE 2030.5 applicable to Australia. The CSIP-AUS can be downloaded from the ARENA DEIP interoperability steering committee website.
DEIP	Australia's Distributed Energy Integration Program steering committee supporting the adoption of CSIP-AUS for DNSPs.
IEEE 2030.5	IEEE Standard for Smart Energy Profile Application Protocol
Jemena's CSIP- AUS Approved Listing	The Jemena's CSIP-AUS Approved Listing contains CSIP-AUS inverters tested against Jemena's Utility Server
Utility Server	Jemena's CSIP-AUS compliant control server that will test inverters against

Abbreviations

The abbreviations used within this document are defined as follows:

Abbreviation	Description
AEMO	Australian Energy Market Operator
AMI	Advanced Metering Infrastructure
CEC	Clean Energy Council
CSIP	Common Smart Inverter Profile
CSIP-AUS	The Common Smart Inverter Profile for Australia,
DEIP	Distributed Energy Integration Program
DER	Distributed Energy Resource
DNSP	Distributed Network Service Provider
DoE	Dynamic Operating Envelope
EBE	Emergency Backstop Enabled
EG	Embedded Generation
GMM	Generation Monitoring Meter
JEN	Jemena Electricity Network
IEEE	Institute of Electrical and Electronics Engineers
LFDI	Long Form Device Identification
MD	Maximum Demand
MSL	Minimum System Load
MVP	Minimal Viable Product
NMI	National Meter Identifier
OEM	Original Equipment Manufacturer
O&M	Operations and Maintenance
VPP	Virtual Power Plant

1. Purpose and Scope

This document outlines the requirements and related processes and procedures Jemena has implemented for external stakeholders, i.e., inverter Original Equipment Manufacturers (OEM), Customers, and Installers, regarding Embedded Generation (EG) and Emergency Backstop Enabled (EBE) systems.

This document covers all EBE systems, which is now required for all photovoltaic EG connections to Jemena's distribution network from 1 July 2024 onwards.

2. Background

The Victorian Government have mandated regulatory obligations as part of Jemena Electricity Network's (JEN's) Distribution Licence regarding implementing and operating an EG Emergency Backstop Mechanism.

The Emergency Backstop Mechanism is required by the Australian Energy Market Operator (AEMO) and is a means by which the power generated by EG connected within a Distribution Network Service Provider's (DNSP) network can be remotely curtailed (or switched off) by the DNSP (at the direction of AEMO) during Minimum System Load (MSL) emergency events.

Connections systems and processes for basic and negotiated connections need to support the adoption of the Emergency Backstop Mechanism for our customers wanting to connect EG to our network. Furthermore, ongoing operations and maintenance of the Emergency Backstop Mechanism will be required.

JEN is introducing three solution options to enable the Emergency Backstop for new and modified EG installations, these being DoE over SCADA for larger EG installations, CSIP-AUS for smaller EG installations, and Generation Monitoring Meter (GMM) for bespoke installations (at the discretion of JEN).

2.1 What is EBE?

The Emergency Backstop Mechanism referenced above is referred to and/or otherwise known as a site's or EG system's EBE capability.

From 1 July 2024, Jemena will verify EBE functionality on all EG connection applications. During the connection process, if Jemena cannot satisfactorily verify EBE, then an EG, depending on its installed capacity and export capacity, will either still be allowed to connect provided it passes all other regulations and standards such as AS4777.2 and AS3000, but a "low static export limit" will be applied or will not be allowed to connect. This ensures that the site does not generate above the allowed limit as it is unable to be effectively controlled.

If a site is EBE compliant, Jemena will allow it to export power above the "low static export limit" provided there is export capacity available. Any site failing EBE verification will either have a "low static export limit" enforced OR not be allowed to connect.

2.2 Jemena's Approved EBE Types

Jemena has approved the following EBE solution types:

- CSIP-AUS
- Generation Monitoring Meter (GMM)
- DoE over SCADA

Note: Not all EBE types are compatible with all sizes of generators, refer to Table 2-1.

System	Example of	Communication type				
size (kVA)	who this system might be for	Internet	AMI	SCADA	Likely connection method *	Connection type
0- 30 kVA	The majority of households / small businesses	Ø	×	8	CSIP-AUS	Basic
>30 kVA	Small		×	×	CSIP-AUS	
– 200 kVA	husiness	×	GMM	Negotiated		
>200 kVA	Larger businesses	×	×		DOE over SCADA	

Table 2-1: Emergency Backstop EG Thresholds

2.3 Common Smart Inverter Profile Australia - CSIP-AUS

CSIP-AUS stands for Common Smart Inverter Profile Australia which leverages the IEEE 2030.5 communication standard to create a framework for Distributed Energy Resources (DER) control within a DNSP network. IEEE developed the IEEE 2030.5 standard to help DNSPs mitigate the issue of controlling all the new embedded generators / DERs safely and securely. Developed and first released in 2018, the standard models a modern IOT protocol with over 30+ function sets covering everything from device discovery to security to smart grid including, but not limited to; DERs, demand response, metering, costing and EV flow reservation.¹

CSIP-AUS implements 20 or more of the 30+ IEEE 2030.5 function sets and is the mandated end-state solution for JEN to comply with the Victorian Government's new Ministerial Licence Condition², applying to all JEN's non-SCADA systems. Refer to Figure 2-1 below.

¹ Source: https://www.qualitylogic.com/knowledge-center/ieee-2030-5-takes-off/

² The Electricity Industry Act 2000 - Ministerial Order Specifying Licence Condition 2024 was released on 31 January 2024 and applies from 1 July 2024 for new or modified Generating Unit sizes of 200 kVA or less. Victoria Government Gazette No. S 31 Wednesday 31 January 2024 https://www.gazette.vic.gov.au/gazette/Gazettes2024/GG2024S031.pdf

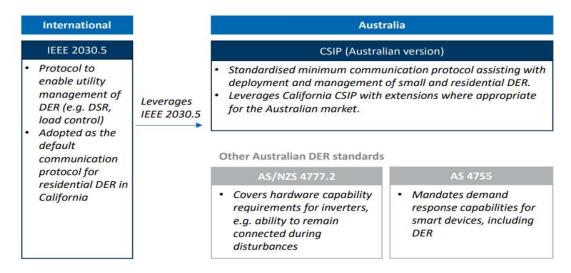


Figure 2-1- CSIP-AUS & IEEE 2030.53

2.3.1 CSIP-AUS Communication Models

The CSIP-AUS protocol is the basis for JEN's communication to small and medium EG installations and to Virtual Power Plant (VPP) Aggregators--via gateways, third-party cloud platforms or natively direct to the inverter⁴. the various types of communications arrangements are outlined in Figure 2-2 below.

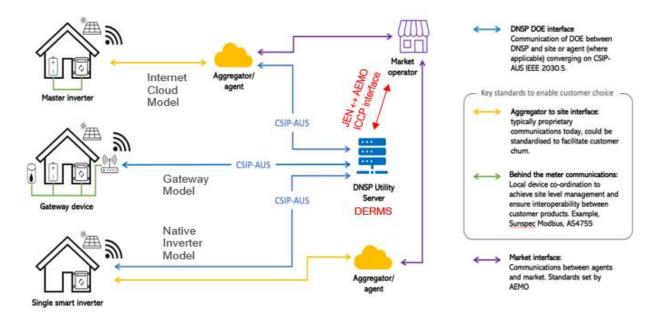


Figure 2-2 - CSIP-AUS Communication Models⁵

CSIP-AUS enables control (trip, restore, setpoint) and monitoring capabilities over the public internet, allowing JEN to communicate, directly or indirectly with EGs (including EBEs), via the new JEN CSIP-AUS Utility Server.

³ Source: FTI Consulting

⁴ FTI - Assessment Framework for DER interoperability policy - December 2021 (Energy.gov.au)

⁵ Source: SAPN (modified by JEN)

2.4 Generation Monitoring Meter - GMM

To manage the early adoption risks with CSIP-AUS, the Generation Monitoring Meter (GMM) is being offered concurrently with CSIP-AUS and adopted as an alternative method for EG installations, applicable for contestable revenue meter customers, for customers without a reliable internet connection, or for non-inverter based EG.

The GMM utilises a dedicated AMI Current Transformer meter to control the generating system; however, it is configured as a non-market smart meter. The GMM has control (trip and restore) and monitoring capabilities. As the GMM is a JEN-owned AMI meter, it interfaces directly into JEN's existing AMI Itron GenX meshed radio communications network. The GMM's internal load contactor is provisioned to signal a trip and restore the EG system or site. The JEN-owned CT meter is ideally suited for contestable meter sites.

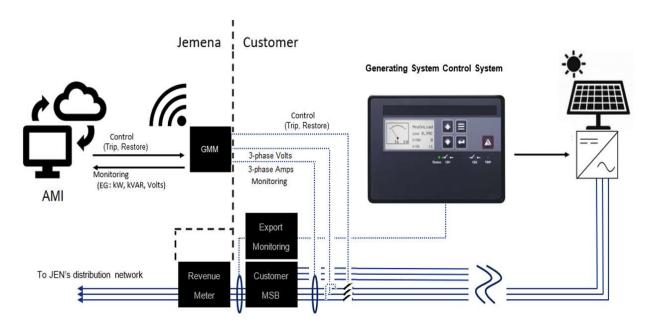


Figure 2-3 - GMM Implementation

2.5 Dynamic Operating Envelope - DoE over SCADA

For EG installations greater than 200 kVA, the imposed regulatory requirements do not specify a particular technology by which Emergency Backstop capability must be implemented.⁶

JEN has therefore adopted our existing SCADA communication system as the method for monitoring EG generation and control as the Emergency Backstop solution for this tranche, using DNP3 over SCADA via gateways and a 4G modem back to our SCADA master-station.

The Dynamic Operating Envelope, DoE, over SCADA method refers to the effective dynamic operation and control of a site's power export through Jemena's DNP3 SCADA control platform.

⁶ See Victoria Government Gazette, No. S 542, 11 October 2023.

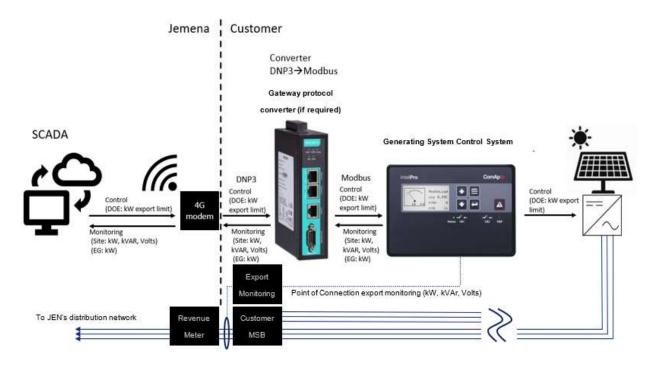


Figure 2-4 - DoE over SCADA Method

2.6 Impact on OEM, Customer and Installer

Jemena, OEMs, customers and installers will all be impacted in various ways to achieve a site's EBE compliance. As such, section 3 outlines the requirements and responsibilities on each party to ensure a site's EBE compliance and verification at different stages of the EG lifecycle.

2.6.1 Basic Embedded Generator Connection Process

For basic EG Connection applications, the process is as summarised below.

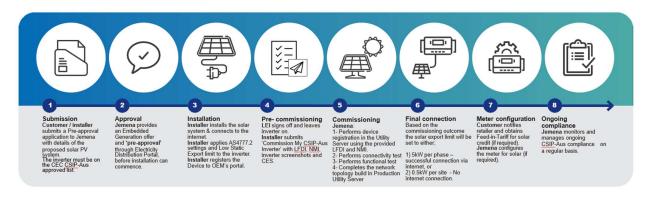


Figure 2-5 - High-Level Basic Embedded Generator Connection Process

2.6.2 Negotiated Embedded Generator Connection Process

The process remains broadly the same for Negotiated EG Connection applications; however, new EBE compliance is required.

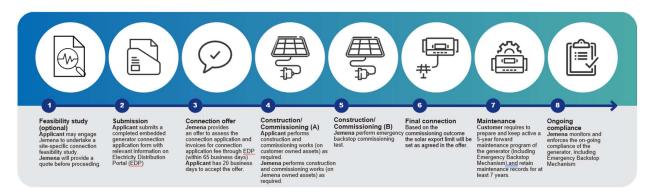


Figure 2-6- High-Level Negotiated Generator Connection Process

3. Requirements

3.1 EBE Export limitations

Linked to EBE compliance is the effective release of the "low static export limit" under different scenarios. Table 3-1 and Table 3-2 explain each system and when the corresponding low static export limits will apply.

3.1.1 Export Levels for EG Systems 0-30kVA

Scenario	Site Export CSIP-AUS
Fixed export limit, with interoperability and export capacity available	5kW per phase
Fixed export limit, with interoperability available but no export capacity	5kW per phase
Loss of comms or fail-safe, with export capacity available	0.5kW total export
Loss of comms or fail-safe, with no export capacity available	0.5kW total export
No connectivity to Utility Server, with export capacity available	0.5kW total export
No connectivity to Utility Server, with no export capacity available	0.5kW total export
Notes:	
The export limits presented above are subject to change.	

Table 3-1: Export Levels for EG Systems 0-30kVA, with CSIP-AUS implementation

3.1.2 Export Levels for EG Systems >30-200kVA

Scenario	Site Export CSIP-AUS	Site Export GMM
Fixed export limit, with interoperability and export capacity available	30% site MD + Adjustable Static ⁷	30% site MD + Adjustable Static
Fixed export limit, with interoperability but no export capacity available	0kW per phase	0kW per phase
Loss of comms or fail-safe, with export capacity available	0.5kW total export	30% site MD + Adjustable Static ⁸
Loss of comms or fail-safe, with no export capacity available	0.5kW total export	0kW total export
No connectivity to Utility Server, with export capacity available	GMM is mandatory	Not applicable
No connectivity to Utility Server, with no export capacity available	GMM is mandatory	Not applicable
Notes:		

Table 3-2: Export Levels for EG Systems >30-200kVA, with CSIP-AUS or GMM implementation

1) The export limits presented above are subject to change.

Fixed export limit will be based on site Maximum Demand (MD). Adjustable Static limit is the additional export capacity we provide where there is export capacity available, however, it can be adjusted anytime when other EG customers take up their allocated export capacity.

There is no fail-safe design function within GMM. However, JEN will continue to explore a fail-safe design with installer as we implement this solution.

3.1.3 What is successful implementation of EBE

Where a site's export can be remotely interrupted and/or curtailed via a Jemena approved method, will be deemed EBE compliant.

3.1.4 What is not successful implementation of EBE

Where a site's export cannot be remotely interrupted and/or curtailed via a Jemena approved method, will be deemed EBE non-compliant.

- For 0-30kVA systems, a low static export limit applies.
- For >30kVA systems, the site will not be able to connect.

3.2 Process

The EBE requirements can be categorised by 3 key stages:

- 1. EBE Equipment Verification (OEM & Jemena)
- 2. Requirements during Connection Process (OEM, Installer & Jemena)
- 3. On-Going Operations and Maintenance (O&M) Requirements (Customer & Jemena)

The following sub-sections outline the requirements and associated supporting documents for each stage and EBE type.

3.2.1 EBE Equipment Verification (OEM & Jemena)

This section outlines Jemena's requirements to verify EBE compliant equipment with OEM prior to it being installed on Jemena network as part of the connection process.

3.2.1.1 CSIP-AUS Type

Due to CSIP-AUS's relatively new industry adoption, there is currently no single accreditation regulatory body managing the compliance of CSIP-AUS for every inverter connected to a DNSPs Utility Server via IEEE 2030.5 protocol. As such, Jemena will verify OEM inverters against its own Utility Server⁹ and manage its own network approved listing, referred to as Jemena's CSIP-AUS Approved Listing.

As the industry adoption will take time, for OEMs to test against Jemena's Utility Server, and until an accreditation body is established, Jemena will provide a period of six months to support OEM testing where Jemena will not restrict any CEC listed and approved AS 4777.2, CSIP-AUS compliant inverters from attempting connection to Jemena's network.

This six-month period starts from 1 July 2024 and is until 1 January 2025.

In summary;

- Jemena provides an OEM test Utility Server to pre-test OEM systems to ensure compliance prior to installation.
- From 1 July 2024, Jemena only accepts CEC listed and approved AS 4777.2, CSIP-AUS compliant systems connecting to its network.
- Upon successful OEM system to Utility Server testing; the tested system is added to Jemena's network
 approved list of CSIP-AUS compliant inverters, referred to as Jemena's CSIP-AUS Approved Listing.

Refer to Jemena's Inverter OEM Validation Test Procedure.

• From 1 January 2025, Jemena will only allow the connection of inverters maintained on our Jemena's CSIP-AUS Approved Listing. When a CSIP-AUS accreditation regulatory body is established, Jemena will revert approval to this new body.

The Jemena's CSIP-AUS Approved Listing contains CSIP-AUS inverters tested against Jemena's Utility Server. New inverters can be added to Jemena's Approved Listing by making applications to emergency.backstop@jemena.com.au.

Prior to 1 January 2025, Jemena will not restrict any CEC CSIP-AUS listed and approved inverters from attempting connection to its network, even if the OEM has yet to test against the provided OEM test Utility Server. This is to allow OEMs that have compliant inverters but unable to test against Jemena's OEM test Utility Server, for whatever reason, a chance to still connect. Note, however, where the device fails the test, a low static export limit or disconnection will still apply (refer to Table 2-1). Jemena therefore recommend OEMs to utilise the provided test Utility Server to test its inverters as soon as possible to ensure a better customer/installer experience.

3.2.1.2 GMM Type

Only sites that Jemena have agreed to use GMM as an EBE type are verified and tested during the connection process. As such, the GMM solution does not require any specific OEM's EBE equipment verification.

3.2.1.3 DoE over SCADA Type

DNP3 control (including DoE over SCADA) of EG systems is not new to Jemena's network on systems above 200kVA. As such, the processes and procedures will continue to follow business-as-usual for verification and validation testing during the connection process. As such, the DoE over SCADA solution does not require OEM's EBE equipment verification.

3.2.1.4 Relevant Documents

The relevant supporting documents grouped by EBE type are summarised in Table 3-3 below.

EBE Type	Document Title	Document Type	URL
All types	Embedded Generation Emergency Backstop Requirements (this document)	Procedure	Embedded Generation Jemena
CSIP-Aus	Inverter OEM Validation Test Procedure	Procedure	Embedded Generation Jemena
GMM	No specific requirements unless OEMs want to set up test bench with Jemena.		
DoE over SCADA			

Table 3-3: Supporting Documents for EBE Equipment Verification

3.2.2 Requirements during Connection Process (OEM, Installer & Jemena)

For each site to connect to Jemena's network, the installer and/or customer, is to follow the EBE requirements as outlined within the relevant documents. Each site, connection type and size have different requirements to adhere to and are summarised in Table 3-4 below.

Size	Applicable EBE Type
0-30kVA	CSIP-AUS
30-200kVA	CSIP-AUS (or GMM at the discretion of Jemena)
>200kVA	DoE Over SCADA

Table 3-4: EBE Type for different EG sizes

3.2.2.1 CSIP-AUS Type

The EBE requirements are:

- All inverters must register the device with the OEM during the connection process. Each connected site must have an LFDI and NMI prior to submitting to Jemena's 'Commission My CSIP-AUS Inverter'. Refer to Section 2.6 for the connection processes.
- Specific requirements and outcomes under different scenarios are outlined in Section 3.1.

3.2.2.2 GMM Type

Only sites that Jemena have agreed to use GMM as an EBE type are verified and tested. The process is slightly different to CSIP-AUS and will require support from the installer (on-site) and collaboration with Jemena's AMI Meter commissioning team to ensure the EBE design is functioning correctly.

Specific requirements and outcomes under different scenarios are outlined in Section 3.1.

3.2.2.3 DoE over SCADA Type

DNP3 control (including DoE over SCADA) of EG systems is not new to Jemena's network on systems above 200kVA. As such, the processes and procedures will continue to follow business-as-usual for verification and validation testing.

3.2.2.4 Relevant Documents

The relevant supporting documents grouped by EBE type and other relevant supporting documents grouped by connection agreements and processes are summarised in Section 6 Appendix 1.

3.2.3 On-Going Operations and Maintenance (O&M) Requirements (Customer & Jemena)

Effective EBE implementation also requires ongoing verification and where applicable, annual site testing. As such, the customer should expect communication from Jemena in this regard. Jemena will ensure, that where a site has successful EBE implemented, it will enact all verification requirements and inform the customer of any such testing required prior to tests being conducted.

See below for outlined testing and notification requirements.

3.2.3.1 Jemena's communication processes

The connection application process requires the customer details for on-going and future notification and communication purposes. A preferred communication method is to be agreed upon at which point all future communication will use the chosen method. If there is no agreed communication method, Jemena will apply its own method to communicate.

Timelines on notification

When actioning an instruction from AEMO to interrupt or curtail electricity generation, Jemena will, as soon as practicable, publish a notice on its website.

When Jemena is carrying out tests to satisfy EBE functionality, and the event is anticipated to result in customer's generation being interrupted or curtailed for a cumulative total of more than 15-minute within a 48-hour period, Jemena will inform the customer at least 48 hours before the event.

In the event an EBE site loses EBE functionality, Jemena will inform customer as soon as practical.

MSO and/or Negotiated Customers

Where customers sign onto an MSO and/or Negotiated connection agreement containing the customer's explicit informed consent, then Jemena will follow that specified in the contract / agreement.

Notification of this procedure

Jemena is publishing this document on its website, and will notify the Essential Services Commission this document or as amended from time to time. Other related EBE documents are also published on Jemena's website.

3.2.3.2 On-going Testing

Post commission testing – (3 to 6 months after)

Every new site undergoing connection will be reviewed approximately 3-6 months after commissioning. This is to confirm EBE functionality and where sites are set to "low static export" they will be verified to ensure they do not export above this limit.

Sites that have successfully passed EBE verification, will be re-verified and re-tested (where necessary) to ensure EBE functionality. This standard is implemented as many sites may still have ongoing works even after connection is established and Jemena is required to ensure all EBE remains functional.

Annual testing (12+ months)

Where sites have successfully passed EBE verification, they will be re-verified to ensure ongoing compliance at least once yearly.

4. Summary of Responsibilities

The following table summarise the roles and responsibilities.

Role	Responsibility
Jemena	 Provides test Utility Server for OEM Provides production Utility Server for Installer and Customer Provides testing requirements and criteria (this document and others outlined) Perform and record test outcomes Administer communication software clients and inverters that passes or fails the test Technical support and resolve dispute Ongoing verification of EBE Upkeep of Jemena's CSIP-AUS Approved Listing
OEM	 Provides registration details of the device to the Installer and/or Jemena (i.e. NMI, LFDI) Communication and system commissioning support Testing troubleshooting support Ensure/Set low static export on EG (as required)
Installer	Registration of device with Jemena and OEM (where applicable – i.e. LFDI, NMI, etc.) Jemena approved CSIP-AUS compliant system installed, connected and ready for commissioning with internet connection made available to inverters Support to Jemena's representative (as required) Ensure/Set low static export on EG (as required)
Customer	Maintain the EG EBE system with ongoing function Maintaining Utility Server connectivity (where applicable)

5. Related / Reference Documents

- 1. Government of South Australia, Technical Regulator Guideline. Link: <u>2022D066388-Technical-Regulator-Guidelines-Distributed-Energy-Resources-Version-1.5-1.pdf</u> (energymining.sa.gov.au)
- 2. DEIP Interoperability Steering Committee Common Smart Inverter Profile Australia Test Procedures v1.0. Link: https://bsgip.com/wp-content/uploads/2023/09/CSIP-AUS-Comms-Client-Test-Procedures-v1.0-final.pdf
- 3. IEEE 2030.5:2018
- 4. SA HB-218:2023

6. Appendix 1: Supporting Documents during Connection Process (OEM, Installer & Jemena)

The relevant supporting documents grouped by EBE type are summarised in the table below.

EBE Type	Document Title	Document Type	URL
All types	Embedded Generation Guidelines (JEN GU 0020)	Guideline	Embedded Generation
	Embedded Generation Emergency Backstop Requirements (this document)	Procedure	<u>Jemena</u>
CSIP-Aus	Installer CSIP-AUS Commissioning Test Procedure	Procedure	Embedded Generation
	Inverter Energy System Embedded Generators Protection Requirements and Settings Summary (AS/NZS 4777.2:2020) – 0-200kVA systems	Fact sheet	<u>Jemena</u>
	Connection Guidelines for Inverter Energy Systems - >10kVA (single phase) and >30kVA to 200kVA (three phase) (ELE GU 0014)	Guideline	
	Residential Solar and Battery Systems EG Application Single Line Diagram Requirements	Fact sheet	
GMM	Embedded Generation Backstop Guideline (Above 30kVA) – DoE Over SCADA and Generator Monitoring Meter Methods (ELE-999-GL-EL-007)	Guideline	Embedded Generation Jemena
	Inverter Energy System Embedded Generators Protection Requirements and Settings Summary (AS/NZS 4777.2:2020) – 0-200kVA systems	Fact sheet	
	Connection Guidelines for Inverter Energy Systems - >10kVA (single phase) and >30kVA to 200kVA (three phase) (ELE GU 0014)	Guideline	
	Residential Solar and Battery Systems EG Application Single Line Diagram Requirements	Fact sheet	
DoE over SCADA	Embedded Generation Backstop Guideline (Above 30kVA) – DoE Over SCADA and Generator Monitoring Meter Methods (ELE-999-GL-EL-007)	Guideline	Embedded Generation Jemena
	Embedded Generation – Connection Principles and Guidelines; Embedded Generation – 5MVA or Greater (ELE GU 0004)	Guideline	
	Embedded Generation – Technical Access Standards; Embedded Generation – 5MW or Greater (ELE SP 0003)	Guideline	
	Register of Completed Embedded Generation Projects (Greater than 5MW)	Guideline	
	Embedded Generation – Example Charges and Fees; Embedded Generation – 5MW or Greater (ELE PR 0007 RG 01)	Guideline	

Other relevant supporting documents grouped by connection agreements and processes are summarised in the table below.

Connection agreements and processes	Document Title	Document Type	URL
Embedded Generation Connection Agreements	Model Standing Offer(s) – IES 0-30kVA	Contract	Embedded Generation Jemena
	Generator Connection Agreement(s) – Above 30kVA	Contract	Available upon request
	Model Embedded Generation Connection Agreement (ELE PR 0007 RF 01)	Contract	Embedded Generation Jemena
Embedded Generation	Basic EG connection process	Procedure	Embedded Generation
Processes and Forms	Negotiated Connection Process (Embedded Generators) – (Embedded Generators with total capacity of up to 5MVA)	Procedure	<u>Jemena</u>
	Description of Connection Process for Embedded Generation 5MVA or Greater (ELE PR 0007)	Procedure	
	Negotiated Connection Services Embedded Generation – Enquiry form	Form	
	Negotiated Connection Services Embedded Generation New Connection & Connection Alteration – Connection Application form	Form	