Register of Completed Embedded Generation Projects Greater than 200kW 2021

PowerWater

Disclaimer
This document has been compiled based on the best information available to Power and Water Corporation (Power and Water) at the time of drafting, and the information published in this document should not be relied upon without consultation with Power and Water.

Version History

Version	TRIM	Date	Comments
1.0	D2019/538917	31/12/2019	Initial version
2.0	D2022/073570	18/02/2022	2020 Version
3.0	D2022/073572	21/02/2022	2021 Version

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1 Introduction

This register of completed embedded generation projects has been developed to provide information on projects that have been successfully connected[1] to Power and Water Corporations (Power and Water) distribution network.

2 Purpose of Register

It is a requirement under Chapters 5 and 5A of the Northern Territory National Electricity Rules (NT NER) that Power and Water publish a register of completed embedded generation projects (i.e. for systems with a generating capacity greater than 200kW).
For projects greater than 2MW, this register:

- includes details of all embedded generation projects completed within the preceding five year period; and
- Is to be updated annually for all completed projects in the 5 year period preceding the review date.

For projects between 200kW and 2MW, this register:

- includes details of all embedded generation projects completed since 1 July 2019; and
- Is to be updated annually for all completed projects in the 5 year period preceding the review date.

3 Details included in the Register

The register of completed embedded generation projects includes, but is not limited to:

- technology of generating unit (e.g. synchronous generating unit, induction generator, photovoltaic array, etc) and it's make and model;
- maximum power generation capacity of all embedded generating units comprised in the relevant generating system;
- contribution to fault levels;
- the size and rating of the relevant transformer;
- a single line diagram of the connection arrangement;
- protection systems and communication systems;
- voltage control and reactive power capability; and
- details specific to the location of a facility connected to the network that are relevant to any of the details above.

[1] To form a physical link to or through a transmission network (including to a network connection asset or through a dedicated connection asset that is physically linked to that transmission network) or distribution network.

4 Project Register

S.No	Generating System	Year Completed (connected)	Location	Technology of the Generating Unit(s)	Generating units Details (Make and Model)	Maximum Power generation capacity of all embedded Generating Units (kW)	Contribution to Fault Levels (kA)	Size and rating of relevant transformers (voltages & kVA)	Single Line Diagram of the connection arrangement (PDF)	Protecting System and Communication Systems	Voltage Control and Reactive power capability	Details relevant to the specific location of the facility
1	Katherine Solar Power Station (25MW Solar PV and 6 MW BESS)	2020	Katherine	Solar PV Array and BESS	RSM 144-6-340P/5BB 1500 Solar PV Panel 9 x SMA Sunny Central (SC)3000-EV - Inverter 6 x 1.053MVA GPTech BESS (3MWD3-V450 BESS)	25000+6318	9.4	3 x 22/0.665 kV, 6MVA	SLD -2	● Anti-Islanding, Inter-tripping, synch check, differential protection scheme between KSPS and KZS. ● Local protection and control operation of KSPS. ● SCADA link	● The default voltage control mode is droop control with reference voltage of 1.0pu and 4.0% droop on 10.8Mvar base. ● The generating system, while not supplying or absorbing reactive power under an ancillary services agreement will draw electricity with a power factor in the range 0.9 lead to 0.9 lag.	Katherine Solar Power Station (KSPS) is a solar generating plant near Katherine Zone Substation in Northern Territory.

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2	Humpty Doo Barramundi-600 kW Solar	2021	Humpty Doo	Solar PV Array	637 kWp solar array and 490 kVA inverter bank	600	N/A	N/A	SLD -1	Anti-islanding Auto-Synchronising Reconnection Time Overcurrent protection Under voltage Trip Pick Up Over voltage Trip Pick Up Under Frequency Trip Pick Up Over Frequency Trip Pick Up System Ramp Up Rate System Ramp Down Rate The EG User is to provide Power and Water with aggregated generation information in the form specified by Power and Water in order to monitor the operation of the	The EG User must maintain the power factor presented to the network between 0.9 and 1.0 (lagging) at all times.	1105 ANZAC Parade, Middle Point 0836

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										generating system and for the EG User to demonstrate compliance with the ramp rate control requirement.		

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3	Batchelor 1 Solar Power Station - 10MW Solar PV	2021	Batchelor	Solar PV Array	Longi 435Wp Mono PERC HC Solar PV Panel 4 x SMA Sunny Central (SC)3000-EV - Inverter	10000	4.864	2 x 22/0.665 kV, 6MVA	SLD -2	● Anti-Islanding, Inter-tripping, synch check, differential protection scheme between BJPS and BAZSS. ● Local protection and control operation of BJPS. ● SCADA link	● The default voltage control mode is droop control with reference voltage of 1.0pu and 4.0% droop on 4.8Mvar base. ● The generating system, while not supplying or absorbing reactive power under an ancillary services agreement will draw electricity with a power factor in the range 0.9 lead to 0.9 lag.	Batchelor Solar Power Station (BJSPS) is a solar generating plant near Batchelor Zone Substation in the Northern Territory.
4	Manton Solar Power Station - 10MW Solar PV	2021	Manton	Solar PV Array	4 x SMA Sunny Central (SC)3000-EV - Inverter	10000	5.968	2 x 22/0.665 kV, 6MVA	SLD -2	● Anti-Islanding, Inter-tripping, synch check, differential protection scheme between MTPS and MTZSS. ● Local protection and control operation of MTPS. ● SCADA link	● The default voltage control mode is droop control with reference voltage of 1.0pu and 4.0% droop on 4.8Mvar base. ● The generating system, while not supplying or absorbing reactive power under an ancillary services	Manton Solar Power Station (MTSPS) is a solar generating plant near Manton Zone Substation in the Northern Territory.

S.No	Generating System	Year Completed (connected)	Location	Technology of the Generating Unit(s)	Generating units Details (Make and Model)	Maximum Power generation capacity of all embedded Generating Units (kW)	Contribution to Fault Levels (kA)	Size and rating of relevant transformers (voltages & kVA)	Single Line Diagram of the connection arrangement (PDF)	Protecting System and Communication Systems	Voltage Control and Reactive power capability	Details relevant to the specific location of the facility
											agreement will draw electricity with a power factor in the range 0.9 lead to 0.9 lag.	
5	Batchelor 2 Solar Power Station - 10MW Solar PV	2021	Batchelor	Solar PV Array	JINKO 465W Solar PV Panel 4 x SMA Sunny Central (SC)3000-EV - Inverter	10000	4.872	2 x 22/0.665 kV, 6MVA	SLD -2	● Anti-Islanding, Inter-tripping, synch check, differential protection scheme between BSF and BAZSS. ● Local protection and control operation of BSF. ● SCADA link	● The default voltage control mode is droop control with reference voltage of 1.0pu and 4.0% droop on 4.8Mvar base. ● The generating system, while not supplying or absorbing reactive power under an ancillary services agreement will draw electricity with a power factor in the range 0.9 lead to 0.9 lag.	Batchelor Solar Power Station (BPS Co) is a solar generating plant near Batchelor Zone Substation in the Northern Territory.

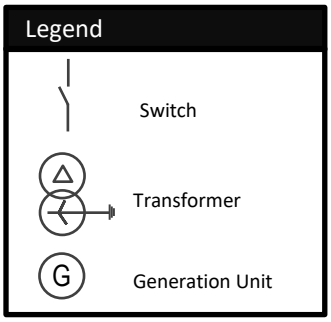
S.No	Generating System	Year Completed (connected)	Location	Technology of the Generating Unit(s)	Generating units Details (Make and Model)	Maximum Power generation capacity of all embedded Generating Units (kW)	Contribution to Fault Levels (kA)	Size and rating of relevant transformers (voltages & kVA)	Single Line Diagram of the connection arrangement (PDF)	Protecting System and Communication Systems	Voltage Control and Reactive power capability	Details relevant to the specific location of the facility
6	Hudson Creek Power Station - 12MW thermal generation power station	2021	Hudson Creek	Thermal generation power station	Caterpillar - 5 x G3520H Generating Units (GU).	12000	29.97	2 x 66/11kV, 15/20 MVA	SLD -2	● Control and monitoring of the generator connection circuit breaker and isolators. ● Tripping the generator connection due to overcurrent, line differential, under voltage and ground fault protections. ● Check synchronisation. ● Inter-trips ●additional overvoltage and frequency protection function in relays ●SCADA links	PWC will send a DNP3 pulse specific to each mode. These pulses will be translated at the power station into an integer register for processing by the PLC, as follows 0: Voltage control mode 1: Reactive power control mode 2: pf control mode Reactive Power: -4.75 MVAr to 4.75 MVAr -0.93 pu (absorbing) to 1.0 pu to 0.93 pu (exporting)	Hudson Creek Power Station (HCPS)) is a gas generator plant near Hudson Creek Terminal Station in the Northern Territory.

S.No	Generating System	Year Completed (connected)	Location	Technology of the Generating Unit(s)	Generating units Details (Make and Model)	Maximum Power generation capacity of all embedded Generating Units (kW)	Contribution to Fault Levels (kA)	Size and rating of relevant transformers (voltages & kVA)	Single Line Diagram of the connection arrangement (PDF)	Protecting System and Communication Systems	Voltage Control and Reactive power capability	Details relevant to the specific location of the facility
7	Robertson Barracks Solar Farm	2021	Robertson Barracks, Darwin	Solar PV Array and BESS	Solar System A 2 x 2.75MVA SMA Sunny Central 2750-EV System B 1 x 2.75MVA SMA Sunny Central 2750-EV System C 1 x 2.75MVA SMA Sunny Central 2750-EV BESS Pack: • System A: 16X57.14Kwh BOL Samsung 198S P3 Racks. • System B: 10X57.14Kwh BOL Samsung 198S P3 Racks. • System C: 12X57.14Kwh BOL Samsung 198S P3 Racks. Battery Inverter • System A- 15x87.67kVAABB PCS100 D-Type • System B - 8 x87.625kVA ABB PCS100 D-Type • System C - 8 x87.625kVA ABB PCS100 O-Type	10000	System A - 0.42 kA System B - 0.22 kA System C - 0.22 kA	System A 1 x BESS, 1.5 MVA, 11/0.375kV, YNd1 coupling tx 2 x PV inverter 2.75MVA, 11/0.385kV, Dy11, ONAN tx System B 1 x BESS, 1.2 MVA, 11/0.375kV, YNd1 coupling tx 1 x PV inverter 2.75MVA, 11/0.6kV, Dy11, ONAN tx System C 1 x BESS, 1.2 MVA, 11/0.375kV, YNd1 coupling tx 1 x PV inverter 2.75MVA, 11/0.6kV, Dy11, ONAN tx	SLD -2	● DNP3 SCADA interface standard	System A.± 1.975MVAr (Pf. 0.9 lead to 0.9 lag) System B : ± 0.9875 MVAr (Pf. 0.9 lead to 0.9 lag) System C. ± 0.9875 MVAr ((Pf. 0.9 lead to 0.9 lag))	Robertson Barracks-Northern Territory

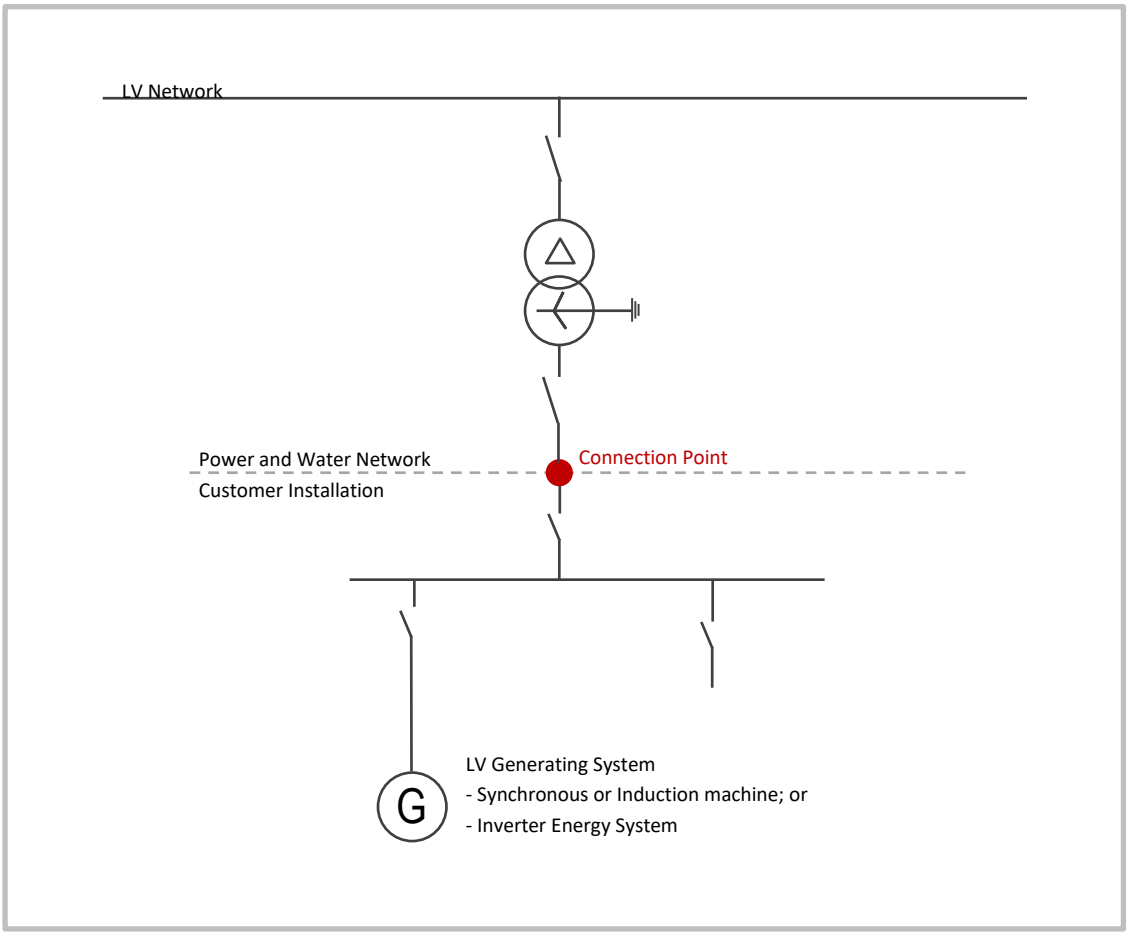
S.No	Generating System	Year Completed (connected)	Location	Technology of the Generating Unit(s)	Generating units Details (Make and Model)	Maximum Power generation capacity of all embedded Generating Units (kW)	Contribution to Fault Levels (kA)	Size and rating of relevant transformers (voltages & kVA)	Single Line Diagram of the connection arrangement (PDF)	Protecting System and Communication Systems	Voltage Control and Reactive power capability	Details relevant to the specific location of the facility
8	RAAF Darwin-Solar Farm	2021	RAAF Darwin	Solar PV Array and BESS	Solar • 2 x 2200kVA SMA Sunny Central MPS BESS Pack • 12 x56.5kWH Samsung 198S P3 Racks Battery Inverter • 10x87.7kVA ABB PCS100 D-Type	3200	1.76kA	1 x BESS, 1.2MVA, 11/0.375kV, YNd11 coupling tx 2 x PV inverter 2MVA, 11/0.385kV, Dy11, ONAN tx	SLD -2	● DNP3 SCADA interface standard	± 1.264MVAr Pf. 0.9 lead to 0.9 lag	RAAF Darwin-Northern Territory

5 Single Line Diagram

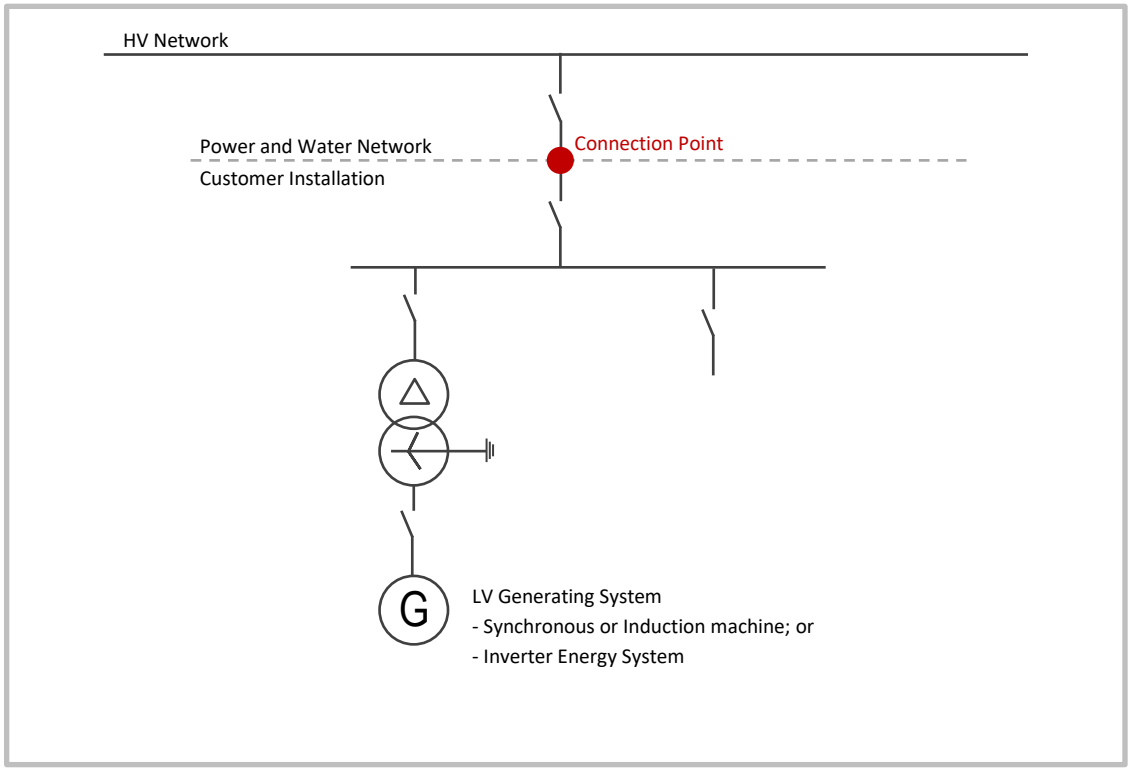
The following single line diagrams depict typical connection arrangements for embedded generators connecting to the Power and Water distribution Network. These diagrams are used for as a reference for connection arrangements listed in the register.



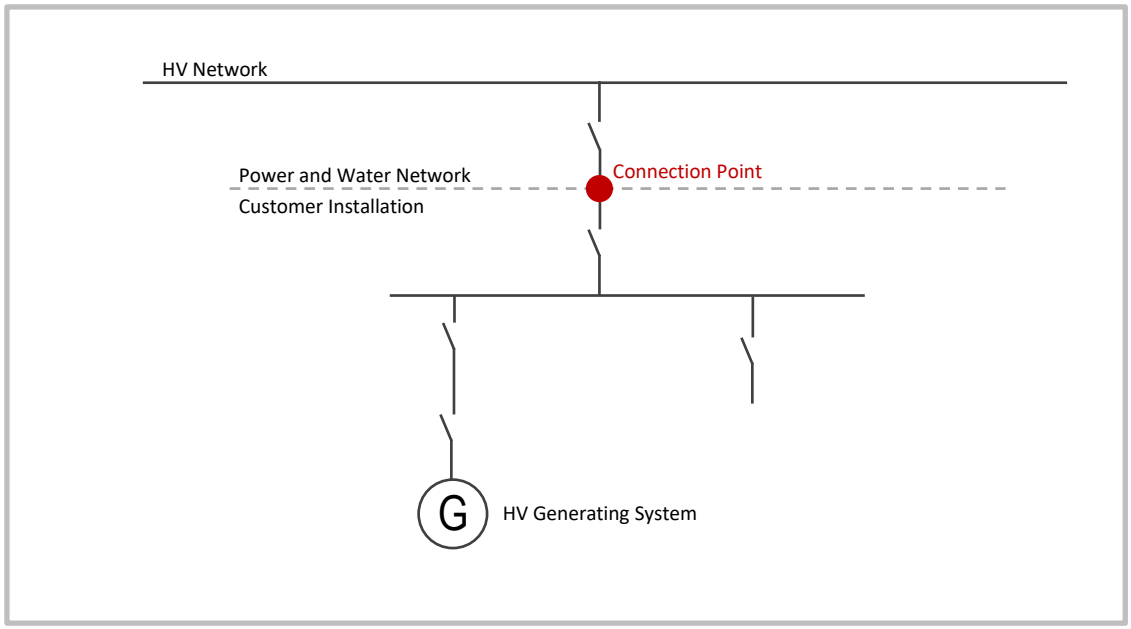
SLD 1 – Low Voltage Connection with Low Voltage Generating System (Synchronous or Induction Machine, or Inverter Energy System)



SLD 2 – High Voltage Connection with Low Voltage Generating System (Synchronous or Induction Machine, or Inverter Energy System)



SLD 3 – High Voltage Connection with High Voltage Generating System (Synchronous or Induction Machine)



6 More Information

For more information about the embedded generation projects, please contact us:

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