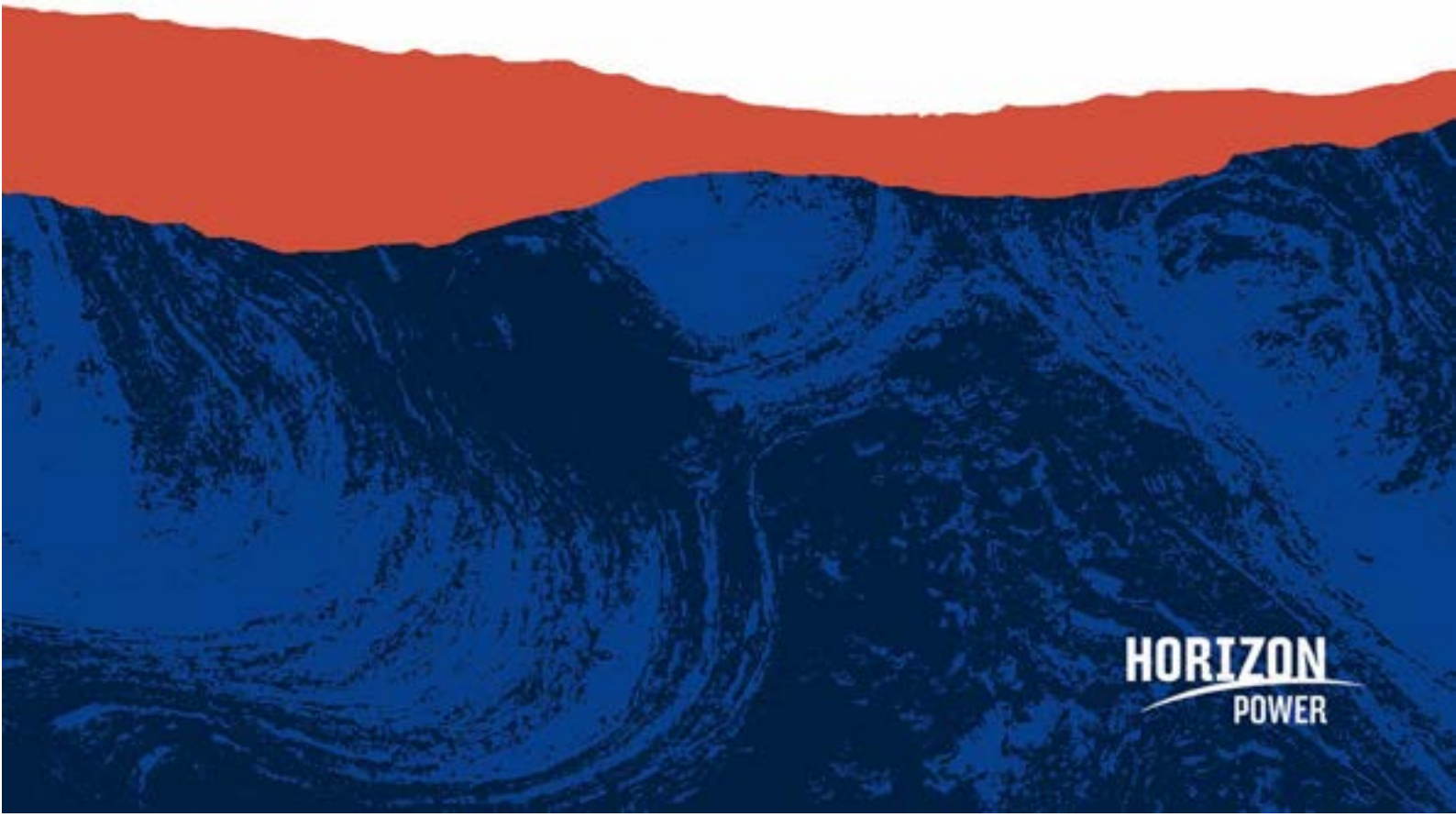
Horizon Power

Pilbara Coastal Network

System Description



Contents

Date Created/Last Updated	25 October 2024
Review Frequency	18 months
Next Review Date	25 April 2026

This policy remains in effect, until replaced or updated, notwithstanding expiration of the review date.

Disclaimer

This document is provided for general informational purposes only. While Horizon Power has made all reasonable efforts to ensure its accuracy, we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability, or availability of the information contained herein. Any reliance placed by third parties on this document is strictly at their risk.

Horizon Power accepts no liability for any loss or damage arising from the use of this document or any information provided within it. This disclaimer applies to all content within the document, including text, graphics, and links.

For specific queries or advice, please contact us at pilbara@horizonpower.com.au. We encourage you to seek professional advice tailored to your individual circumstances.

1. PURPOSE AND STRUCTURE

This document addresses the system description requirements established by the Pilbara Networks Access Code 2021 (**PNAC**).

The sections of this document address the requirements of the PNAC as follows:

- A map showing the geographical extent of the light regulation network is provided in Section 4.
- A simplified single line diagram of the light regulation network that shows the location of key facilities is provided in Section 5.
- Constraint rules which may affect access to, or use of the Horizon Power Network and current limit advice provided to the Pilbara ISOCo (**ISO**) under the Pilbara Networks Rules 2021 (**PNR**) is provided in Section 6.
- Other key technical constraints in the light regulation network that will, or are reasonably likely to, materially affect access to, or use of, the Horizon Power Network, are provided in Section 7.
- Information about the light regulation network's capacity in key locations is provided in Section 7.

2. OUR BUSINESS

Horizon Power owns and manages a significant portion of the North West Interconnected System (**NWIS**) in the Pilbara – the 'Horizon Power coastal network' (as defined by the PNAC) – referred to in this document as the **Horizon Power Network**. Horizon Power separately provides electricity generation and retail services to electricity customers that are connected to the NWIS. Ring-fencing arrangements ensure that Horizon Power carries out its network functions in the Horizon Power Network in a competitively neutral manner, allowing private generators and retailers to compete to supply electricity customers connected to that network. In this document, the term **Horizon Power Pilbara Network Business** is used when referring to functions performed by Horizon Power as the owner and operator of the Horizon Power Network.

The Horizon Power Network is regulated under the PNAC and the PNR. For more information on the regulatory arrangements governing Horizon Power management of the Horizon Power Network, please refer to our website[1].

[1] https://nwis.com.au/

3. SCOPE OF THE SYSTEM DESCRIPTION

The System Description provides a current description of the Horizon Power Network, information on the present capability of the Network, and summarises the nature and location of the main capacity constraints emerging in the Network.

The PNR provides for constrained access, this allows for network constraints to be resolved through either:

1. Constraints on the output of generators; or
2. Network augmentation.

This document describes the existing network constraints, and the generation constraints associated with these constraints at the time of publication.

Any significant new connections or changes to loads connected to the Horizon Power Network will change either the limits on the output of generation or require investment in network augmentations. The required combination of these responses is determined through the connection application process detailed within Horizon Power Network's User Access Guide.

Any party can make application to Horizon Power Pilbara Network Business to undertake network augmentation to modify a network constraint in order to reduce the limitations on a generator. The process of reducing the limits on generators as a result of making capital contributions to network augmentations is detailed in Subchapter 9.1 of the PNR.

In respect of load connections, the information provided in the System Description is intended to assist current or potential customers to form an initial view on the ability of the Network to accommodate future requirements. This document cannot provide a complete view and the information on which it is based is continually changing. Customers are encouraged to contact Horizon Power Pilbara Network Business to discuss their requirements when planning a new project. This will ensure customers can proceed with developing their plans with the benefit of the most up-to-date and relevant information.

4. GEOGRAPHICAL MAP

The Horizon Power Network supports the Pilbara economy by connecting customers to a safe, reliable, timely and affordable electricity supply. Figure 1 below illustrates the Pilbara region transmission networks, and adjacent non-interconnected systems. The diagram illustrates that the Horizon Power Network shares multiple points of interconnection with transmission assets owned by other network service providers.

Assets not owned by Horizon Power have been presented for reference only and should not be relied upon. Interested parties should refer to the official system map published by the ISO under Rule 98 of the PNR.

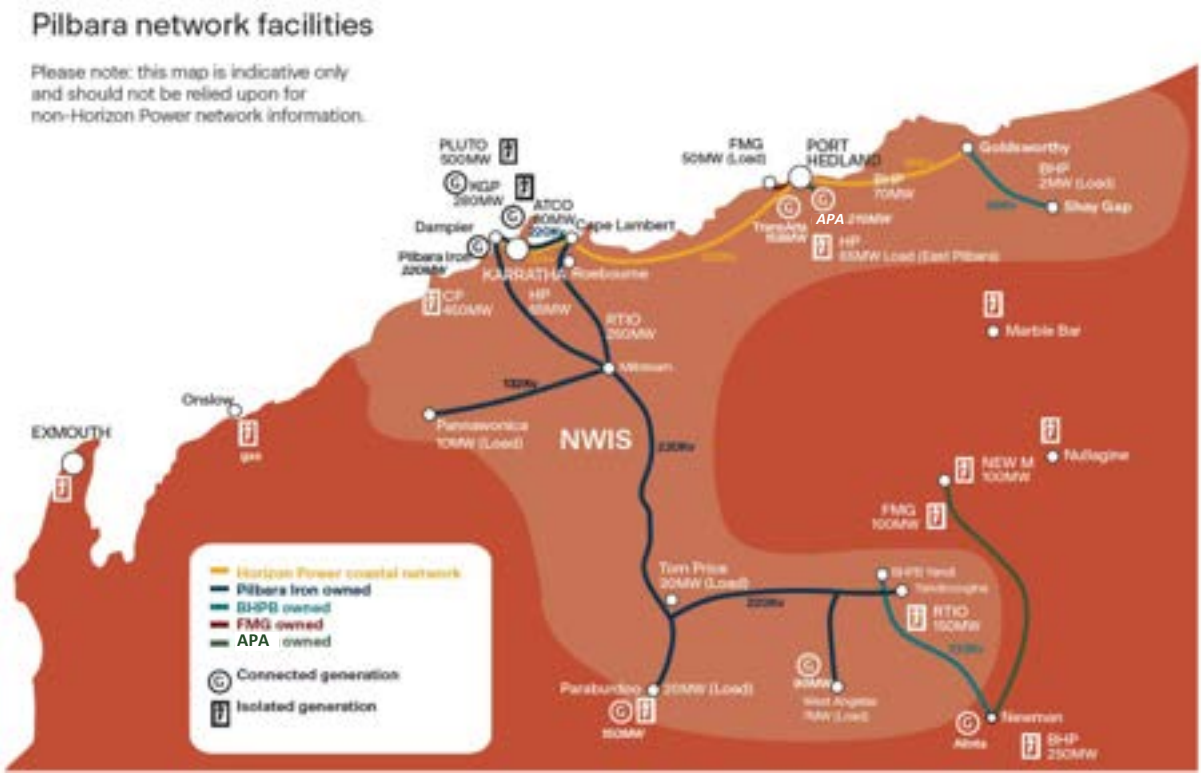


Figure 1 North-West Interconnected System geographical overview

5. SINGLE LINE DIAGRAM

5.1 Overview of Horizon Power Network's transmission network

Horizon Power Network is divided into two planning regions – the West Pilbara (Figure 2) and the East Pilbara (Figure 3). These diagrams collectively illustrate:

- interconnection points with other network service providers;
- transmission line names, lengths, voltages, and ratings;
- substation locations and ownership; and
- generation locations.

The transmission network covers all network assets down to the zone substation level including power transformers and the medium voltage switchgear / busbars to which distribution feeders are connected. While the interconnections with networks owned by other parties are shown, the large generating units and loads connected to those networks are not illustrated.

The West Pilbara is supplied by a 132 kV transmission network and interconnects with the East Pilbara through a long 220kV transmission line at Cape Lambert. This line is typically importing power from East Pilbara, or operating close to zero transfer.

The 132kV transmission ring between Pegs Creek (**PCK**), Bulgarra (**BUL**) and Karratha Terminal (**KRT**) supplies the 22kV distribution network in Karratha. The Dampier (**DMP**) and Cape Lambert (**CLB**) substations supply 33kV distribution networks and provide interconnections to Rio Tinto Iron Ore (**RTIO**).

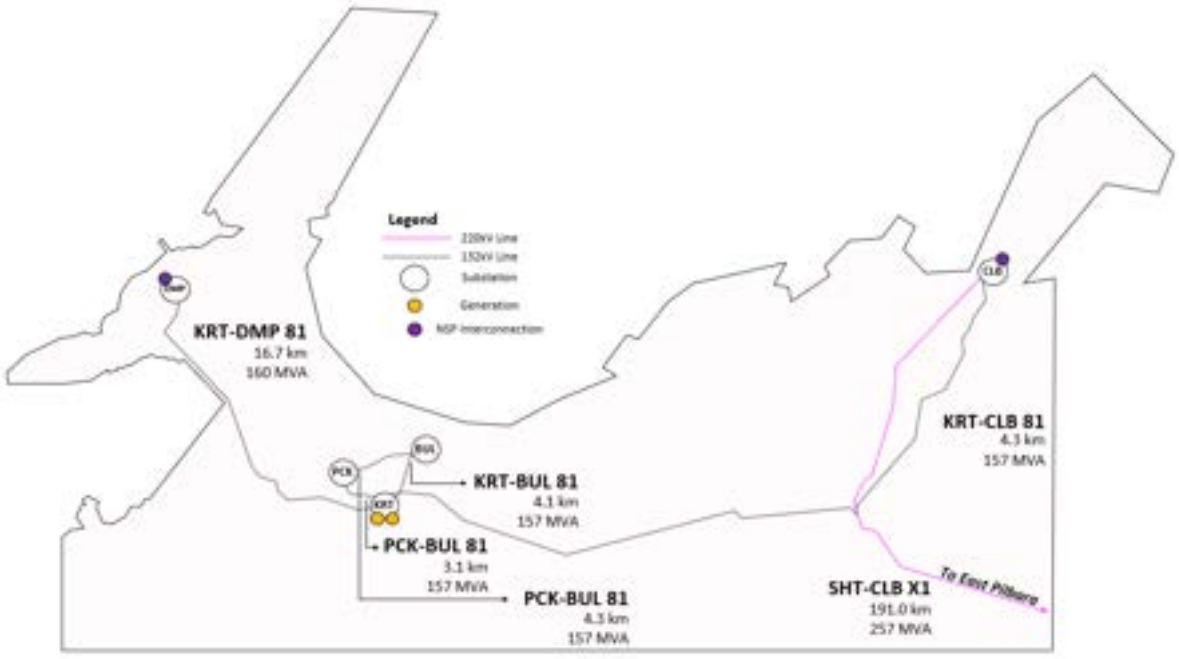


Figure 2 Horizon Power West Pilbara transmission network

The East Pilbara area is supplied by 220kV and 66kV transmission networks. The Anderson Street (**AST**), Murdoch Drive (**MDR**) and Wedgefield (**WFD**) substations service a 22kV distribution network to various residential, commercial, and industrial loads. MDR and WFD also maintain 66kV interconnections with APA.

South Hedland Terminal (**SHT**) is a bulk generation node. South West Creek (**SWC**) and Mount Newman (**MNM**) substations service bulk load connections.

Lastly, the 66kV tee line to Goldsworthy (**GW**) and Strelley (**SRY**) is a lightly loaded and geographically distant (from Port Hedland) connection to loads.

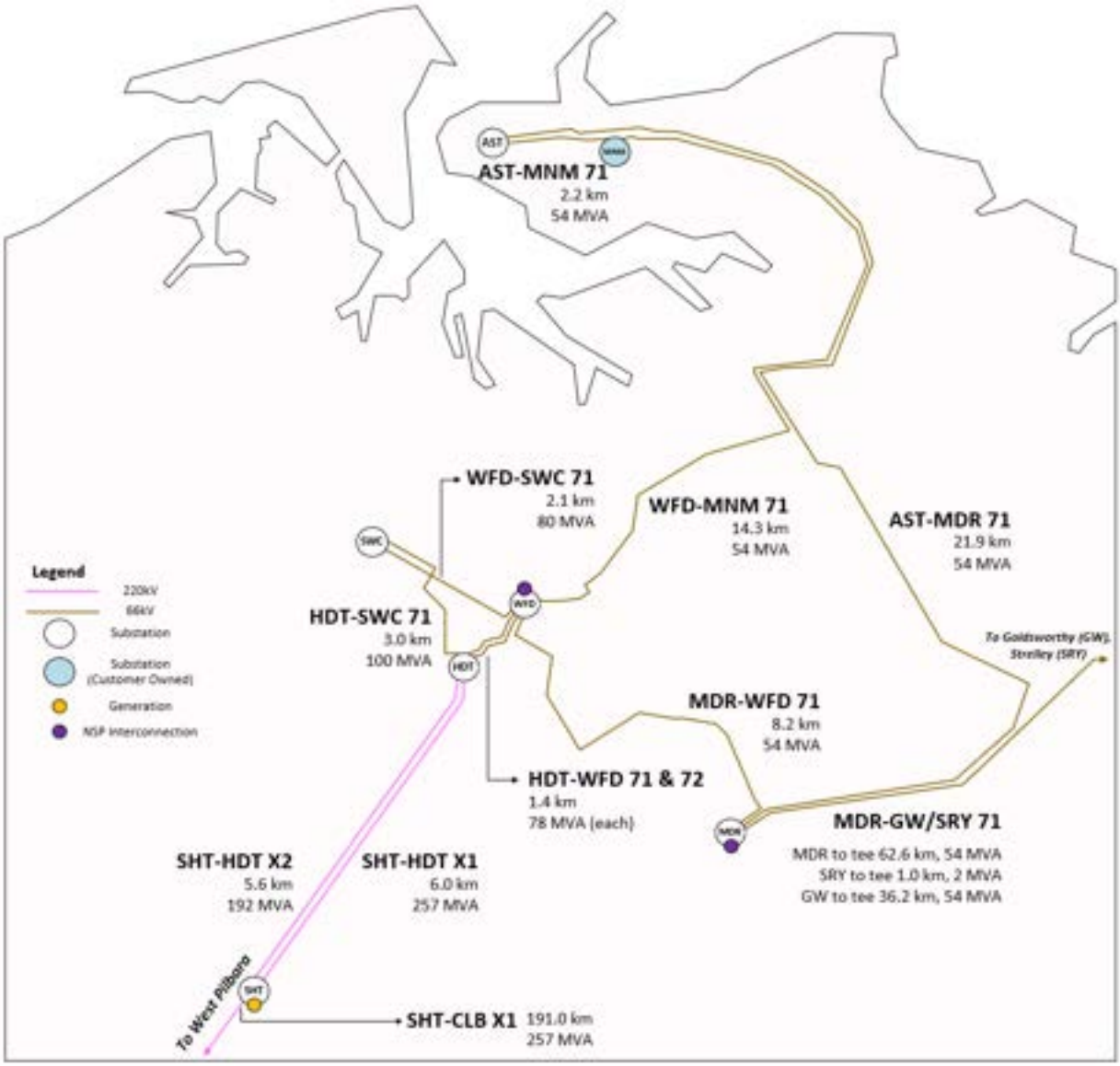


Figure 3 Horizon Power East Pilbara transmission network

5.2 Impact of Other Network Service Providers

Transmission networks owned by RTIO and APA are interconnected with the Horizon Power Network. Network outages on either the RTIO, APA or Horizon Power Network may result in changed power flows on other parties' networks. These power flows allow loads on all networks to continue to be supplied following the network outage. For this reason, the NWIS is considered as an interconnected system for the purpose of determining network capacity constraints.

6. NETWORK CONSTRAINTS

6.1 Approach to identifying constraints

Horizon Power Network Business assesses the ability of the transmission network to supply existing and future demand in the NWIS and support flows arising from the interconnections to other systems.

Horizon Power Pilbara Network Business will continue to work with all stakeholders to improve information sharing and support robust modelling, network planning and operation.

The constraints and limitations detailed below have been established by applying the Horizon Power planning contingency criteria[2], as defined in the Horizon Power Technical Rules.

These criteria apply to the following load and generation scenarios:

1. The existing and projected maximum and minimum system loads.
2. Each credible generation output scenario that meets the requirements of the system load and the Essential System Services Requirements determined by the ISO.

These loads have been based on Horizon Power Network's latest demand and energy forecasts.

[2] https://nwis.com.au/media/pixo05dz/nwis-planning-standards.pdf

6.2 Summary of Constraints

New and modified connections to the network may require specific network investment and may change the outcome of assessed constraints. The requirements and impacts of each network connection change are determined through the connection application process[3].

Table 2 provides an overview of capacity utilisation that result from the consideration of Horizon Power's NWIS planning criteria[4], as defined in the Horizon Power Technical Rules. The standard merit order dispatch (*standard dispatch*) is assumed to analyse expected utilisations on the network. Horizon Power's portfolio of generation is then re-dispatched to determine whether the overload can be mitigated through *constrained dispatch*. This informs whether the constraint is a generation constraint or network issue.

Table 1 Summary of capacity utilisation

Constraint ID	Element	N-1 utilisation (Re-dispatched and max contractual demand)
1	SHT-HDT X1, SHT-HDT X2	75%
2	HDT-SWC 71	100%
3	HDT-WFD 71, HDT-WFD 72	75%
4	WFD-SWC 71	100%
5	WFD-MNM 71	100%
6	MNM-AST 71	80%
7	AST-MDR 71	100%
8	WFD-MDR 71	80%
9	CLB-SHT X1	(n-0)[5]
10	CLB-KRT 81	(n-0)
11	KRT-BUL 81, BUL-PCK 81, KRT-PCK 81	45%
12	KRT-DMP 81	(n-0)
13	DMP-DBS 61/62 (RTIO)	
14	CLB-CBS 61 (RTIO)	
16	HDT T1	80%
17	HDT T2	80%
18	HDT T3	105%

[3] Refer to Horizon Power's User Access Guide
[4] https://nwis.com.au/media/pixo05dz/nwis-planning-standards.pdf
[5] System constraints due to spinning reserve will apply – refer to https://pilbaraisoco.com.au/wp-content/uploads/2023/06/ESS-Procurement-2023-24-Final-Decision.pdf

7. OTHER KEY TECHNICAL CONSTRAINTS AND CAPACITIES

7.1 Maximum Short Circuit Levels

The maximum short circuit level at a given point in a network may be used by electricity networks and their customers to specify equipment ratings and protection schemes.

Estimated maximum short circuit levels for a range of connection points in the Horizon Power Network are shown in APPENDIX A. Please note that the values should be treated as indicative only as actual fault levels are dependent on many factors and may vary depending on specific connection requirements.

In addition, Horizon Power has specific design requirements that apply to new connections, in relation to fault level withstand capability and protection systems.

Customers seeking to connect to or increase supply within the Horizon Power Network should contact Horizon Power Pilbara Network Business to discuss requirements, or to request the latest fault level information.

7.2 Distribution capacity to connect additional load

The Horizon Power distribution network (the electricity network operating at voltages below 66 kV) covers the medium voltage (1 kV to 33 kV) and low voltage (below 1 kV) feeder assets that reticulate supply to the vast majority of customers on the Horizon Power Network.

A summary of estimated spare capacities available to connect new loads at individual substations is provided in APPENDIX B. These values are provided as a range and should be treated as indicative as spare capacity is subject to change and may vary depending on specific connection requirements.

Customers seeking to connect to, or increase supply within, the distribution network should contact Horizon Power to discuss their requirements.

7.3 Capacity to connect embedded renewable systems

Over the next 5 years, most customers of the Horizon Power Network are expected to be able to connect embedded renewable systems of up to 200 kW to the LV network without any form of generation management. However, Horizon Power anticipates that customers seeking to connect systems larger than 200 kW will be required to install a feed-in management system.

Horizon Power maintains a tool on its website, which customers can use to check whether the Horizon Power Network has sufficient hosting capacity to accommodate their proposed embedded renewable system (see https://www.horizonpower.com.au/contractors-installers/connect-solar-battery-ev/technical-requirements). This assessment considers only the impacts of the proposed embedded renewable system on generation plant operating on the Horizon Network (whether connected directly or indirectly).

8. FURTHER INFORMATION

For further information, please contact Horizon Power's regional offices:

KARRATHA REGIONAL OFFICE

Lot 1966 Stovehill Road
Karratha, Western Australia 6714
Phone: (08) 9159 7250
Email: karratha@horizonpower.com.au

PORT HEDLAND REGIONAL OFFICE

18 Anderson Street
Port Hedland, Western Australia 6721
Phone: (08) 9173 8281
Email: porthedland@horizonpower.com.au

APPENDIX A MAXIMUM SHORT CIRCUIT LEVELS

This appendix lists maximum short circuit levels forecast at each of the Horizon Power Network major nodes. This information should only be used as an approximate guide.

Appendix Table 1: Estimated maximum short circuit levels

Substation	Region	Voltage (kV)	Fault level – three phase (kA)	Fault level - single phase (kA)
AST	East Pilbara	22	4.2	6.2
BUL	West Pilbara	22	6.9	6.1
CLB	West Pilbara	33	24.8	33.1
DMP	West Pilbara	33	21.4	24.8
MDR	East Pilbara	22	4.6	5.7
PCK	West Pilbara	22	6.9	7.2
ROE	West Pilbara	11	5.5	6.1
SWC	East Pilbara	22	4.9	6.6
SWC	East Pilbara	33	4.6	0.4
WFD	East Pilbara	22	7.2	7.5

Note: these estimates of maximum fault levels are based on studies carried out March 2024.

Please note that these estimates should be treated as indicative as actual fault levels are dependent on many factors and may vary depending on specific connection requirements.

APPENDIX B SPARE TRANSFORMER CAPACITIES AT SUBSTATIONS

This appendix provides ranges for the estimated power transformer capacity available at Horizon Power substations today and five years into the future.

The estimates provided in Appendix Table 2 are based on comparing the thermal ratings of substation transformers to the forecast network demand.

These estimates are based on N-1 supply reliability, unless otherwise stated. Where appropriate, these estimates are given as a range, reflecting the uncertainties as to future demand and the need to avoid disclosing commercially sensitive information in the case of substations supplying only a small number of large loads.

Please note that these estimates of substation capacity do not guarantee that this level of power can be supplied to any project seeking to connect to the relevant substation. Horizon Power Pilbara Network Business will need to undertake connection studies to accurately assess the capacity available for specific projects, taking all relevant technical limits into account.

Appendix Table 2: Estimated spare substation capacity based on thermal ratings

Substation	Region	Estimated spare capacity as at July 2023 (MVA)	Forecast spare capacity in 2028 (MVA)
AST	East Pilbara	10 to 20	10 to 20
BUL	West Pilbara	20 to 30	20 to 30
CLB	West Pilbara	0 to 5	0 to 5
DMP[6]	West Pilbara	0 to 5	0 to 5
MDR	East Pilbara	0 to 5	0 to 5
PCK	West Pilbara	10 to 20	10 to 20
ROE	West Pilbara	0	0
SWC	East Pilbara	0	0
WFD	East Pilbara	20 to 30	10 to 20

Note: these estimates of spare capacity are based on studies carried out March 2024

[6] DMP is planned to the N-0 criterion due to being classed as a 'minor substation'