electranet

Assessment of Network Capacity for Connections Report 2029

June 2025

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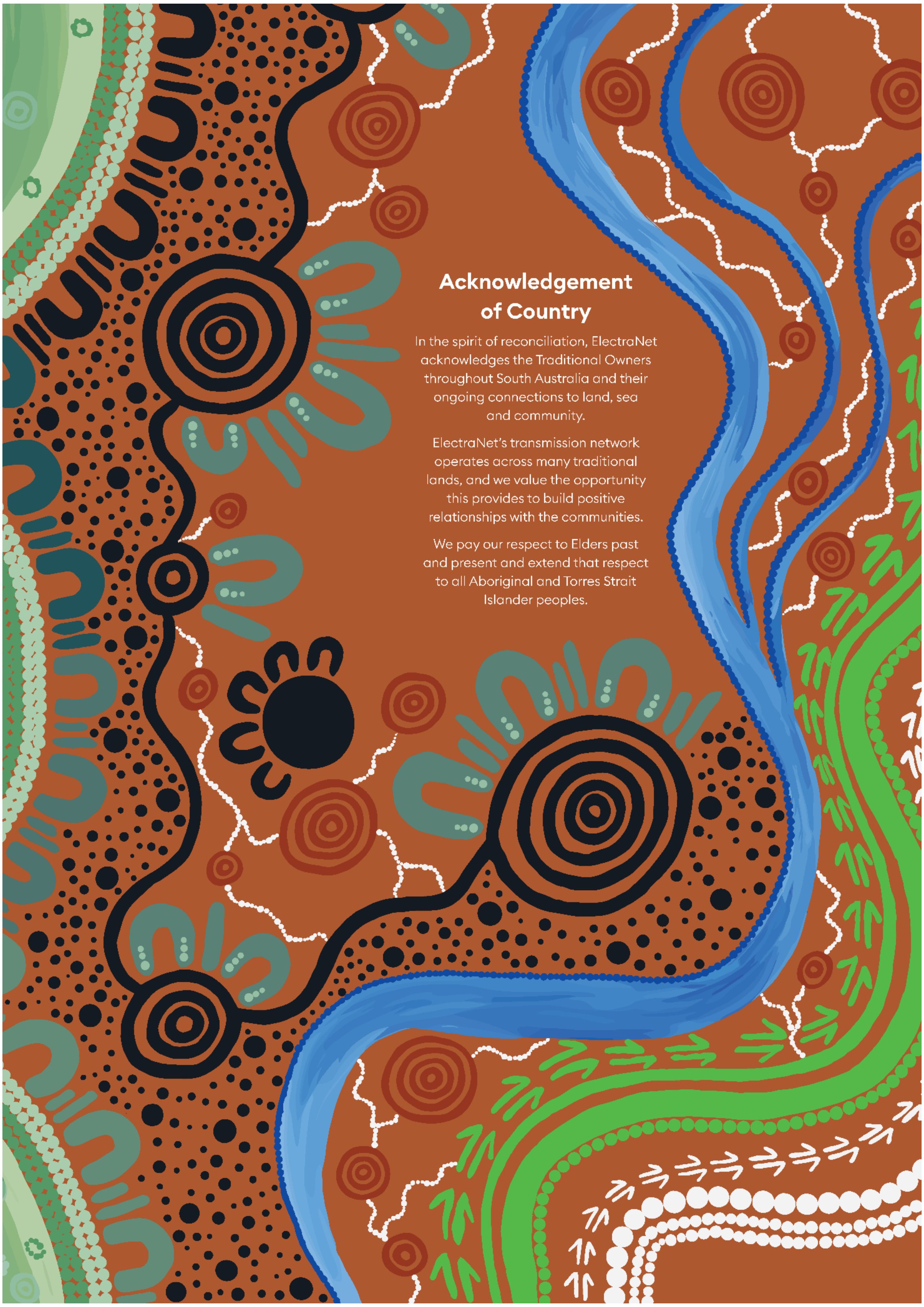


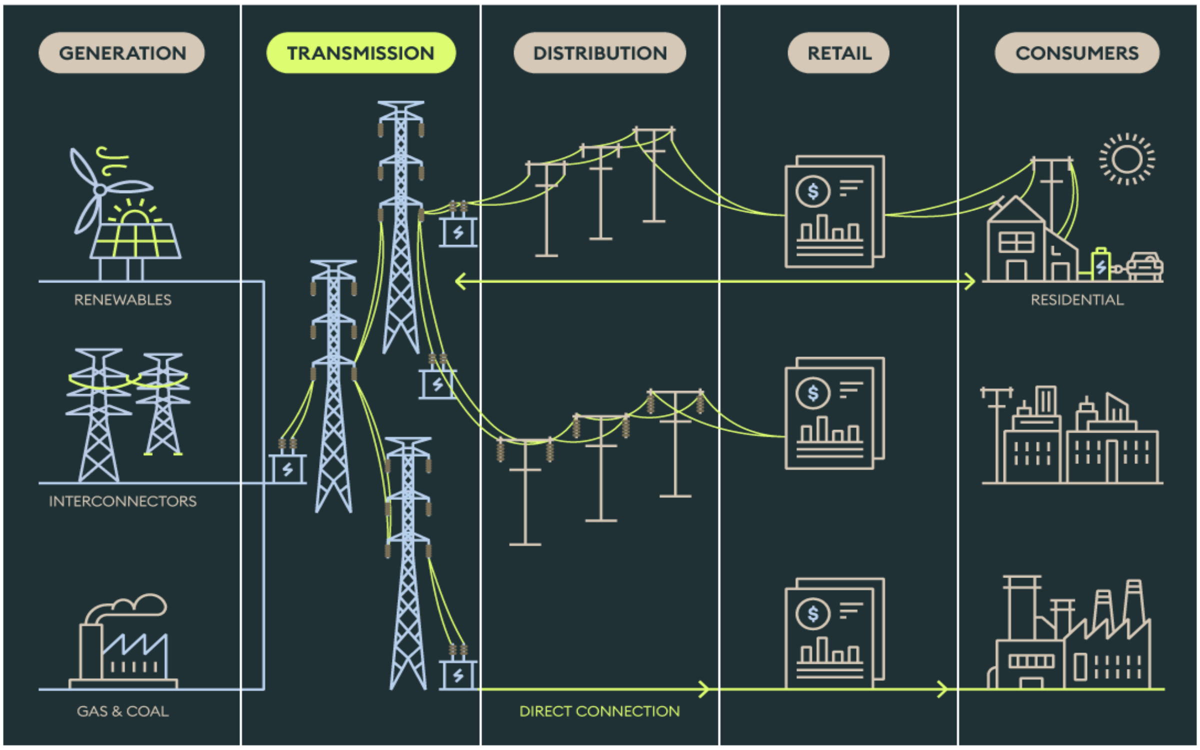
About ElectraNet

Energising South Australia's Clean Energy Future

We are leaders in the clean energy transition, delivering reliable and sustainable electricity transmission services and valued customer connections.

As South Australia's primary Transmission Network Service Provider (TNSP), we are a critical part of the electricity supply chain, that includes enabling the transition to a clean energy future. We own and manage the high-voltage transmission lines and substations that connect this State's electricity customers, including those connected to SA Power Networks' lower-voltage distribution network, to generation sources both locally and interstate.

We also provide connection and other services to customers and generators wanting to connect to the high-voltage electricity transmission network.



South Australia remains a leader in the global energy transformation through its world-leading uptake of grid scale renewable energy resources and rooftop solar PV.

As we enter the next phase of this transformation, we are witnessing an unprecedented level of interest from new, large electricity loads seeking to connect to this clean energy.

ElectraNet's Network Transition Strategy provides a pathway and framework for working with our customers and stakeholders to manage the challenges and opportunities of the energy transition.

The Network Transition Strategy outlines actions we have taken and solutions we are developing to maintain reliable, affordable and sustainable electricity as South Australia continues its journey to 100 per cent net renewables by 2027.

The Network Transition Strategy supports our core objectives of safety, affordability, reliability and sustainability and covers three key themes:

- Energy reliability – developing a capable transmission network;
- Power system security and resilience – maintaining a secure and resilient power system; and
- Operability – managing increasing system complexity and risk.

Disclaimer

The information provided in this Report is general in nature and should not be taken as advice. You should seek independent commercial, technical and/or legal advice specific to your project before making any decisions related to connections to the South Australian transmission network.

Reasonable endeavours have been used to ensure that the information contained in this report is accurate at the time of writing. ElectraNet gives no warranty and accepts no liability for any loss or damage incurred in reliance on this information.

This Report contains certain predictions, estimates and statements that reflect various assumptions concerning, amongst other things, economic growth scenarios, demand forecasts and developments within the National Electricity Market. These assumptions may or may not prove to be accurate. The Report also contains statements about ElectraNet’s future plans. Those plans may change from time to time and should be confirmed with ElectraNet before any decision is made or action is taken based on this Report.

Introduction and Purpose

ElectraNet has performed a Network Capacity for Connections assessment indicating the capability for the transmission network in the Mid North region of South Australia to accommodate connections up to 2029, while ensuring the network is adequate to meet the ongoing demand for electricity transmission services under a variety of operating scenarios.

The Network Capacity for Connections Assessment Report aims to assist both load and generation stakeholders to make more informed decisions about where to pursue load or generation connections by providing information about the connection capacity that will be available on the transmission network up to June 2029, assuming that all committed projects are completed on time. The term "network capacity for connection" refers to the amount of load or generation that can be connected on the transmission network at a given time and at a given location without adversely affecting grid reliability and without requiring significant infrastructure upgrades. The network capacity for connection is indicative as there are more complex studies required to determine the available capacity for a specific connection enquiry.

The Network Capacity for Connections Assessment provides the load and generation connection capacity at three levels, namely substation level, sub-region level and region level.

This Report presents the outcomes of the Network Capacity for Connections assessment and forms part of an ongoing engagement process to ensure the efficient and effective communication with stakeholders on opportunities for connection to the transmission network to facilitate electricity demand growth and support the transition to renewable energy sources.

Figure 1 below indicates the South Australian transmission network. The Mid North Region, indicated within the red boarder, being the network considered in this Network Capacity for Connections Assessment and incorporates all the committed projects.

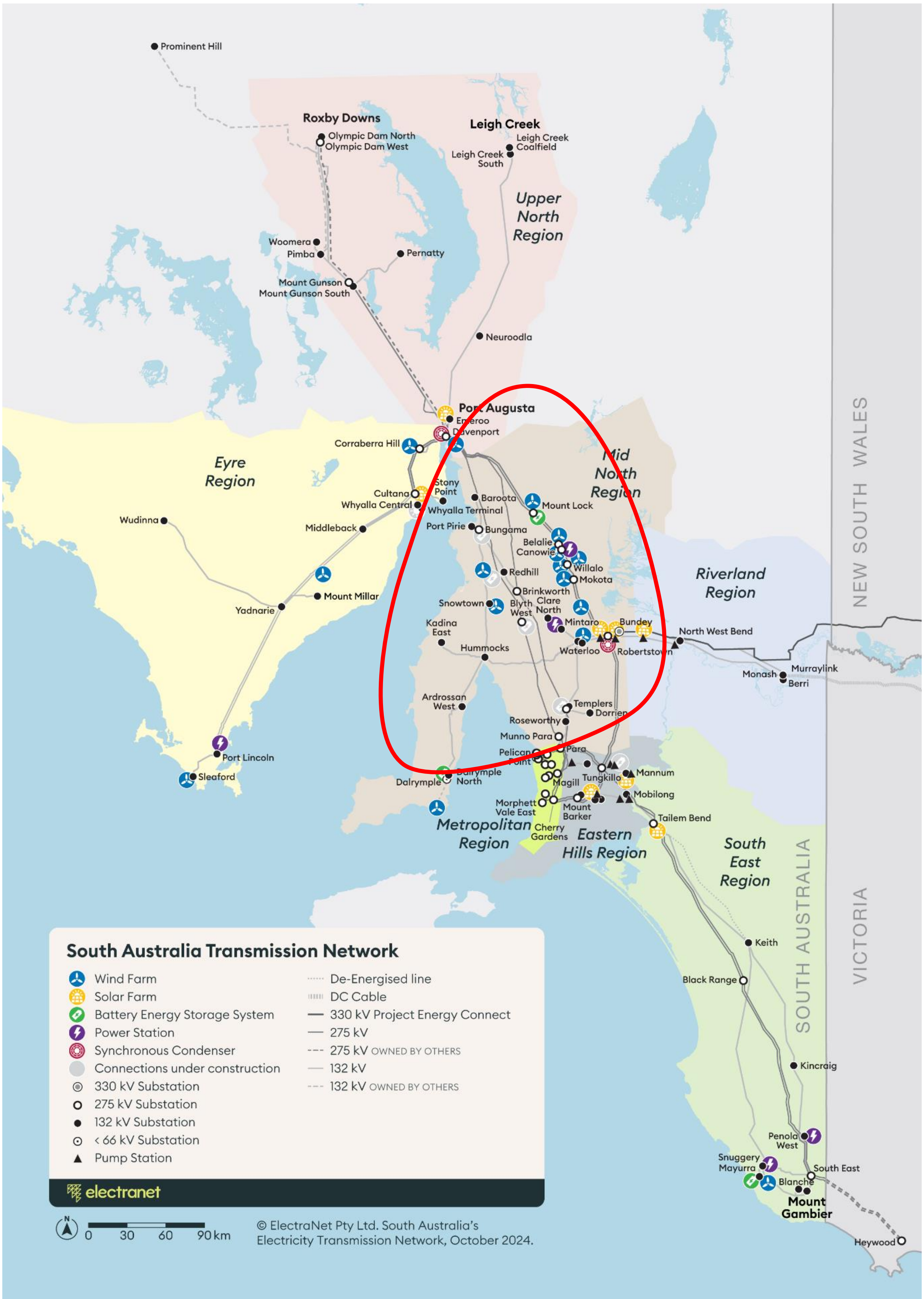


Figure 1: South Australia Transmission Network

The following Report section provides information on:

a. Section 1: General considerations for connection;
b. Section 2: Interpreting this Report
c. Section 3: Description of the Mid North study area;
d. Section 4: Assumptions on load forecast and committed projects;
e. Section 5: Assessment of Generation and Load opportunity; and
f. Appendix: Detailed Assessment of Connection Opportunities

We are committed to ongoing improvement in stakeholder engagement, and value to our customers, consumers, and industry stakeholders.

We invite feedback on any aspect of this report. Your feedback will help us to serve you better and ensure we can continue to provide reliable and affordable electricity transmission services.

Comments and suggestions can be directed to:

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Glossary

Abbreviation	Definition
AEMO	Australian Energy Market Operator
AMD	Agreed Maximum Demand
bay	The part of a substation within which the switchgear and control-gear relating to a given circuit is contained
BESS	Battery Energy Storage System
CPS	Customer Performance Standard
diameter	The arrangement of equipment for a breaker-and-a-half switching configuration between 2 busbars
ESCOSA	Essential Services Commission of South Australia
FAMD	Forecast Agreed Maximum Demand
GPS	Generator Performance Standard
GW	Giga-Watt, equivalent to 1,000 MW
IBR	Inverter Based Resources
ISP	AEMO's Integrated System Plan
kV	kilo-Volt, a unit of electrical potential
MVA	Mega-Volt-Ampere, a unit of apparent electrical power
MW	Mega-Watt, a unit of active electrical power
N-1	System Normal minus one transmission element
NEM	National Electricity Market
NER	National Electricity Rules
NSP	Network Service Provider (may be a transmission or a distribution entity)
NTx	Northern Transmission Project
OTR	Office of the Technical Regulator
PADR	Project Assessment Draft Report
PEC	Project EnergyConnect
POE	Probability of exceedance
PSCAD	Manitoba HVDC Research Centre Ltd. Power System Computer Aided Design software
PSCR	Project Specification Consultation Report
RAS	Remedial Action Scheme
RIT-T	Regulatory Investment Test - Transmission
SA	South Australia

Abbreviation	Definition
SAIT RAS	South Australian Interconnector Trip Remedial Action Scheme
TNSP	Transmission Network Service Provider
TNU	Transmission Network User
WF	Wind Farm

1 General considerations for connection

1.1 System Strength

The NER require NSPs to maintain system strength standards and give generators, market network service providers and certain loads the choice to procure the service either from NSP as a prescribed service or to provide their own (ElectraNet could provide these services as a negotiated transmission service). All connections are required to follow the system strength rules and guidelines.

To enable ElectraNet to be ready to provide services for procurement, ElectraNet commenced the associated RIT-T in November 2023 with the publication of a Project Assessment Specification Report (PSCR)[1]. The RIT-T is being applied to options that will deliver an efficient level of system strength services to the SA power system, facilitating a stable voltage waveform for new inverter-based renewable generators (efficient level) above and beyond the minimum level of system strength.

ElectraNet published a Project Assessment Draft Report (PADR), which is the second stage of the RIT-T process, in April 2025. Detailed modelling completed by ElectraNet has shown that the existing network, including the existing synchronous condensers and following the commissioning of PEC Stage 2 (330 kV double circuit interconnector between Bundey substation, Buronga substation and Wagga Wagga substation to be operational in 2027), will have sufficient system strength to meet the efficient level required under the NER.

There are some uncertainties with this analysis, including:

- the rate of growth in IBR investments;
- the rate at which IBR generators will improve and contribute to satisfying system strength services; and
- the assumed representation of the forecast generation included in the PSCAD models more than three years ahead.

As a result, ElectraNet does not consider there to be a requirement for large capital expenditure on additional synchronous condensers at this point under the ISP Step Change scenario. This position differs from that in the PSCR and is due to changes in the IBR forecasts since the PSCR was published, as well as the more refined methodology we have applied at the PADR stage.

Looking to the 2024 ISP Step Change scenario after December 2029, ElectraNet considers it prudent to identify low-cost generic system strength services as a low regret back up. ElectraNet also recognises that AEMO's forecast on IBR volume under the Green Energy Exports scenario exceeds 11 GW of wind, solar and batteries over the next 10 years.

The interest in new large industrial load connections to the transmission network also raises the potential for a much more rapid increase in IBR connections than forecast in the Step Change scenario. This would require a significant increase in the efficient level of system strength.

[1] System Strength Requirements in South Australia RIT-T

If rapid investment in new IBR connections occurs and no action is taken to meet the efficient level, there could potentially be significant and rapid investment in further system strength services requirements. It may not be possible to deliver this investment sufficiently quickly, due to the long lead times for some of these investments, which could result in insufficient system strength. Alternatively, while it may be possible to deliver an urgent investment in time, it could come at a significant cost to customers.

Proactively preparing the network with low-cost mechanical clutches to new synchronous generators, enabling them to operate as synchronous condensers, may partially or completely avoid the need for any such 'emergency investment' (as well as any reliability implications for customers).

The proposed use of mechanical clutches provides an opportunistic, low cost and 'low regret' insurance against the need to provide additional system strength in South Australia due to a greater volume of IBR connecting (e.g. through large industrial load connections) in the next three to five years.

1.2 South Australian Interconnector Trip Remedial Action Scheme (SAIT RAS)

ElectraNet and Transgrid are constructing PEC, the new interconnector between South Australia and New South Wales, which will increase the transfer capacity with the NEM by around 800 MW.

This significant increase in transfer capacity will increase access to other regions in the wholesale electricity market. Importantly, PEC will increase system security and the resilience of the power system by significantly reducing the risk of separation of South Australia from the rest of the NEM.

In order for the network to operate securely, it is essential to protect the power system from system events. Without robust protection systems, in the event of a double circuit failure of either the existing Heywood or PEC interconnectors, a cascading overload and trip of the remaining interconnector may occur. Tripping of both interconnectors may result in the separation of South Australia from the NEM which could result in a state-wide loss of supply.

To manage the risk of such an event, ElectraNet is developing a special protection scheme, known as SAIT RAS, to reduce the risk of South Australia separating from the NEM once PEC is energised.

The SAIT RAS will respond automatically if either of the double circuit interconnectors is lost. If an event occurs while exporting at high transfer conditions, the SAIT RAS will shed the required amount of generation to ensure system stability. Conversely, if an event occurs while importing at high transfer conditions, the SAIT RAS will shed the required amount of load to ensure system stability. The above SAIT RAS responses may need to be supplemented in some circumstances by a fast change in output from various BESSs.

It is proposed that new generation or battery, is also expected to be integrated into the SAIT RAS to facilitate the stable operation of the transmission network. Registered Participants in the NEM, pursuant to S5.1.8 of the NER, stakeholders' cooperation and participation in the SAIT RAS will be required.

Schedule 5.1.8 of the NER requires:

- a Network Service Provider, in planning and operating a network, to give consideration to non-credible contingency events such as an outage of both circuits of a double circuit interconnector and must install, maintain and upgrade emergency controls within the Network Service Provider and/or Registered Participants' system as necessary to minimise disruption to any transmission network and to significantly reduce the probability of cascading failure; and
- Registered Participants to co-operate with a Network Service Provider to achieve stable operation of the national grid and to use all reasonable endeavours to negotiate with the Network Service Provider regarding the installation of emergency controls.

SAIT RAS will be a critical and complex wide area emergency control scheme with high dependability and reliability requirements. Given the above, and fast response times required, customers will be tripped at the connection point breaker when required as part of the SAIT RAS response, unless specific arrangements can be made to trip a few breakers within their plant.

All communication interfaces to SAIT RAS central controllers and control functionalities in a customer's facility are to be designed, installed, and commissioned as part of the connection scope of works. Integrating the connection into the scheme may occur immediately or in the future and is typically excluded from the connection scope of works.
Please refer to the following links for more information relating to SAIT-RAS and its impact on new connections to the SA transmission network:

- SAIT-RAS and Connections in SA; and
- SAIT-RAS Technical Integration Note for BESS.

1.3 Other connection requirements

There are several other requirements that new connections should consider, including but not limited to:

- ESCOSA issues generation licenses for generators connecting in SA and stipulates several requirements for the issue of the generation license. Information regarding the licensing requirements of ESCOSA[2], including the proposed revisions to those requirements, is available on its website;
- The OTR assesses all proposed developments of generating plant with capacity larger than 5 MW to determine whether the proposed generator complies with the requirements of the OTR in relation to the security and stability of power systems;
- Generation connections are required to have GPS registered with AEMO. Similarly, load connections are required to have registered CPS;
- As required by the NER, some or all of any proposed facility may be subject to a range of measures including incorporation of generator shedding in the SA Over Frequency Generation Shedding schedule, and load shedding in the SA Under Frequency Load Shedding schedule; and

[2] ESCOSA - Licensing

- Other project approvals and requirements – development approval, environmental approval, native title consent, cultural heritage approval, access to land tenure.
- RAS schemes could be required for future connections in order to manage the various network contingency evens that result in a technical criteria violations such as network islanding, voltage exceedances, network overload events or other violations.

2 Interpreting this Report

The Network Capacity for Connections Assessment Report provides the load and generation connection capacity in terms of megawatts (MW) and physical substation connection capability for the Mid North Region at three levels, namely:

a. substation level (under various loading conditions what is the substation capacity limit at the substation, feeder connections and control room establishment;

b. sub-region level (which is the limit of the transmission network connecting transmission substations in a local area under various loading conditions and for the loss of any single line in the local area); and

c. region level (which is the limit of the transmission network connecting all local areas within a supply area under various loading conditions and for the loss of any single line in the supply area).

The hierarchy is such that a substation lies within a substation level, several substation areas lie within a local level, and several local levels lie within a supply region. A condition of the hierarchy is that the combined substation level limits may not exceed sub-region limit, and the combined sub-region limits may not exceed the region limit; that is, the stated generation connection capacity is limited by the lowest capacity at all the levels.

2.1 Physical Substation Connection Capability Assumptions

Available connection points listed in the section 5 are those that are available for prospective TNU connections. For example; if a substation has 6 spare connection points, but 2 are marked for transformers for SA Power Networks supply, and 1 is reserved for a transmission line to another substation, the substation would be listed to have 3 spare connection points available for prospective TNU connections.

Existing control buildings have not been assessed to determine additional panel capacity, however initial investigations have been undertaken to see if there is space within the existing substation for an additional control building in the event it is necessary.

2.2 Available Capacity Tables

Under the Available Capacity Tables in section 5, we have provided an indication of the level of proponent interest at each of the respective locations. When interpreting the proponent interest for the purposes of evaluating whether to consider a particular location for a project, the following classifications should be referred to:

- High: >3 proponents in connection application or later stages of the connection process;
- Medium: 2-3 proponents in connection application or later stages of the connection process; and
- Low: <2 proponents in connection application or later stages of the connection process.

3 The Mid North electricity transmission network

The Mid North transmission network (Figure 2) supplies several load connection points including the Barossa Valley and Yorke Peninsula regions. The 275 kV network is connected to the 132 kV network with the Mid North at five 275/132 kV substations, namely: Bungama, Brinkworth, Robertstown, Templers West, and Para. It is connected to the northern part of the South Australian 275 kV transmission system at Davenport substation and connects to the 275 kV transmission system and the 132 kV Eastern Hills sub-transmission network at Para substation, and the 132 kV Riverland sub-transmission network at Robertstown substation.

The Mid North 132 kV network has been developed progressively since 1952 and now operates in parallel with the Main Grid network that connects the major sources of generation in the Mid North region with the Adelaide metropolitan load centre. Consequently, power flows in the Mid North are not only determined by the loads that must be supplied within the region, but also by flows on the Murraylink interconnector and flows on the Main Grid between Davenport substation and the Metropolitan region.

The Mid North region has historically had a maximum demand of 240 MW, which is forecast to grow to over 300 MW in the next 20 years (Figure 5).

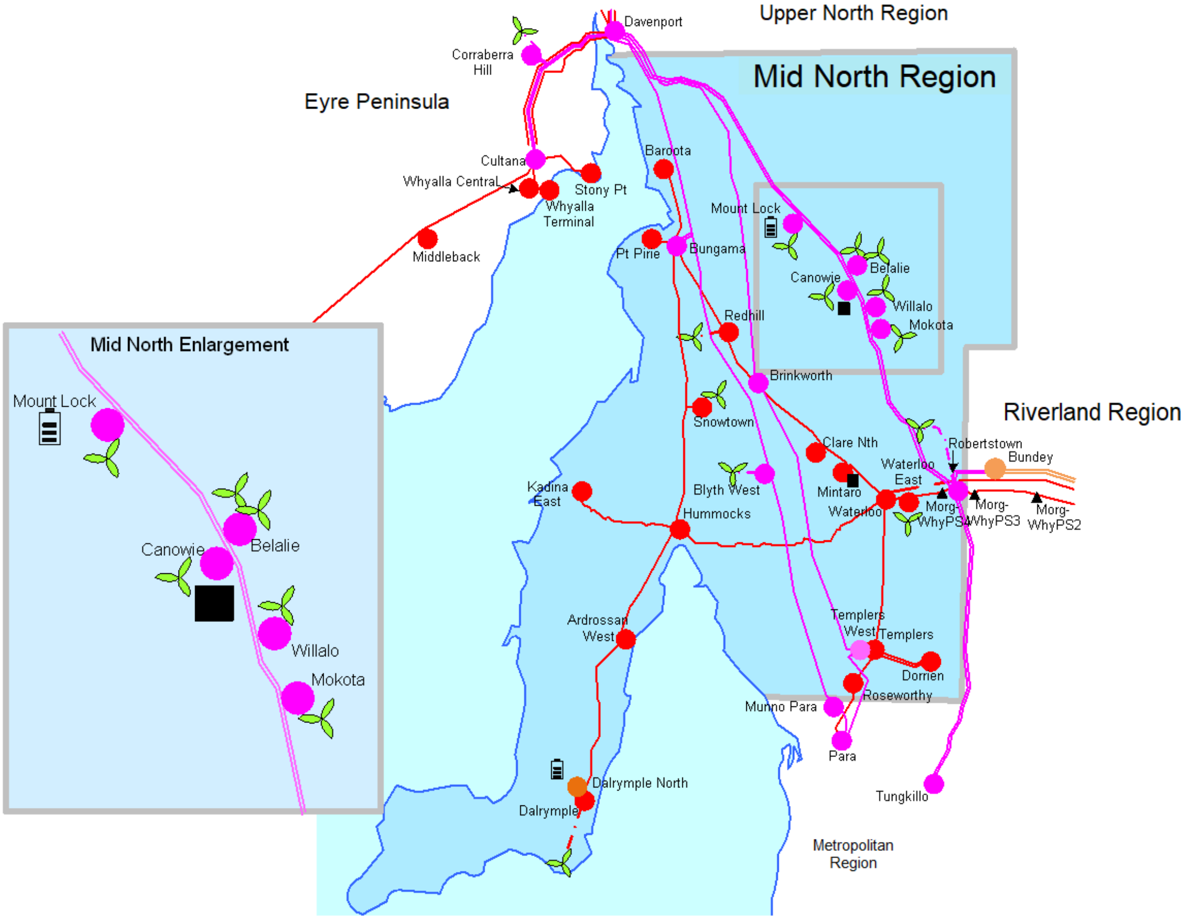


Figure 2: Mid North transmission network and supply region

3.1 Constraints within the Mid North transmission network

The Mid North transmission network can be considered as comprising several sub-regions refer to Figure 3 and Figure 4 below.

Figure 3: Geographic drawing of the sub-regions in the Mid North transmission network

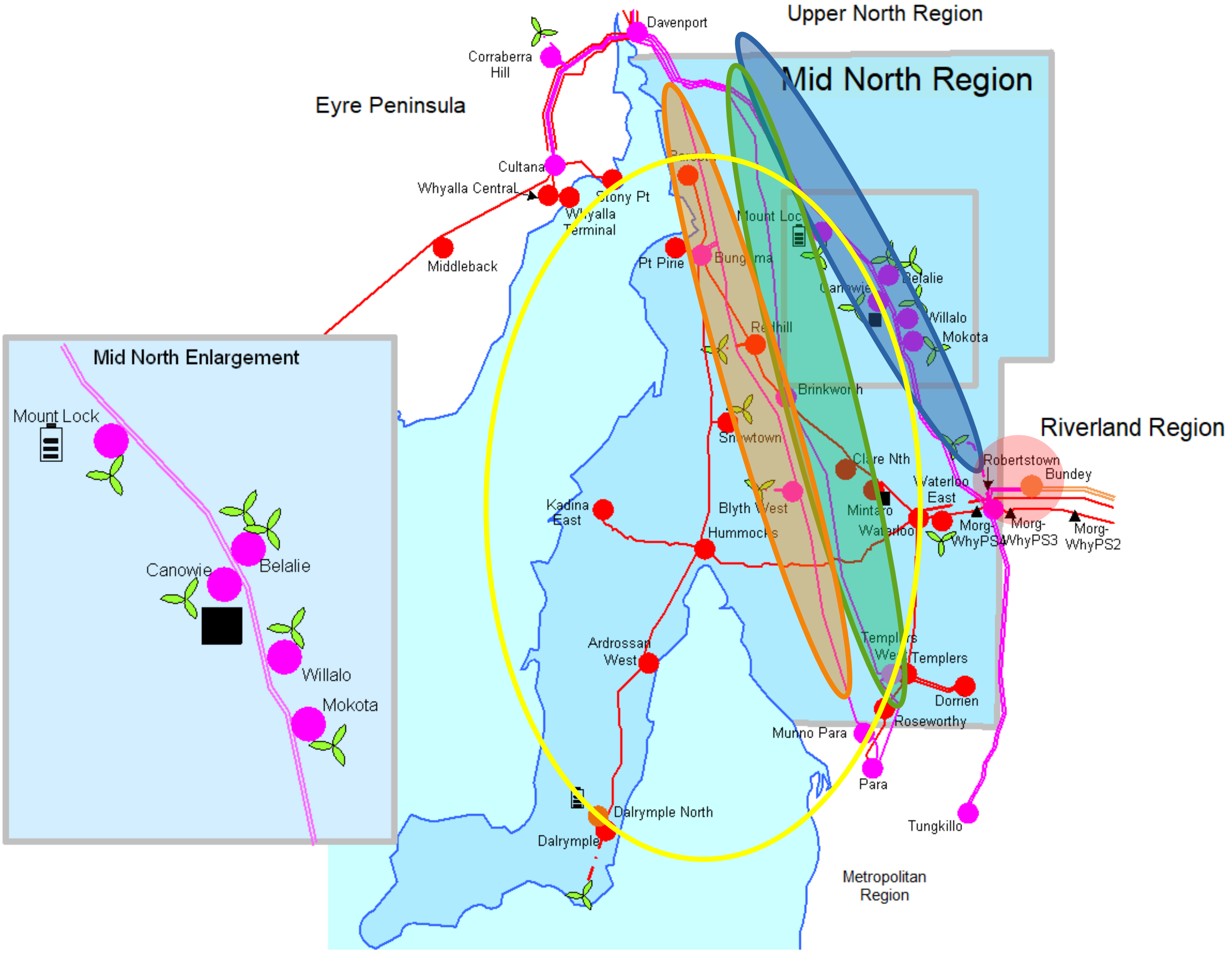
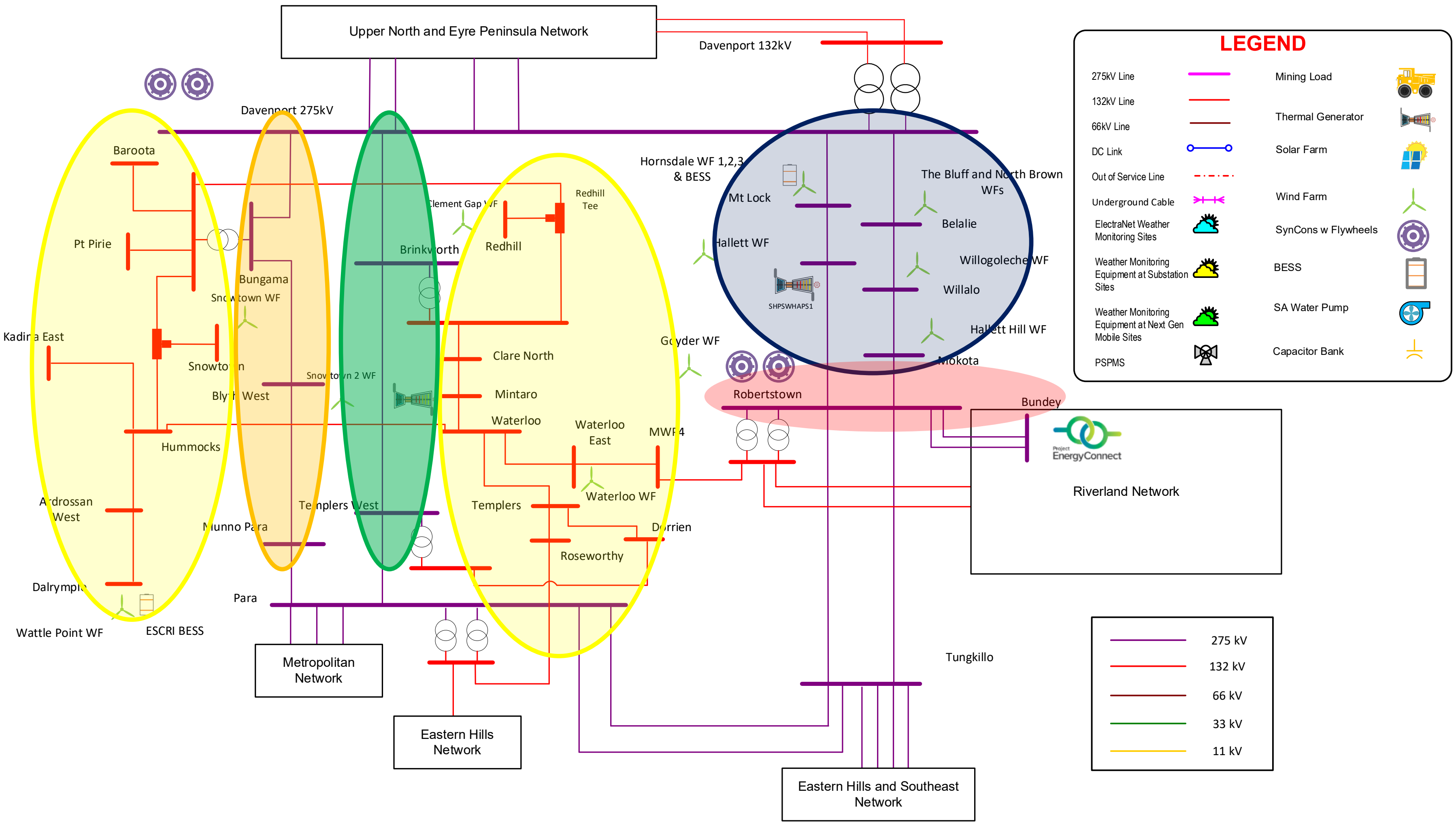


Figure 4: Single Line Drawing of the sub-regions in the Mid North transmission network



3.1.1 Bundey, Robertstown and PEC sub-region

Bundey and Robertstown substations depicted by the red circle in Figure 3 and Figure 4, provide direct access to PEC, and to Adelaide via the Robertstown – Tungkillo 275 kV lines.

The NTx project has not be considered within the network capacity assessment of this report.

Existing and committed generation and load connections are shown in Table 1.

Table 1: Existing and committed generation and load connections: Bundey, Robertstown and PEC sub-region

Name	Type	Size	Status
Goyder South Wind Farm 1A	Wind Farm	209 MW	In commissioning
Goyder South Wind Farm 1B	Wind Farm	203.5 MW	Committed
Robertstown	275/132 kV transformer connection to the regulated Mid North and Riverland 132 kV load networks	2x160 MVA	In service

3.1.2 Mt Lock – Canowie and Belalie – Willalo – Mokota sub-region

Depicted by the Blue circle in Figure 3 and Figure 4.

The sub-region is currently well-utilised for wind farm connections. Constraints can be applied at times to manage limitations under N-1 outage conditions.

No loads are currently connected to this sub-region.

Existing generation and BESS connections include:

- 786 MW of wind farms;
- 150 MW of BESS connections; and
- 270 MW of gas-fired turbines.

Key limits that apply to this sub-region include the following:

- System normal:
  The maximum amount of generation that could be dispatched from within this sub-region under ideal conditions is about 1,200 MW, based on the summer ratings of the Davenport – Mt Lock, Davenport – Belalie, Mokota – Robertstown and Canowie – Robertstown 275 kV lines.
  However, if flows were biased towards the Davenport substation end of the 275 kV lines and no power flows were exiting, this sub-region at the Robertstown substation end, the maximum amount of generation that could be dispatched would be approximately 1,000 MW; and
- N-1:
  Following an outage at either end of either the Davenport – Mount Lock – Canowie – Robertstown or the Davenport – Belalie – Willalo – Mokota – Robertstown 275 kV line, AEMO would reduce the amount of generation that can be dispatched from the affected line to

about 270 MW (largest amount of generation that can be lost due to a single credible contingency in SA). This may increase from 270 MW to about 400 MW following the completion of PEC Stage 2, subject to the necessary power system studies and validation.

Existing generation connections are shown in Table 2.

Table 2: Existing generation connections: Mt Lock- Canowie and Belalie – Willalo – Mokota sub-region

Name	Type	Size	Status
Hallett Stage 1 Brown Hill WF	Wind Farm	94.5 MW	In service
Hallett GT	Gas turbines	276.86 MW	In service
Hornsdale Wind Farm Stage 1	Wind Farm	102.4 MW	In service
Hornsdale Wind Farm Stage 2	Wind Farm	102.4 MW	In service
Hornsdale Wind Farm Stage 3	Wind Farm	112 MW	In service
Hornsdale Power Reserve	Battery	150 MW	In service
Hallett 4 North Brown Hill	Wind Farm	132.3 MW	In service
Hallett 5 The Bluff WF	Wind Farm	52.5 MW	In service
Willogoleche Wind Farm	Wind Farm	119.76 MW	In service
Hallett Stage 2 Hallett Hill	Wind Farm	71.4 MW	In service

3.1.3 Brinkworth – Templers West sub-region

Depicted by the Green circle in Figure 3 and Figure 4: Single Line Drawing of the sub-regions in the Mid North transmission network.

This sub-region currently has few connections but significant interest.

275/132 kV transformers at Brinkworth substation and Templers West substation provide connection to the Mid North 132 kV network. At times, rating limitations on the 132 kV network can restrict power flows that are achievable on the parallel 275 kV network.

If multiple large connections proceed, a new RAS may be required to manage post-contingency limitations on this moderate-capacity 275 kV line and the connected 275/132 kV transformers.

Existing load connections are shown in Table 3.

Table 3: Existing load connections: Brinkworth – Templers West sub-region

Name	Type	Size	Status
Brinkworth	275/132 kV transformer connection to the regulated Mid North 132 kV load network	1x 160 MVA	In service
Templers West	regulated Mid North 132 kV load network	1x 160 MVA	In service

3.1.4 Bungama – Blyth West – Munno Para sub-region

Depicted by the Orange circle in Figure 3 and Figure 4.

A RAS is already in place to manage existing wind farms and BESS connections within post-contingency limitations on this moderate-capacity 275 kV line and the connected 275/132 kV and 275/66 kV transformers.

Additional generator or BESS connections in this sub-region could introduce a requirement for the application of constraints on generators under system normal conditions.

Existing generation and load connections are shown in Table 4.

Table 4: Existing and committed generation and load connections: Bungama – Blyth West – Munno Para sub-region

Name	Type	Size	Status
Bungama	275/132 kV transformer connection to the regulated Mid North 132 kV load network	1x 160 MVA	In service
Bungama Solar	Battery	150 MW	Committed
Blyth BESS	Battery	200 MW	In service
Snowtown S2 Wind Farm	Wind Farm	270 MW	In service
Munno Para	275/66 kV transformer connection to the regulated Northern Suburbs 66 kV load network	1x 225 MVA	In service

3.1.5 Mid North and Yorke Peninsula 132 kV sub-region

Depicted by the Yellow circle in Figure 3.

The Mid North 132 kV network has limited-to-no capacity available at times of high wind farm generation output due to existing wind farm connections and rating limitations of the sub-region's 132 kV lines and 275/132 kV transformers.

The Yorke Peninsula is subject to the same limitations as the rest of the Mid North 132 kV sub-region, with the additional limitation of N-1 limitations on the Bungama – Hummocks 132 kV line and Waterloo – Hummocks 132 kV line that are already managed by existing connection arrangements and intertrip schemes.

Existing and committed generation connections are shown in Table 5.

Table 5: Existing and committed generation and load connections: Mid North and Yorke Peninsula 132 kV sub-region

Name	Type	Size	Status
Angaston	Diesel turbines	36.0 MW	In service
Clements Gap Wind Farm	Wind Farm	56.7 MW	In service
Clements Gap BESS	Battery	60 MW	Committed
Dalrymple North BESS	Battery	30 MW	In service
Morgan to Whyalla Pipeline No. 4 PS	Solar Farm	5.5 MW	In service
Snowtown Wind Farm	Wind Farm	98.7 MW	In service
Templers BESS	Battery	111 MW	Committed
Waterloo Wind Farm	Wind Farm	130.8 MW	In service
Wattle Point	Wind Farm	90 MW	In service

4 Load and Generation assumptions

4.1 Methodology of generation opportunity calculations

A range of demand, generation, and interconnector operating conditions were considered to determine an indicative maximum generation capacity that could be connected without exceeding existing line and transformer thermal ratings, under system normal and single credible contingency conditions.

However, this assessment is limited to operating conditions in Table 6 and does not attempt to define the amount and value of constraints that could be experienced in terms of energy lost by connecting generation. We have not considered the potential impact of constraints outside of South Australia on the ability to export power out of South Australia.

In making this assessment, we have included the impact of generators that are considered committed to connect.

We recommend that parties seeking connection to the network carry out a detailed network access and market impact assessment.

4.2 Key committed and potential near to medium-term network investments to release capacity in the Mid North

We have evaluated the anticipated thermal capability of the transmission network in the Mid North Region to accommodate additional generation, with inclusion of the anticipated full capacity of PEC, under five system conditions.

The first stage of PEC (150 MW) has been completed and commissioned. The second stage of the project, under the remit of NSW TNSP Transgrid, is yet to be completed. The release of the full 800 MW transfer capacity is anticipated in 2027, subject to availability of suitable test conditions and successful test outcomes.

The South Australian works for PEC included the creation of the new Bundey substation, which is able to facilitate new 275 kV or 330 kV connections near Robertstown area.

These conditions were selected to reflect a range of dispatch scenarios, capturing various demand levels, generation mixes, and interconnector flows, representing typical situations the network may experience. During the development of these scenarios, BESS operation was excluded from the study, as their impact on overall system conditions is considered minimal. Additionally, conventional generation was limited where possible to better represent the expected future operation of the network.

The study was conducted across all Mid North connection points, where we gradually increased the output of the new generator at each location. During this process, the flows on both interconnectors were managed within their secure limits to maintain the supply-demand balance. The new generator output was increased until either a voltage limitation or thermal overload was observed, while considering all possible single credible contingencies. The impact of existing runback schemes was also accounted for where practicable.

Potential impacts on new or existing generators due to system strength limitations have not been considered. The indicative capacity of the Mid North transmission network and its connection points to accommodate additional generation (beyond existing and committed generation) is summarised in Section 5.2

In some cases, larger generators may be connectable if low-cost upgrades can enhance the network's transfer capacity, for instance, by replacing low-cost equipment that limits the available rating of a transmission line.

Table 6: Initial system conditions considered in the assessment of the ability of the Mid North to accommodation additional generation

System condition	SA Demand (MW)	Heywood interconnector flow (MW)	PEC flow (MW)	Conventional generator output (% of capacity)	Wind farm output (% of capacity)	Solar farm output (% of capacity)	BESS
High summer demand - sunny at noon	2,500	350 (import)	450 (import)	0%	50%	90%	0%
High winter demand - very windy and overcast	2,000	230 (export)	250 (export)	0%	90%	0%	0%
Medium demand - sunny and still	1,300	250 (import)	195 (import)	0%	5%	90%	0%
Medium demand - cloudy and windy	1,300	500 (export)	400 (export)	0%	80%	5%	0%
Very low daytime demand - sunny and still	0	400 (export)	450 (export)	0%	5%	95%	0%

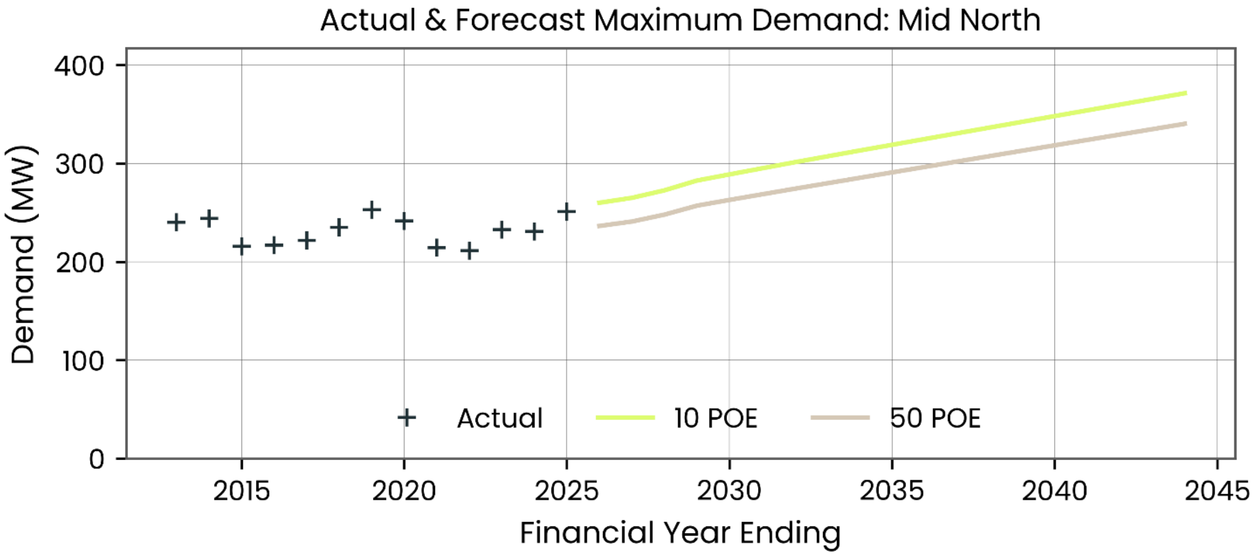
4.3 Methodology to load opportunity calculations

We have assessed the ability of existing connection points to accommodate the connection of new large loads (Section 5.2). The values listed represent the additional load that, without transmission network upgrades, could be connected to the high voltage bus in addition to the forecasted South Australian 2028-9 10% POE load at the time of early evening maximum demand, with:

- Conventional generators dispatched to 100% of capacity
- Wind farms dispatched to 10% of capacity
- Solar farms off
- Import of 600 MW across the Heywood interconnector and 750 MW across PEC.

4.4 Historical and forecast of demand in the Mid North Region

Detailed information about historical and forecast connection point demands is available on our Transmission Planning Report webpage.[3] A summary of total demand in the Mid North region is provided in the following figures.



[3] Our Transmission Planning Report webpage is available at https://electranet.com.au/resources/transmission-annual-planning-report/.

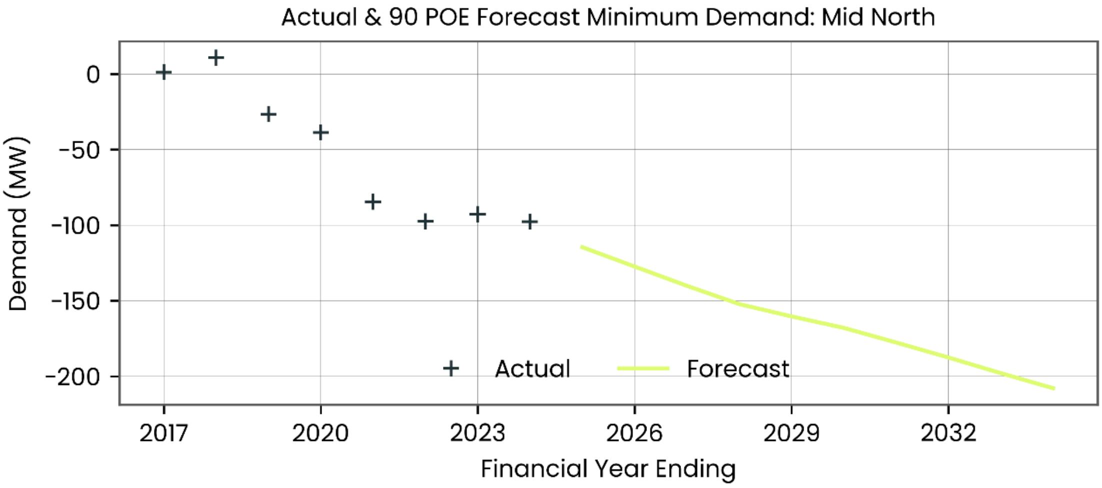


Figure 5: Mid North demands and demand profiles

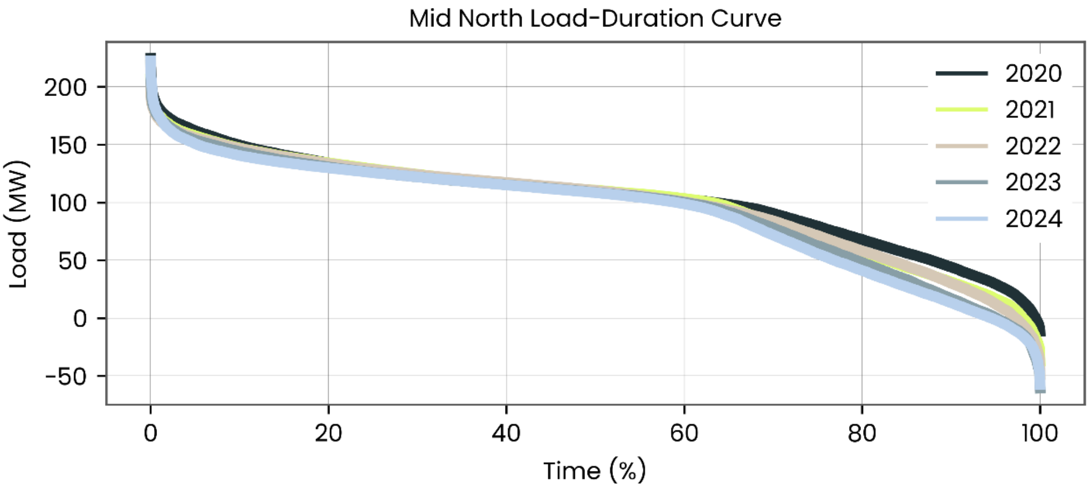


Figure 6: Mid North load duration curve

4.5 Methodology to physical network connection capability

Line routes and easements into and out of substations have not been considered. The connection into existing substations may be via overhead transmission line or through underground cable, depending on the land, approval requirements and constraints at specific locations.

Physical space limitation at some existing substations may necessitate the use of gas insulated switchgear rather than air insulated switchgear (GIS or hybrid bays).

Existing substations that have connection capacity within the boundary of the existing substation bench also have capacity for a new control room if required for a customer connection.

Space within ElectraNet Joint use sites has been assessed using AIB (Asset interface and Boundary) document.

Substations that are in land of other utilities or customers and have access issues have not been considered.

5 Assessment of Generation and Load Opportunity

5.1 General observations about connection opportunities for generators

Several 275 kV substations in the Mid North represent strategic locations close to fuel resources, including wind.

Sites that are electrically favourable for connecting generation are located along the 275 kV backbone; however:

- Connections on the Davenport – Bungama – Blyth West – Munno Para – Para 275 kV lines will be subject to constraints or forced outages under N-1 conditions, and may become increasingly subject to constraints at times of high aggregate generation output under system normal conditions
- Connections on the Davenport – Brinkworth – Templers West – Para 275 kV lines may be subject to constraints or forced outages under N-1 conditions, and may become increasingly subject to constraints at times of high aggregate generation output under system normal conditions
- Connections on the Davenport – Robertstown 275 kV lines may become subject to constraints under N-1 conditions.

5.2 Summary of connection opportunities

A summary of the ability of the Mid North transmission network to accept generator or load connections by 2029 is given in the following sections. Refer to Appendix A for the detailed assessment of connection opportunities by 2029

5.2.1 Bundey, Robertstown and PEC sub-region

275 kV and 330 kV connections are available at Bundey substation. Key limits that apply to this sub-region can be seen in Table 7 below.

Table 7: Indication of available capacity to connect generation and load in Bundey Substation, Robertstown and PEC sub-region

Substation	Voltage (kV)	Spare Bay Availability	Additional available Generation Network Capacity (MW)		Additional available Load Network Capacity (MW)	Proponent Interest
			Low constraints	High constraints		
Bundey	330	4	55	>600	850	High
	275	19	45			
Robertstown	275	2	40			Medium

5.2.2 Mt Lock – Canowie and Belalie – Willalo – Mokota sub-region

Table 8: Indication of available capacity to connect generation and load in Mt Lock – Canowie and Belalie – Willalo - Mokota sub - region

Substation	Voltage (kV)	Spare Bay Availability	Additional available Generation Network Capacity (MW)		Additional available Load Network Capacity (MW)	Sub-Region Limit (MW)		Proponent Interest
			Low constraints	High constraints		System Healthy	Worst N-1 (MW)	
Canowie	275	0	70	585	700	1000-1200	770-900	N/A
Mount Lock	275	3	65	565	500			Low
Belalie	275	4	75	575	550			Low
Willalo	275	3	65	575	550			Low
Mokota	275	1	60	575	500			Low

5.2.3 East: Brinkworth – Templers West

This sub-region currently has few connections but significant interest.

Table 9: Indication of available capacity to connect generation and load in Brinkworth – Templers West sub-region

Substation	Voltage (kV)	Spare Bay Availability	Additional available Generation Network Capacity (MW)		Additional available Load Network Capacity (MW)	Sub-Region Limit (MW)		Proponent Interest
			Low constraints	High constraints		System Healthy	Worst N-1	
Brinkworth	275	6	5	425	200	800	400	Low
	132	2	5	285	200			
Templers West	275	0	0	285	130			N/A
	132	3	0	140	100			

5.2.4 West: Bungama – Blyth West – Munno Para sub-region

Table 10: Indication of available capacity to connect generation and load in Bungama – Blyth West – Munno Para sub-region

Substation	Voltage (kV)	Spare Bay Availability	Additional available Generation Network Capacity (MW)		Additional available Load Network Capacity (MW)	Sub-Region Limit (MW)		Proponent Interest
			Low constraints	High constraints		System Healthy	Worst N-1 (MW)	
Bungama	275	1	55	320	350	800	270-400	Medium
	132	1	20	265	245			
Blyth West	275	4	70	440	325			Low
Munno Para	275	3	115	420	400			Low

5.2.5 Mid North and Yorke Peninsula 132 kV sub-region

Table 11: Indication of available capacity to connect generation and load in Mid North and Yorke Peninsula 132 kV sub-region

Substation	Voltage (kV)	Spare Bay Availability	Additional available Generation Network Capacity (MW)		Additional available Load Network Capacity (MW)	Sub-Region Limit (MW) considering 0MW load		Proponent Interest
			Low constraints	High constraints		System Healthy	Worst N-1 (MW)	
Clare North	132	2	0	170	125	600	400	Low
Dorrien	132	0	0	130	75			N/A
Mintaro	132	0	0	170	125			N/A
Roseworthy	132	0	20	135	100			N/A
Templers	132	0	0	195	100			N/A
Waterloo	132	2	0	230	0			Low
Waterloo East	132	3	0	115	5			Low

Appendix A Detailed Assessment of Connection Opportunities

A.1 Existing network review

- High level numbers on connections available per region and per substation at specific voltage levels
- These are connections available to TNU customers

Table 12: Summary of available bays in Mid North region substations

Region	275kV Spaces	132kV Spaces
Mid North	40	15

A.2 Substations with available capacity within ElectraNet owned Land

Below list of substations within the Mid North region that have TNU connection capacity where connections are within the bounds of existing ElectraNet owned land.

A.3 Bundey Robertstown sub-region

Table 13: Details of available bays in Bundey Substation

Spare connection points			
Bundey Substation	existing diameter / bay	existing bus/bench	ElectraNet owned land with additional infrastructure
330 kV	0	0	4
275 kV	0	0	19

Table 14: Details of available bays in Robertstown Substation

Spare connection points			
Robertstown	existing diameter / bay	existing bus/bench	ElectraNet owned land with additional infrastructure
275 kV	2	0	0
132 kV	1	0	0

A.4 Mt Lock – Canowie and Belalie – Willalo – Mokota sub-region

Table 15: Details of available bays in Davenport Robertstown sub-region substations

Spare connection points			
Substation Voltage Level	Existing diameter / bay	Existing bus/bench	ElectraNet owned land with additional infrastructure
Mokota (275 kV)	0	0	0
Willalo (275 kV)	0	0	3
Belalie (275 kV)	0	0	0
Canowie (275 kV)	0	0	0
Mount Lock (275 kV)	0	0	3

A.5 Mid North East: Brinkworth – Templers West sub-region

Table 16: Details of available bays in Electranet East sub-region substations

Substation Voltage Level	Spare connection points		
	Existing diameter / bay	Existing bus/bench	ElectraNet owned land with additional infrastructure
Templers West 275 kV	0	0	0
Brinkworth 275 kV	2	4	0
Brinkworth 132kV	1	1	0

A.6 Mid North West: Bungama – Blyth West – Munno Para sub-region

Table 17: Details of available bays in Electranet West region substations

Substation Voltage Level	Spare connection points		
	Existing diameter / bay	Existing bus/bench	ElectraNet owned land with additional infrastructure
Blyth West 275 kV	0	0	1
Bungama 275 kV	1	0	0
Bungama 132 kV	1	0	0
Munno Para 275 kV	0	0	1

A.7 Yorke Peninsula 132kV sub-region

Table 18: Details of available bays in Electranet York Peninsula 132kV sub-region substations

Substation Voltage Level	Spare connection points		
	Existing diameter / bay	Existing bus/bench	ElectraNet owned land with additional infrastructure
Dalrymple 132 kV	0	0	0
Ardrossan West 132 kV	1	0	0
Kadina East 132 kV	0	0	3
Hummocks 132 kV	0	0	0

A.8 Mid North 132kV sub-region

Table 19: Details of available bays in Electranet Mid North 132kV sub-region substations

Substation Voltage Level	Spare connection points		
	Existing diameter / bay	Existing bus/bench	ElectraNet owned land with additional infrastructure
Roseworthy	0	0	0
Dorrien	0	0	0
Templers West	0	0	3
Templers	0	0	0
Waterloo East	0	0	0
Waterloo	0	2	0
Mintaro	0	0	0
Clare North	2	0	0
Red Hill	0	0	0
Baroota	0	0	0
Port Pirie	0	0	0
Snowtown	0	0	0

A.9 Detailed indication of available capacity to connect generation and load by 2029

Table 20: Details of available capacity in Electranet Mid North region substations

Substation Connection point	Additional generation that could be connected (MW)					Additional load that could be connected (MW)
	High summer demand sunny at noon	High winter demand very windy and overcast	Medium demand sunny and still	Medium demand cloudy and windy	Very low daytime demand sunny and still	High Summer demand evening peak and not windy
Ardrossan West 132 kV	35	0	65	0	65	50
Baroota 132 kV	0	0	0	0	0	0
Belalie 275 kV	75	240	575	70	290	550
Blyth West 275 kV	235	70	440	115	325	250
Brinkworth 275 kV	75	165	425	5	320	200
Brinkworth 132 kV	50	55	285	5	210	200
Bundey 330 kV	55	210	600+	110	255	850
Bundey 275 kV	45	185	600+	90	270	850
Bungama 275 kV	205	115	540	55	320	350
Bungama 132 kV	80	85	265	20	245	150
Canowie 275 kV	70	260	585	70	290	700
Clare North 132 kV	25	5	170	0	130	125
Dalrymple 132 kV	35	0	70	5	65	40
Davenport 275 kV	165	220	600+	40	165	450
Dorrien 132 kV	75	115	130	0	115	75
Hummocks 132 kV	30	10	95	0	80	40
Kadina East 132 kV	30	10	100	0	85	40
Mokota 275 kV	60	240	575	75	285	500
Mount Lock 275 kV	95	280	565	65	295	500
Munno Para 275 kV	150	115	420	140	325	400

Substation Connection point	Additional generation that could be connected (MW)					Additional load that could be connected (MW)
	High summer demand sunny at noon	High winter demand very windy and overcast	Medium demand sunny and still	Medium demand cloudy and windy	Very low daytime demand sunny and still	High Summer demand evening peak and not windy
Port Pirie 132 kV	45	45	45	20	45	350
Robertstown 275 kV	40	175	600+	90	275	850
Roseworthy 132 kV	80	60	135	20	125	100
Templers 132 kV	60	50	195	0	195	100
Templers West 275 kV	130	225	285	0	250	400
Templers West 132 kV	90	130	115	0	140	100
Tungkillo 275 kV	600+	600+	600+	265	325	900
Waterloo 132 kV	15	0	230	0	125	100
Waterloo East 132 kV	20	0	115	0	110	75
Willalo 275 kV	65	240	575	70	285	550