Attachment 10, Appendix A

Network Capability Incentive Parameter Action Plan

Revenue Proposal 2023-24 to 2027-28

31 JANUARY 2022

ElectraNet

Company Information

ElectraNet Pty Ltd (ElectraNet) is the principal electricity transmission network service provider (TNSP) in South Australia.

For information about ElectraNet visit www.electranet.com.au.

Contact

For enquiries about this Revenue Proposal please contact:

Simon Appleby
Manager Regulation and Investment Planning
ElectraNet
52-55 East Terrace
Adelaide SA 5000

revenue.reset@electranet.com.au

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1. Introduction

This document presents ElectraNet's proposed Network Capability Incentive Parameter Action Plan (Plan) for the 2023-24 to 2027-28 regulatory period. The Plan operates under the Network Capability Component of the Australian Energy Regulator's (AER's) electricity transmission Service Target Performance Incentive Scheme (STPIS).

The Network Capability Component (NCC) was introduced to the STPIS in December 2012. The STPIS including the NCC was amended in September 2015 to version 5.

This Plan addresses the requirements of the NCC of version 5 of the STPIS.

1.1 Purpose of the Network Capability Component

The NCC incentivises measures that improve the capability of transmission assets through operating expenditure and minor capital expenditure on a transmission network that results in:

- Improved capability of those elements of the transmission system most important to determining spot prices; or
- Improved capability of the transmission system at times when Transmission Network Users place greatest value on the reliability of the transmission system.

The NCC was designed to improve the capability of the transmission network to benefit electricity customers. It incentivises TNSPs to review the capability of the transmission network and identify low-cost network capability improvements that would provide greatest benefit to customers. As a result of such improvements, generation is less likely to be constrained by network limits, leading to more efficient dispatch and putting downward pressure on wholesale energy prices. Customers benefit from the resulting lower wholesale prices.

The elements most important to determining spot prices tend to be interconnector limits and major intra-regional constraints. The projects in the Plan have been targeted directly at these elements.

This Plan proposes four projects that will contribute to improving the capability of South Australia's transmission network.

1.2 Period of the Plan

The Plan covers the five-year period from 1 July 2023 to 30 June 2028

1.3 Context

This Plan is provided in the context that South Australia remains at the forefront of global change in the energy sector. Significant growth of rooftop PV and large-scale renewable generation is forecast to continue in South Australia into the next regulatory period and beyond. The forecast shift from centralised generation sources to distributed energy sources close to customers and remote renewable sources will result in changing power flows and changing patterns of congestion. Unabated, this congestion would hinder the development of low-cost renewable energy in South Australia.

This Plan identifies ways to abate that congestion. It also identifies projects that will enhance the capability of South Australia's interconnectors, Heywood and Murraylink and Project EnergyConnect, under development).

Below are some of the major changes in South Australia's energy system that will shape the development of the grid over the next regulatory period:

- Project EnergyConnect (SA-NSW interconnector) is set to commence commissioning in 2023-2024. Once fully delivered, the full combined transfer limit across both the Heywood and Project EnergyConnect interconnectors will be 1,300 MW into South Australia and 1,450 MW export.
- Construction of Eyre Peninsula Link started in mid-2021 and is due to be complete by the end of 2022.
- There has been significant interest in new generator and load developments, especially in the Mid North, Eyre Peninsula, Riverland and South East regions. By 2027-2028, around 1,200 MW [1] of new renewable energy generation is forecast to connect in South Australia.
- Rooftop PV is forecast to increase by almost 1,500 MW by 2027-28 to a total of around 3,000 MW.
- Rooftop PV is leading to minimum grid demand declining during the day. By 2022, all domestic consumption in South Australia is forecast to be met at times by local distributed PV. South Australia has already experienced net negative demand events at points in time where all distributed load was supplied by distribution connected generation including wind and solar. Most surplus energy from grid connected renewables under these conditions will be exported to the east coast.
- Maximum grid demand across the State is forecast to remain stable at around 2,800-2,900 MW for the next ten years. [2]
- Four synchronous condensers at Davenport and Robertstown have been commissioned in 2021. Commissioning of the synchronous condensers has allowed the amount of non-synchronous generation that can be dispatched at times of minimum conventional generation in South Australia to be increased from 2,000 MW to 2,500 MW as well as alleviating voltage limits in the Mid North.

1 AEMO's draft 2022 ISP, AEMO | 2022 Draft ISP Consultation

2 AEMO's 2021 ESOO Central forecast

2. Approach

This chapter outlines the approach ElectraNet has used and the engagement it has undertaken with key stakeholders to identify and rank projects for the purposes of this Plan including AEMO and customers.

2.1 Requirements of the STPIS

The STPIS requires ElectraNet to:

- Identify, for every transmission circuit or injection point on its network, the limit and the reason for the limit for each transmission circuit or injection point. These data are provided in the Network Limits Information provided with the Revenue Proposal.
- Propose the priority projects to be undertaken in the 2023-24 to 2027-28 regulatory period to reduce the limits on the transmission circuits and injection points listed above through operational and/or minor capital expenditure projects. This proposal must include the following for each project:
  - the total operating and capital cost;
  - the proposed value improvement target in the limit;
  - the current value of the limit for the transmission circuits and/or injection points which the project is seeking to improve;
  - the priority project's rank within the proposed projects based on its likely benefit to customers or its likely impact on wholesale market outcomes; and
  - a description of how achieving the priority project improvement target would result in a material benefit being achieved, including an outline of the key assumptions on which this result is based.

These are provided under each proposed project below.

We must also ensure that the average total expenditure of the priority projects outlined in each regulatory year is no greater than 1 per cent of our average annual maximum allowed revenue proposed in our revenue proposal for the regulatory control period

2.2 Approach to identifying projects

ElectraNet has systematically reviewed limits, operating conditions and constraints on its network to identify projects for inclusion in the Plan. The reviews that were undertaken involved:

- Reviewing the limits for each transmission line, connection point and transformer, including identification of all limiting factors less than the conductor thermal rating;
- Identifying credible contingencies where increased capability would improve wholesale market outcomes;
- Reviewing binding transmission constraints to identify capability improvements that would improve wholesale market outcomes;
- Identifying operating conditions where capability improvements could provide benefits; and
- Identifying innovations that could provide capability improvements.

This was done in collaboration with AEMO in its roles as National Transmission Planner and Market Operator, and in accordance with its South Australian advisory functions under the National Electricity Law Development. AEMO has reviewed and endorsed the projects proposed in this Plan for the purposes of the Revenue Proposal[3].

The costs associated with the projects proposed in this plan are not included in the capital or operating expenditure forecasts in respect of the forthcoming regulatory control period.

2.3 Approach to ranking projects

The NCC requires proposed projects to be ranked in descending order based on the likely benefit of the project to customers or the likely impact on wholesale market outcomes. ElectraNet and AEMO have taken the following approach to ranking the projects:

- Estimate annual benefits of each project;
- Estimate project cost;
- Calculate payback periods for each project;
- Prioritise projects based on their estimated payback periods - shorter payback periods given priority over longer; and
- Determine the timing of each project with regards to ElectraNet's capabilities to deliver, the likelihood that conditions that give rise to congestion will be realised and the operational flexibility that the project provides.

2.4 Consultation with Customers

ElectraNet has consulted with customers and wider stakeholders through the release of a draft Plan in its Preliminary Revenue Proposal, issued for comment in July 2021. ElectraNet invited submissions from customers, representatives and other stakeholders, and held forums and individual meetings with stakeholders to discuss these proposals.

ElectraNet also held a series of intensive workshops with a Working Group of its Consumer Advisory Panel to review aspects of the Preliminary Revenue Proposal in detail, attended by representatives of the AER.

The feedback received during the course of this engagement confirmed that the level of electricity prices in South Australia remains of concern to customers. Accordingly, ElectraNet has been encouraged to continue its focus on driving costs down, including broader measures to reduce the delivered cost of energy.

Consistent with this feedback, ElectraNet has developed this plan to focus on those projects expected to produce the greatest net benefit to customers, in the form of improved power flows across the network and reduced constraints on generation dispatch. This delivers benefits by placing downward pressure on wholesale energy costs, and in turn on delivered energy costs for customers.

[3] Refer ENET034

3. Network capability improvement prioritisation

ElectraNet's Plan will reduce network congestion, increase output from low cost renewable energy generators and increase the transfer capability across the Murraylink interconnector. The effect of these improvements will be to increase access to lower cost renewable energy for customers ultimately lowering the price for delivered electrical energy.

The total value of the proposed projects identified is $14.9 million ($FY'21). One per cent of ElectraNet's average forecast Maximum Allowed Revenue for the forthcoming regulatory control period is $17.1 ($FY'23) million. Therefore, the total value of the proposed projects identified does not exceed the maximum allowed threshold for the forthcoming period.

Projects are ranked in descending order of their net benefit to customers as shown in Table 1.

Table 1 Summary of NCIPAP projects for regulatory period 2024-2028

Rank	Proposed Project	Timing	Capital Expenditure ($m nom)	Operating Expenditure ($m nom)	Payback period (Years)	Benefits
1	Robertstown to Tungkillo 275 kV Line Uprating	2023-24	2.43		1	Reduce network congestion, avoid renewable energy curtailment, defer major network upgrade.
2	Davenport to Cultana Line Uprating	2024-25	1.53		2	Reduce network congestion, avoid renewable energy curtailment.
3	Transmission line rating improvement	2024-25	1.80	4.15	5	Reduce network congestion, avoid renewable energy curtailment.
4	Increase Murraylink transfer capability	2025-26	5.02		5	Increased imports/exports of low-cost renewables across Murraylink.
	Total		**10.78**	**4.15**		

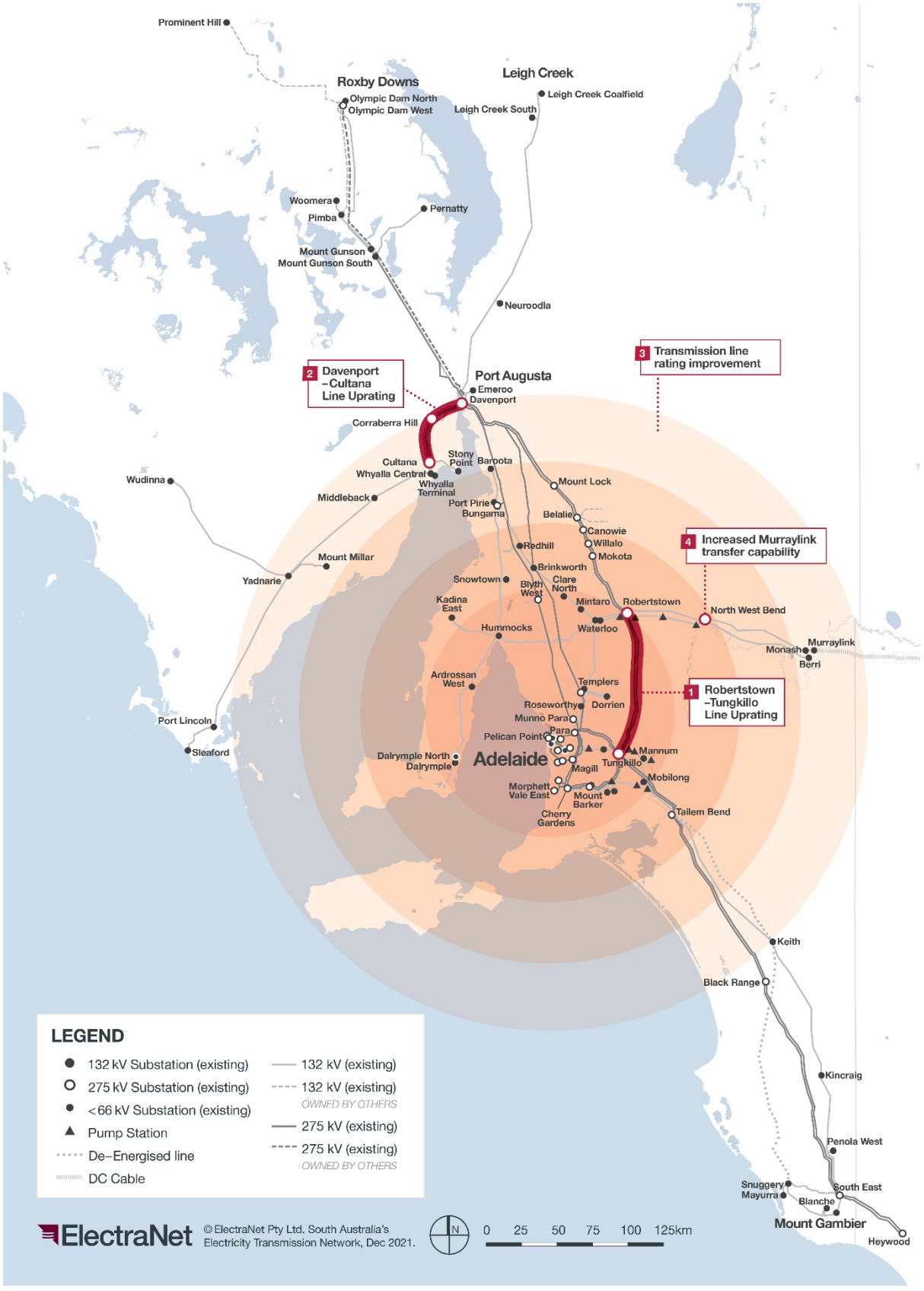
The timing of projects is presented in Table 2. The timing has been determined to optimise the benefits.

Table 2 NCIPAP project timings for the regulatory period 2024-2028

Project	2023-24	2024-25	2025-26	2026-27	2027-28	Total
1. Robertstown to Tungkillo 275 kV Line Uprating	2.43					
2. Davenport to Cultana Line Uprating		1.53				
3. Transmission line rating improvement	2.98	2.97				
4. Increase Murraylink transfer capability			5.02			
Total						**14.93**

Figure 1 overleaf presents the location of our proposed NCIPAP projects. Note that project EC.15571 Transmission line rating improvement applies to all transmission lines across the whole network and will alleviate congestion across the network . The greatest benefit of this project is forecast to occur immediately north of the greater Adelaide area.

Figure 1 Location of proposed NCIPAP projects

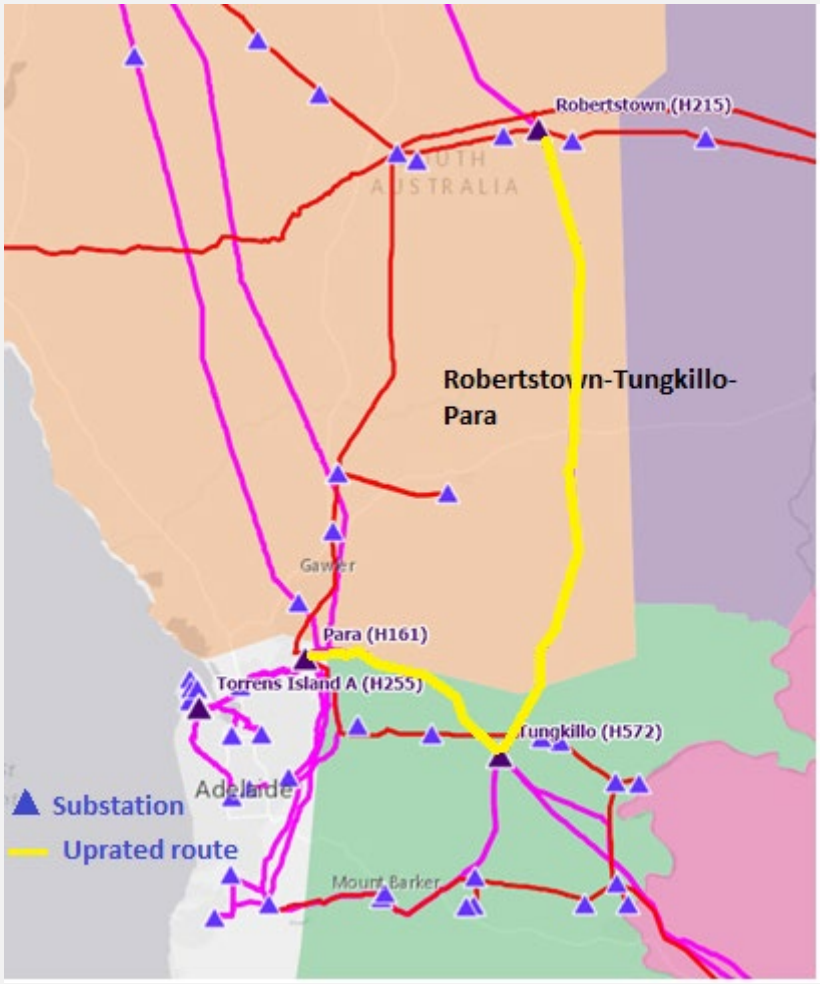


4. Proposed projects

4.1 Robertstown to Tungkillo Line Uprating

This project will increase the network's capability between the termination point of Project EnergyConnect and the greater Adelaide region. This will enhance Project EnergyConnect's ability to support new entrant renewables in South Australia, resulting in lower wholesale prices for customers.

Project name/ID	EC.15179 - Robertstown to Tungkillo 275 kV Line Uprating
Transmission Circuit/Injection Point	Robertstown – Tungkillo 275 kV Robertstown – Para 275 kV
Basis and cause for the limit in the identified transmission circuit and injection point	Designed thermal limit of the lines and protection settings

Project name/ID	EC.15179 - Robertstown to Tungkillo 275 kV Line Uprating
Project Description	Robertstown to Tungkillo and Robertstown to Para 275 kV[4] lines will be uprated from T100 rating to T120 rating by upgrading 15 low hanging spans[5]. Figure 2 highlights the uprated circuits. **Figure 2 Robertstown to Tungkillo & Para 275 kV network** 
Current value of the limit	Line Thermal Limits: (Summer/ Autumn-Spring/Winter) Transmission Circuit / Summer Rating (MVA)[6] / Autumn-Spring (MVA) / Winter Rating (MVA) Robertstown – Tungkillo 275 kV: 597 / 617 / 677 Robertstown – Para 275 kV: 603 / 624 / 684 Constraints: S>>NIL_RBPA_RBTU S>>NIL_RBTU_RBPA

4 ElectraNet's "Smart Wires PowerLine Guardian trial" project is uprating these circuits to T100

5 Robertstown to Para will be turned in at Tungkillo as part of Project EnergyConnect scope.

6 Prior to competition of "Smart Wires PowerLine Guardian trial" Robertstown – Para 275 kV has operating rating of 451/481/564 MVA

Project name/ID	EC.15179 - Robertstown to Tungkillo 275 kV Line Uprating
Improvement target in the limit	New Line Thermal Limits: (Summer/ Autumn-Spring/Winter) Transmission Circuit — Summer Rating (MVA) — Autumn-Spring (MVA) — Winter Rating (MVA) Robertstown – Tungkillo 275 kV — 701 — 717 — 766 Robertstown – Para 275 kV — 701 — 717 — 766 Updated Constraints: S>>NIL_RBPA_RBTU + 104 MVA S>>NIL_RBTU_RBPA + 104 MVA
Material benefit	The benefits of this project have been estimated based on modelling results from ElectraNet's market model using AEMO's Input and Assumptions Scenario Report (IASR). [7] We have forecast that this project would avoid around $3.6m p.a. in congestion by 2023 The uprating of the lines between Robertstown and Para will provide approximately 40% of the modelled transmission expansion. This expansion cost is estimated at $2.43m (equivalent cost of $24k/MW) and is fully recovered in the first year of operation. The payback period is estimated at 9 months.
Planned Completion Date	2023-24
Capital Cost ($ nominal)	$2.43 million
Operating Cost	$0
Market benefit (per year)	$3.6 million
Payback period	<1 year
Project ranking	1
Classification of priority project	Improve transfer capability
Reasons to undertake the project	Based on multiple renewable energy developers' activities, it is expected that the Mid North and Riverland transmission zones in South Australia are going to host large capacities of renewable plants. Publicly announced projects totalling around 7,500 MW wind and solar generation and 2,500MW / 4,150 MWh of energy storage are recorded. The Robertstown to Tungkillo lines will be an important link to transmit power from the Riverland and Mid-North region to the Adelaide Metropolitan area. Transmission capacity of this corridor can be increased by 104 MVA by operating these lines at T120 rating which will require uplifting conductors on 15 spans and uprating protection settings in the terminal substations thereby releasing network capacity and delivering market benefits through improved access to low cost generation.

[7] IASR workbook version 1.5 30 July 2020

4.2 Davenport to Cultana Line Uprating

This project will uprate the network from Davenport to Cultana by removing the plant limits to reach the design capability. This will improve the output of renewable energy generation in the Eyre Peninsula and result in lower wholesale prices for customers.

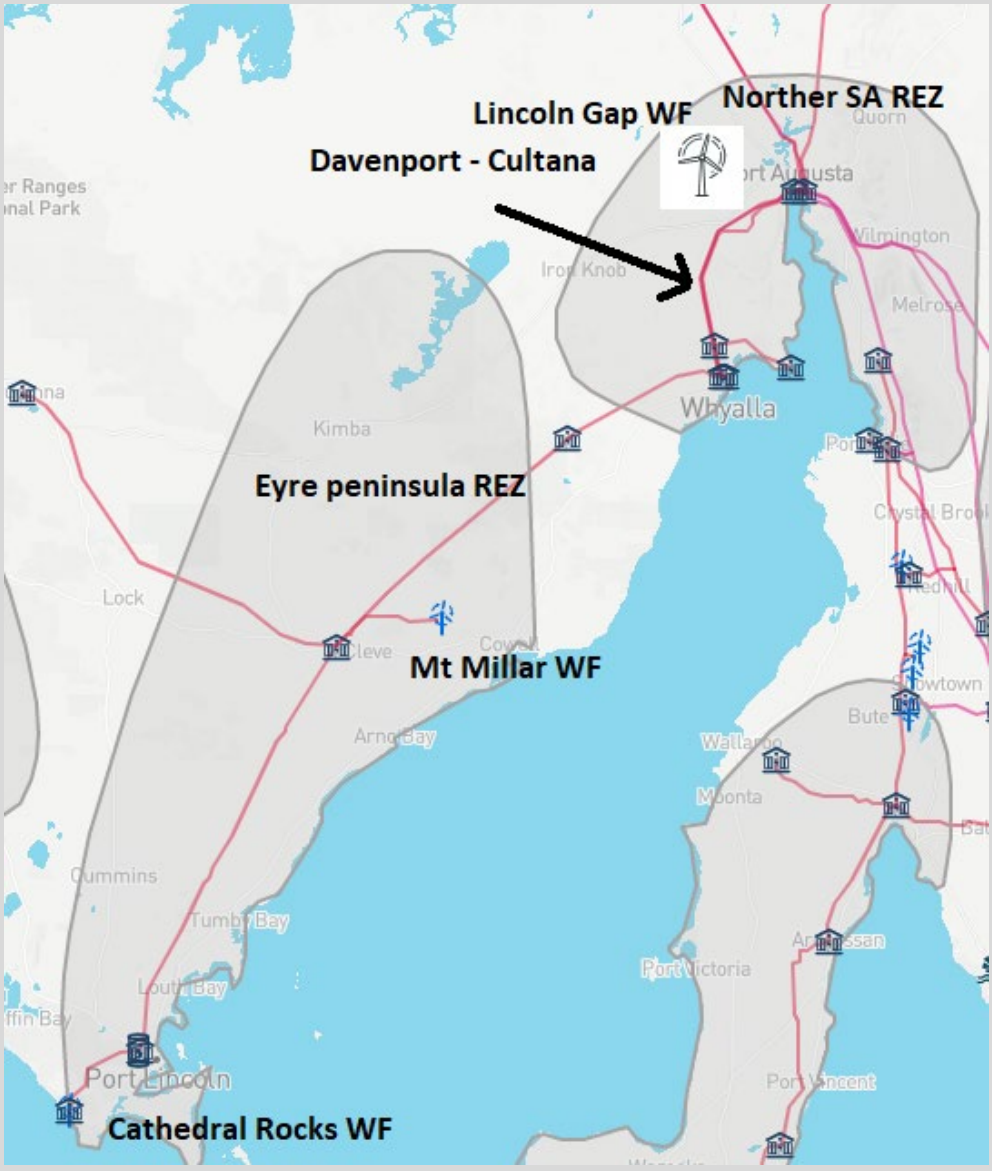
Project name/ID	EC.15171 - Davenport to Cultana Line Uprating
Transmission Circuit/Injection Point	F1965 Davenport - Corraberra Hill 275 kV F1935 Corraberra Hill - Cultana 275 kV F1936 Davenport - Cultana No2 275 kV
Basis and cause for the limit in the identified transmission circuit and injection point	The limit arises from constraints which prevent the overload of one Davenport – Cultana line upon the trip of the other circuit.
Project Description	Plant that is rated lower than the design capability of the transmission lines will be removed and replaced to release further transfer capacity. On F1936 Davenport-Cultana No 2 275 kV line, a number of span(s) will be lifted to achieve higher clearances allowing an increase in the maximum operating temp to T100 from T80. Remove plant limits at Davenport, Cultana and Corraberra Hill substations.
Current value of the limit	Transmission Circuit / Summer Rating (MVA) / Winter Rating (MVA) F1935 Corraberra Hill - Cultana 275 kV: 457 / 457 F1936 Davenport - Cultana No2 275 kV: 457 / 457 F1965 Davenport - Corraberra Hill 275 kV: 457 / 457
Improvement target in the limit	Transmission Circuit / Summer Rating (MVA) / Winter Rating (MVA) F1935 Corraberra Hill - Cultana 275 kV: 597 / 677 F1936 Davenport - Cultana No2 275 kV: 597 / 677 F1965 Davenport - Corraberra Hill 275 kV: 597 / 677
Material benefit	The value of congestion has been estimated at $110 /MWh, which is an indicative estimate of substituting thermal gas generation[8] for renewable generation[9] in South Australia. Modelling results from ElectraNet's economic network models[10] have showed that future congestion across this flow path will rise to 102.9 hours per annum (or around 1 per cent of the year) over the course of the next regulatory period. Annual benefits have been estimated as: *Duration (Hours) * Value ($/MWh) * [Target (MW) * Utilisation (%)]* *= 102.9 * 110 * 140 * 0.5 = $0.79 million per annum.* The expected pay-back period is 2 years.

8 Gas generation is assumed to be 50% from Pelican Point and 50% from Torrens Island B from AEMO's 2022 IASR.

9 Renewable source is assumed to be 50% from solar and 50% from wind from AEMO's 2022 IASR.

10 ElectraNet's internal market model using Step Change scenario from AEMO's Input and Assumptions Scenario Report (IASR) workbook version 1.5

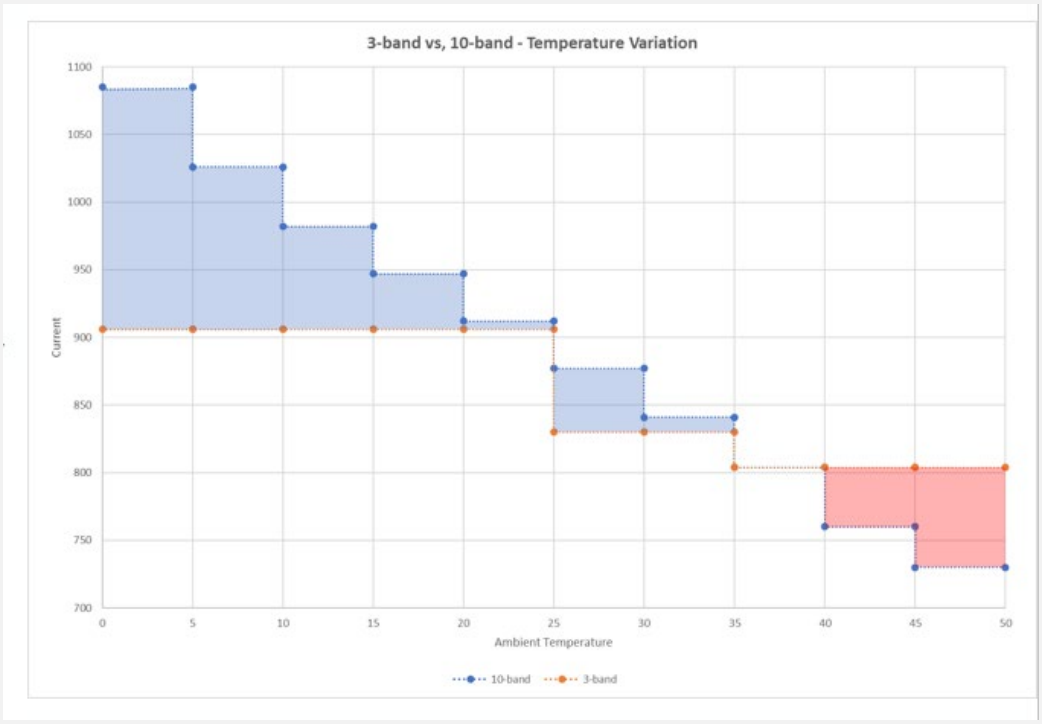
Project name/ID	EC.15171 - Davenport to Cultana Line Uprating
Planned Completion Date	2024-2025
Capital Cost ($ nominal)	$1.53 million
Operating Cost	0
Market benefit (per year)	$0.79 million
Payback period	2 years
Project ranking	2
Classification of priority project	Improve transfer capability

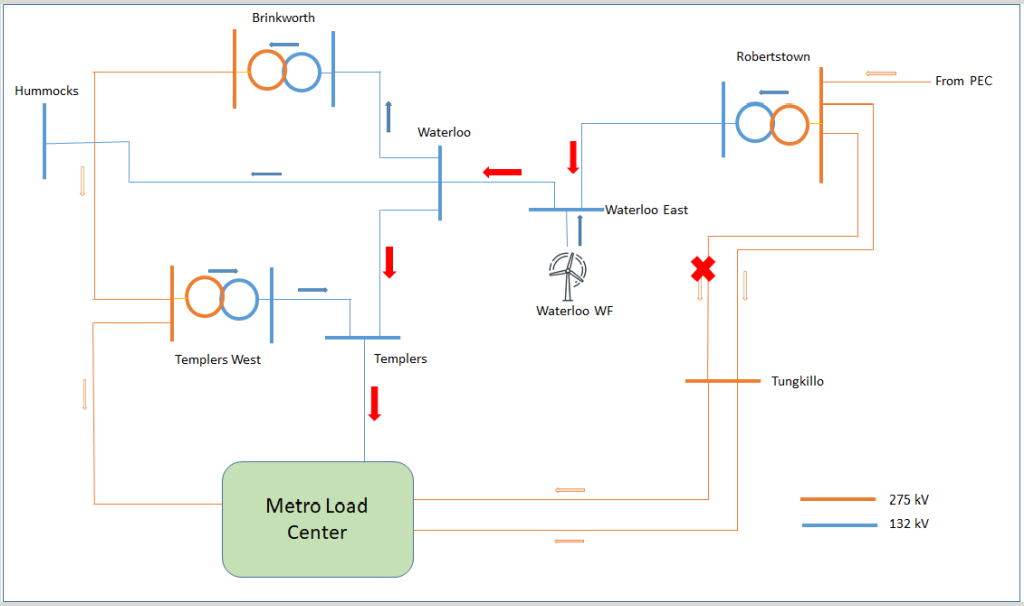
Project name/ID	EC.15171 - Davenport to Cultana Line Uprating
Reasons to undertake the project	Due to strong rooftop PV development in the Eyre Peninsula, load south of Cultana drops to zero or negative during daylight hours. Generation from Lincoln Gap (212 MW), Mount Millar (70 MW) and Cathedral Rocks (66 MW) wind farms flows from the Eyre Peninsula to Davenport and is limited by the Cultana – Davenport path during high PV periods (Figure 3). Congestion is also forecast to increase with additional distributed and grid scale generation in the Eastern Eyre Peninsula REZ zone. Recently, the Eastern Eyre REZ is attracting considerable attention as a potential Hydrogen hub centred on around Whyalla. The proposed uprating will therefore deliver material market benefits by reducing network constraints and improving access to low cost generation at times of increased generation output on Eyre Peninsula. Figure 3 Davenport - Cultana congestion from renewable generators 

4.3 Transmission Line Ratings Improvement

This project will improve the rating of all lines across the network by applying a 10-band rating system. This will reduce congestion in the network, especially in the mid-north region where there are abundant renewable energy resources. Eventually, this project is expected to reduce the wholesale price for customers.

Project name/ID	EC.15571 - Transmission Line Ratings improvement
Transmission Circuit/Injection Point	All transmission lines across the South Australian transmission network.
Basis and cause for the limit in the identified transmission circuit and injection point	Currently the South Australian transmission network is operated on a 3-temperature band static rating system, with a fixed pre-defined rating for each temperature band. This results in conservative application of ratings for a significant percentage of time that can cause limitations for access to the network especially by renewable generators. With further penetration of renewables in the system, congestion due to such limitations is expected to grow over time.

Project name/ID	EC.15571 - Transmission Line Ratings improvement
Project Description	Under favourable weather conditions, higher ratings can be applied to transmission lines. ElectraNet has developed a strategy to apply a 10-band rating, which is expected to provide increased ratings most of the time, with a small downside risk of lower rating than currently applied occasionally when the temperature is extremely high. This strategy is currently undergoing testing in a pilot project. Should this pilot demonstrate that the strategy is achievable, this project will apply the ratings across the transmission network. The comparison of a 3-band rating with the possible 10 band rating for 5 degree temperature steps is shown in Figure 4. **Figure 4 Three vs possible ten band rating comparison at different temperatures**  The project requires the following to implement the new rating strategy: • Tools and Systems development • Integration of temperature-based line rating tool • Development of tension rating tool to verify temperature-based ratings • Development of micro-climate model • Calculation of risk adjusted 10-band ratings • Risk assessment and system verification • Integration with the Energy Management System (EMS)
Current value of the limit	Existing 3-band static rating
Improvement target in the limit	10-band static rating (historical analysis has indicated this would improve ratings by around 10% on average when constraints bind)

Project name/ID	EC.15571 - Transmission Line Ratings improvement
Material benefit	With the development of renewable energy projects in the Mid-North region and commissioning of PEC (from 2024), there will be increasing flows from the mid north (Robertstown) to Adelaide load centre. A trip in the 275 kV network (Robertstown-Para 275kV or one of the Robertstown 275/132kV transformers) will divert more flows to the 132 kV path from Robertstown to Templers. This can curtail the generation from Waterloo wind farm, other 132 kV and 275 kV connected generators around the mid-north, anticipated renewables in mid north region and/or imports from NSW. This may happen under peak demand in South Australia. Increasing the limit on this corridor (Robertstown – Waterloo – Templers 132 kV) will reduce congestion through this corridor increasing renewable energy dispatch. Congestion on this corridor was experienced for 195 hours [11] in financial year 2020 and is expected to increase substantially after PEC and commissioning of new renewable energy projects in the Mid-North. **Figure 5 Congestion in the 132 kV Mid-North network under 275 kV outage conditions**  Benefits are calculated based on the expected rating improvement and hours of congestion on the 132-kV mid-north using ElectraNet's NEM market model[12]. Financial year 2020 is used as the reference year for all weather-related data (demand, renewable energy traces, line rating traces etc.). The benefit in a particular congested hour t is calculated as: $Benefit\ (t) = \sum SRMC(t) \times \{Improved\ Limit(t) - Existing\ Limit\ (t)\ \} \times Utilisation\ factor;$ with: • SRMC(t): Marginal cost of dispatch at time t • Improved Limit(t): Improved line rating using variable line rating at time t

[11] ElectraNet Transmission Annual Planning Report 2020, links: https://www.electranet.com.au/wp-content/uploads/2020/11/2020-ENet-TAPR.pdf

[12] ElectraNeT's internal market model using Step Change scenario from AEMO's Input and Assumptions Scenario Report (IASR) workbook version 1.5

<table>
<tr><td>Project name/ID</td><td>EC.15571 - Transmission Line Ratings improvement</td></tr>
<tr><td></td><td>

Existing Limit (t): Existing line rating limit with 3-band rating
Utilisation factor reflects how the much of the additional capability would be required = 0.5

Over the planning horizon (2024-2044), this project alleviates $1.25 million per year of generation congestion on average. The below table summarizes the yearly average values for the Mid-North region of South Australia where congestion is forecast at 2,187 hours.

Table 3 Average value of network congestion in the Mid North
<table>
<tr><th>Parameter</th><th>Average Value</th></tr>
<tr><td>SRMC ($/MWh)</td><td>28</td></tr>
<tr><td>Existing rating (MW)</td><td>166</td></tr>
<tr><td>New Rating (MW)</td><td>186</td></tr>
<tr><td>Forecast congestion (hrs)</td><td>2,187</td></tr>
<tr><td>Annual value ($m)</td><td>1.2</td></tr>
</table>
</td></tr>
<tr><td>Planned Completion Date</td><td>2024-25</td></tr>
<tr><td>Capital Cost ($ nominal)</td><td>$1.80 million</td></tr>
<tr><td>Operating Cost</td><td>$4.15 million</td></tr>
<tr><td>Market benefit (per year)</td><td>$1.25 million</td></tr>
<tr><td>Payback period</td><td>5</td></tr>
<tr><td>Project ranking</td><td>3</td></tr>
<tr><td>Classification of priority project</td><td>Improve transfer capability</td></tr>
<tr><td>Reasons to undertake the project</td><td>The use of a 10-band rating will provide higher thermal ratings compared to the current 3-band rating which will deliver market benefits for customers by releasing additional network capacity and improving access to low cost generation in South Australia, as described above.</td></tr>
</table>

4.4 Increase Murraylink transfer capability

This project improves the transfer capability between SA and VIC on the Murraylink. This will increase the import and export of low-cost renewable energy across the Murraylink and benefit consumers from both states.

Project name/ID	EC.15175 - Increase Murraylink transfer capability
Transmission Circuit/Injection Point	Monash 132 kV Substation/ North West Bend 132 kV Substation
Basis and cause for the limit in the identified transmission circuit and injection point	The export limit of Murraylink is currently capped at around 100 – 170 MW subject to availability of the existing capacitor bank on the Riverland 132 kV network and combined instantaneous load levels at the Berri, North West Bend, Morgan-Whyalla Pump 1, Morgan-Whyalla Pump 2 and Morgan-Whyalla Pump 3 connection points.
Project Description	An additional 15 MVAr capacitor bank will be added to the Riverland 132 kV network (Monash substation or North West Bend) including an automated capacitor switching control system installed to manage voltage and reactive power support. The project will also upgrade the existing runback control scheme to include bi-directionality and allow it to run forward if required.
Current value of the limit	Muraylink Export Limit Equations (SA to VIC): SVML^NIL_MH-CAP_ON
Improvement target in the limit	Muraylink Export Limit Equations (SA to VIC): SVML^NIL_MH-CAP_ON + 15 MW
Material benefit	The benefits of this project have been estimated based on modelling results from ElectraNet's market model using AEMO's Input and Assumptions Scenario Report (IARS). [13] The results forecast that "SVML^NIL_MH-CAP_ON" constraint will bind for an average of 1,118 hours per year on current export limits. An additional 15 MVAr of reactive capacity at the Monash 132 kV substation or North West Bend along with a capacitor control scheme upgrade will increase reactive power support in Riverland region and is expected to increase the current Murraylink export limit by 15 MW. This additional export capacity in Murraylink will support the replacement of gas generation in VIC with cheaper wind and solar generation from SA which would be otherwise curtailed. Therefore, the annual benefit will be the difference between the short-run marginal cost (SRMC) of the technologies across the border as shown in following equation: *Fuel saving benefit = (Improved Target Limit)x(Gas Generation Cost – RE generation cost)x(Forecast binding hour)x(Utilization Factor)* *= 15x(109.60)x(1,118)x(0.5)=$919,558* The expected annual benefit is $0.9 m. The estimated payback period is 5 years.
Planned Completion Date	2025-26

[13] ISAR workbook version 1.5

Project name/ID	EC.15175 - Increase Murraylink transfer capability
Capital Cost ($ nominal)	$5.02 million
Operating Cost	$0
Market benefit (per year)	$919,558
Payback period	5 years
Project ranking	4
Classification of priority project	Improve transfer capability
Reasons to undertake the project	The present thermal rating of the double circuit lines between Robertstown and Monash (325/335/360 MVA for Summer/Spring/Winter) along with the Murraylink runback scheme is adequate to support 250 MW export to VIC and supply Riverland loads without any contingency. However, the export capacity of Murraylink is limited by voltage stability issues[14] in the Riverland radial network. The Murraylink export limit from SA to VIC is influenced by the reactive power injection capability of Monash substation. To maintain voltage stability, the export capacity of Murraylink is limited to between 100 MW and 170 MW depending on the combined load at Berri, North West Bend, Morgan-Whyalla Pump 1, Morgan-Whyalla Pump 2 and Morgan-Whyalla Pump 3 connection points referred to as Riverland Load. Additional reactive power support from Monash or North West Bend substation will reduce this constraint. With the addition of a 15 MVAr capacitor bank on the Riverland 132 kV network potential exports across Murraylink corridor will increase. The additional export capacity in Murraylink will allow the export of additional renewable generation from SA to VIC delivering market benefits to customers through improved access to low cost generation.

[14] AEMO Market Notice ID 82115. Available: https://www.aemo.com.au/market-notices?marketNoticeQuery=&fromdate=&todate=&marketNoticeFacets=CONSTRAINTS

5. Projects considered but not proposed

Several further potential projects were considered but are not proposed to form part of the Plan at this time as these were not found to deliver sufficient network capability improvement benefits as outlined below.

As further information becomes available, we will propose any additions or changes to the Plan to ensure that it delivers maximum benefit for electricity customers.

Project Name	Project Description	Commentary
Kanmantoo Outage Management	Install an additional 132/33/11 kV transformer at Kanmantoo substation to improve service continuity during maintenance	A review of the frequency and expected duration of outages and asset condition indicate that contracting temporary generator remains the most efficient solution for outage managements.
Alleviate Mid North Voltage Instability	Install 1x275 kV circuit breaker and all associated equipment on the Robertstown exit at Canowie as per the ultimate layout for the site	This limitation has almost entirely been rectified with the enhance voltage management in the mid-north with the system strength remediation program. Any additional works to alleviate the remaining limitations to not result in a 'material benefit' under current forecasts.
Increase Murraylink transfer capability 2	Install another 15 MVAr capacitor bank at either North West Bend or Monash following EC.15175 to further increase Murraylink flows	Additional works to alleviate forecast congestion on Murraylink do not result in a material benefit under current forecasts.
Uprate East circuit to 100 degrees maximum operating temperature		Following uprating to T80 in project EC.11441 - Para-Brinkworth-Davenport Hazard Mitigation no further uprating can occur.
Uprate West circuit to 100 degrees maximum operating temperature		Investigation indicates more than 400 spans would need to be addressed to uprate the circuit. This is unlikely to be achieved with capital costs below $6m.
Eastern hill control scheme		Historical data and forecast modelling do not show sufficient binding hours to deliver a material benefit under current forecasts.
PV system on warehouse		Does not result in an increase in transmission capability
Dynamic Stability and Virtual Network Inertia		Project unlikely to satisfy STPIS 5.2 (d)

Project Name	Project Description	Commentary
Snow Town to Bungama 132 kV control scheme	This project reduces the binding hours on constraints S>NIL_HUWT_STBG by implementing a control scheme on Snow Town WF. Upon the loss of Hummocks - Waterloo line, Snow Town WF will be tripped to prevent overload of Snowtown - Bungama line.	Forecast congestion is insufficient (17.5hr) to deliver a material benefit under current forecasts.
Control scheme – ESCRI-SA BESS: Extend the scope of island operation	Install a control scheme to include the Ardrossan West load in the islanded operation of the ESCRI-SA BESS during an outage of the Hummocks-Ardrossan West 132 kV line	Forecast congestion is insufficient to meet a material benefit under current forecasts.
Control scheme – ESCRI-SA BESS: Integrate rooftop solar PV	Install a control scheme to curtail solar PV generation and extend the capability of the ESCRI-SA BESS to provide islanded supply during outage conditions and at times of negative demand caused by high solar PV generation and low native demand.	Forecast congestion is insufficient to meet a material benefit under current forecasts.

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