Eyre Peninsula Electricity Supply Options

RIT-T Project Specification Consultation Report

28 April 2017

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Executive Summary

Reliable electricity supply is of the utmost importance to the Eyre Peninsula

ElectraNet understands the importance of a reliable electricity transmission supply to the regional areas of South Australia such as the Eyre Peninsula, and the contribution it makes to the ongoing economic development of the wider South Australian economy.

The Eyre Peninsula is served by a radial 132 kV transmission line which runs from Cultana to Yadnarie to Port Lincoln (refer to Figure 1). A radial 132 kV line also extends from Yadnarie to Wudinna to supply the West Coast. The original line to Port Lincoln was established in 1967. We have in recent years been rebuilding and reinforcing the Cultana and Whyalla substations.

Supply to Port Lincoln is supported by a network support arrangement which enables ElectraNet to call upon the services of three diesel fired gas turbines connected at Port Lincoln when needed. This arrangement expires in December 2018. The South Australian Electricity Transmission Code[1] (ETC) reliability standards require that ElectraNet provide non-continuous "N-1" equivalent line capacity to the Port Lincoln exit point, so that back-up supply is available for Port Lincoln when supply from the 132 kV line is interrupted.

ElectraNet has been actively exploring options to improve the reliability of supply to Port Lincoln, including options to replace or upgrade the transmission lines serving the lower Eyre Peninsula. Our most recent assessment of the line condition indicates that components of the line are nearing the end of their functional life and will require replacement in the next few years.

To enable this work, we have included in our 2018-19 to 2022-23 revenue proposal to the Australian Energy Regulator (AER) an allowance for the replacement of major transmission line components on the Eyre Peninsula[2].

Alternatively, the full replacement of the line (for example as a double circuit line) may be more cost effective and deliver greater benefits to Eyre Peninsula customers through potentially improving supply reliability and capturing other market benefits. To take this forward, we are undertaking the Regulatory Investment Test for Transmission (RIT-T), which will assess the costs and benefits of alternative network and non-network solutions.

This Project Specification Consultation Report (PSCR) represents the formal commencement of the RIT-T process to investigate electricity supply options for the Eyre Peninsula.

We will continue to actively monitor and maintain the condition of transmission lines on the Eyre Peninsula through our ongoing maintenance program, to ensure the safety, security and reliability of supply to the Eyre Peninsula.

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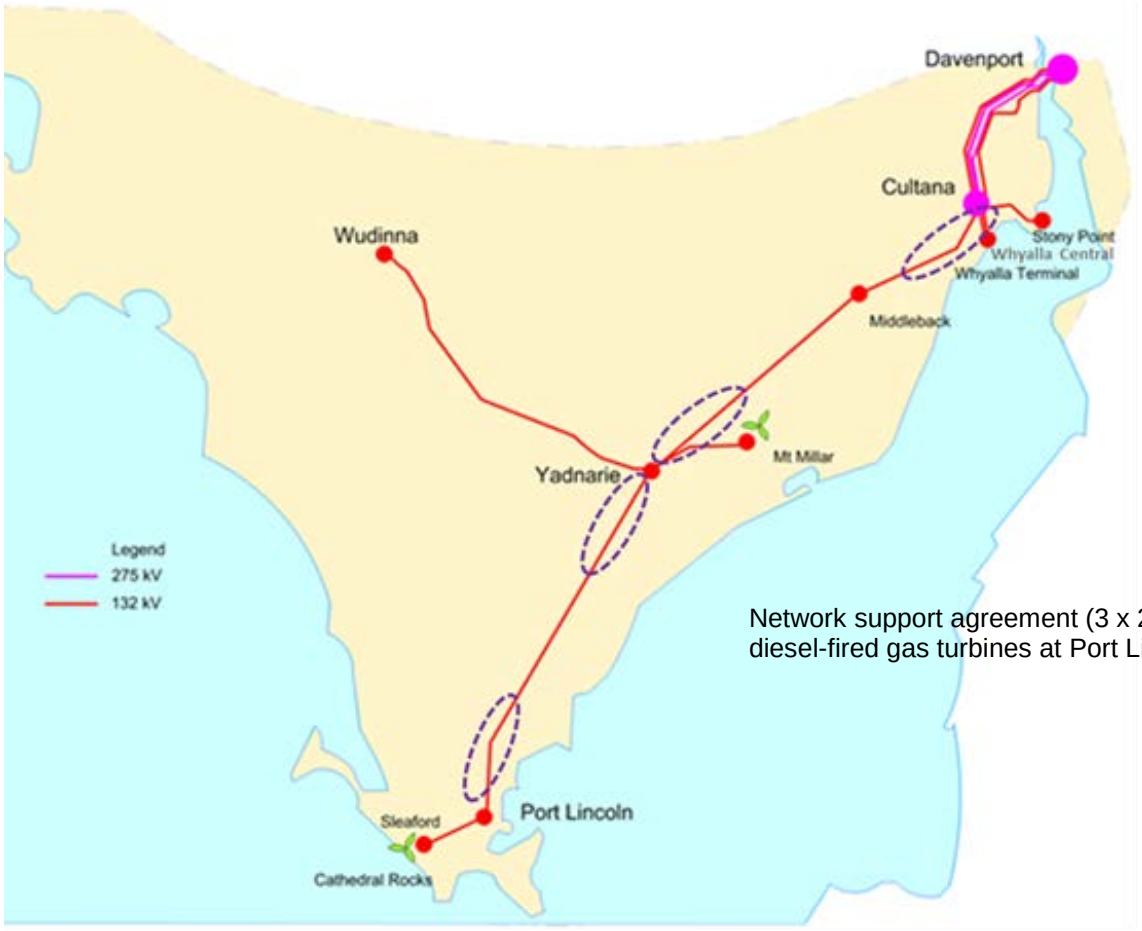
1 Issue TC08 currently in force, issue TC/09 applicable on and from 1 July 2018. Both issues available from www.escosa.sa.gov.au/industry/electricity/codes-guidelines/codes.

2 ElectraNet submitted a revenue proposal to the AER on 28 March 2017 for the 5-year regulatory period from 1 July 2018 to 30 June 2023. The proposal capital expenditure forecast includes approximately $80m for replacing the line conductor in high priority sections of the Eyre Peninsula 132 kV lines.

Figure 1 Existing electricity transmission supply to the Eyre Peninsula



About 120 km of line conductor needs to be replaced in the 2019 to 2023 regulatory period

The required replacement works on the existing transmission line and upcoming expiry of the existing network support contract provide a valuable opportunity to investigate alternative supply options

The identified need for this RIT-T is to explore electricity supply options for meeting Electricity Transmission Code (ETC) reliability standards at Port Lincoln most efficiently in the future – driven by the need to replace major transmission line components serving the lower Eyre Peninsula in the next few years, and the upcoming expiry of the network support arrangement at Port Lincoln.

We note that, following on from recent supply interruptions, the South Australian government has asked the Essential Services Commission of South Australia (ESCOSA) to investigate how electricity companies can improve power reliability and quality on the Eyre Peninsula.

While the focus of the ESCOSA review is to investigate and make recommendations on what measures can be taken to incentivise ElectraNet and SA Power Networks to upgrade current infrastructure and reconnect supply quicker after damaging storm events, the review will also look at the ETC reliability standards.

There is, therefore, the possibility that the ETC reliability standards applying to the Eyre Peninsula may change following the ESCOSAs review. Any change to the reliability standards will be taken into account in the RIT-T process and how this is done will be highlighted in the Project Assessment Draft Report (PADR) to be published in the second half of 2017.[3]

There are also significant renewable energy and mining resource opportunities on the Eyre Peninsula

The Eyre Peninsula is widely renowned as having the best wind resources in Australia. There are currently two wind farms located on the Eyre Peninsula – namely the:

- 70 MW Mount Millar wind farm; and
- 66 MW Cathedral Rocks wind farm.

While there is significant potential for renewable energy developments on the Eyre Peninsula,[4] the limited capacity of the existing transmission infrastructure acts as a constraint on the amount of additional generation that can be accommodated, limiting the incentive for new wind generation developments on the Eyre Peninsula.

Further, the two existing wind farms are at times constrained due to limitations on the lines – this, for example, occurred for up to 24 per cent of the time in 2016 and up to 15 per cent of the time in 2015.[5] While ElectraNet has had a number of enquiries from wind farm developers, no new wind farms have been commissioned on the Eyre Peninsula since 2006.

The Eyre Peninsula region also has significant mineral resources and exploration potential, including the Gawler Craton and the Eucla Basin. Over the coming decades mining investment and outputs are expected to grow substantially and this region is widely recognised as an important new frontier for mineral development in Australia.[6] The Eyre Peninsula electricity network currently has limited capacity to accommodate significant additional demand without augmentation.

Investment in the Eyre Peninsula transmission network therefore also brings the potential for significant market benefits from relieving constraints on existing Eyre Peninsula wind farms as well as facilitating additional wind generation on the Eyre Peninsula (as opposed to other, lower-quality, regions in the NEM) and the connection of new mining load. These market benefits will be taken into account in the RIT-T assessment.

Options for delivering reliable supply into the future have been identified

At this stage, we have identified five credible options to consider, as summarised in Table 1.

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3 We will keep interested parties informed of any material changes impacting on the RIT-T process via our website

4 South Australian Department of Planning, Transport and Infrastructure, *Eyre and Western Region Plan*, June 2011, p.71.

5 Note that as the wind farms are unscheduled, the constraints are implemented by means of an ElectraNet-owned Generation Dispatch Limiter, rather than by central AEMO dispatch.

6 Ibid, p. 37.

Table 1 Summary of potential credible options

Option	Overview of option(s)	Indicative capital cost ($ million, nominal)
Option 1 – Continue network support arrangement at Port Lincoln and component replacement works on the existing 132 kV single-circuit transmission line	132 kV line replacement works combined with a network support contract	80*
Option 2 – Double circuit 132 kV line†	Construction of a new double circuit 132 kV transmission line following a Cultana to Yadnarie and Yadnarie to Port Lincoln route^	200-300
Option 3 – two single circuit 132 kV lines†	Construction of two single circuit 132 kV transmission lines following separated routes between Cultana and Port Lincoln	200-350
Option 4 – double circuit 275 kV line†,#	Construction of a double circuit 275 kV transmission line following a Cultana to Yadnarie and Yadnarie to Port Lincoln route^	280-380
Option 5 – two single circuit 275 kV lines†,#	Construction of two single circuit 275 kV transmission lines following separated routes between Cultana and Port Lincoln	400-550

***** This option would also have significant operating costs for ongoing network support at Port Lincoln

^ For these options, we will investigate the potential benefits of additional emergency restoration measures, that may include network support, as well as the possibility of building the double circuit lines to a higher than normal wind loading design level

† For these options, we will also consider the potential benefits of upgrading the Davenport to Cultana 275 kV transmission lines to further improve supply reliability and security to the Eyre Peninsula

\# To be operated initially at 132 kV

ElectraNet encourages responses from non-network proponents

Non-network option providers could participate in meeting the required service requirements from January 2019 by providing network support consistent with the Port Lincoln ETC (issue TC/09) Category 3 reliability standard. In particular, this would require restoring at least “N” equivalent line capacity within 1 hour of the commencement of an interruption arising from the failure of the installed transmission lines, the installed transformers or the network support arrangements.

These network support services are to be provided until the failure is resolved and while ElectraNet and/or SA Power Networks use their best endeavours to restore line capacity as soon as practicable.

ElectraNet encourages proponents of non-network solutions to respond to this PSCR with the costs and operating profiles associated with meeting the ETC reliability standards or better.

This PSCR includes the indicative amount of power required to be supplied by non-network solutions at Port Lincoln.

Next steps

ElectraNet welcomes written submissions on the information contained in this PSCR. Submissions are due on or before 21 July 2017. Submissions are sought on the credible options presented and the potential for non-network options.

Submissions should be marked “Eyre Peninsula Electricity Supply Options PSCR feedback” and emailed to consultation@electranet.com.au

Submissions will be published on the ElectraNet website. If you do not want your submission to be made publicly available, please clearly specify this at the time of lodging your submission.

A PADR, including full options analysis, is expected to be published by the end of October 2017.

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Glossary of Terms

Term	Description
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ESCOSA	Essential Services Commission of South Australia
ETC	Electricity Transmission Code (issue TC/08 currently in force, issue TC/09 applicable on and from 1 July 2018)
NPV	Net Present Value
NER	National Electricity Rules
PACR	Project Assessment Conclusions Report
PADR	Project Assessment Draft Report
PSCR	Project Specification Consultation Report
RET	Renewable Energy Target
RIT-T	Regulatory Investment Test for Transmission
NER, Rules	National Electricity Rules
TNSP	Transmission Network Service Provider
USE	Unserved Energy
VCR	Value of Customer Reliability

1. Introduction

ElectraNet understands the importance of a reliable electricity transmission supply to the regional areas of South Australia such as the Eyre Peninsula, and the contribution it makes to the ongoing economic development of the wider South Australian economy.

The Eyre Peninsula is served by a radial 132 kV transmission line which runs from Cultana to Yadnarie to Port Lincoln. A radial 132 kV line also extends from Yadnarie to Wudinna to supply the West Coast. The original line to Port Lincoln was established in 1967. We have in recent years been rebuilding and reinforcing the Cultana and Whyalla substations.

Supply to Port Lincoln is supported by a network support agreement which enables ElectraNet to call upon the services of three diesel fired gas turbines connected at Port Lincoln when needed. This arrangement expires in December 2018. The South Australian Electricity Transmission Code[7] (ETC) reliability standards require that ElectraNet provide non-continuous "N-1" equivalent line capacity to the Port Lincoln exit point, so that back-up supply is available for Port Lincoln when supply from the 132 kV line is interrupted.

ElectraNet has been actively exploring options to replace or upgrade the transmission lines serving the Eyre Peninsula. Our most recent assessment of the line condition indicates that components of the line are nearing the end of their functional life and will require replacement in the next few years.

To enable this work, we have included in our 2018-19 to 2022-23 revenue proposal to the AER an allowance for the replacement of major transmission line components on the Eyre Peninsula.

Alternatively, the full replacement of the line (for example as a double circuit line) may be more cost effective and deliver greater benefits to Eyre Peninsula customers through potentially improving supply reliability and capturing other market benefits.

To take this forward, we are undertaking the Regulatory Investment Test for Transmission (RIT-T), which will assess the costs and benefits of alternative network and non-network solutions. This Project Specification Consultation Report (PSCR) represents the formal commencement of the RIT-T process to investigate electricity supply options for the Eyre Peninsula.

We will continue to actively monitor and maintain the condition of transmission lines on the Eyre Peninsula through our ongoing maintenance program, to ensure the safety, security and reliability of supply to the Eyre Peninsula.

[7] Issue TC/08 currently in force, TC/09 applicable on and from 1 July 2018. Both issues available from www.escosa.sa.gov.au/industry/electricity/codes-guidelines/codes.

1.1 Update since the 2012-13 Eyre Peninsula Reinforcement RIT-T

In 2012, ElectraNet commenced a RIT-T looking at options to reinforce the existing 132 kV transmission network on the Eyre Peninsula.[8] In particular, that previous RIT-T focused on the projected capacity limitation of the transmission network in the light of proposed load increases from mining interests within the region. A PSCR was published in February 2012, and a Project Assessment Draft Report (PADR) was published in January 2013.

The RIT-T assessment undertaken for the 2013 PADR highlighted that the preferred option for investment on the Eyre Peninsula was at that time, heavily dependent on whether substantial new loads connect in the area or not. ElectraNet considered that there was significant uncertainty at the time in relation to the connection of such additional load, with none of the then current connection applications having reached committed status.

ElectraNet noted at the time that the network was expected to meet reliability criteria until 2018 and, as a consequence, there was no immediate pressure from a reliability perspective to finalise the RIT-T analysis. In light of the uncertainty in relation to new load developments, ElectraNet considered it prudent to delay the finalisation of the previous RIT-T process and the publication of the PACR until anticipated new load developments become committed or reliability constraints needed to be addressed.

This PSCR focuses on investigating the most cost effective Eyre Peninsula electricity supply options post 2018.

1.2 Role of this report

This PSCR represents the first step in the application of the Regulatory Investment Test for Transmission (RIT-T) to network and non-network options for ensuring reliable electricity supply to the Eyre Peninsula post 2018.

The purpose of this first step is to:

1. set out the reasons why ElectraNet proposes that action be undertaken (that is, the 'identified need');

2. present a number of options that ElectraNet currently considers address the identified need, including various network options and non-network alternatives; and

3. provide details as to what non-network solutions would need to provide in order to address the identified need, and invite submissions from proponents of potential non-network options to be included in the RIT-T assessment;

4. allow interested parties to make submissions and provide input to the RIT-T assessment.

[8] All RIT-T documentation for this previous RIT-T is available at: https://www.electranet.com.au/projects/eyre-peninsula-reinforcement-project/

The next stage of this RIT-T is the quantitative assessment of the net benefit to the NEM associated with different investment options, and the publication of a PADR for stakeholder comment.

The entire RIT-T process is detailed in Appendix C. The next steps for this particular RIT-T assessment are discussed further below.

1.3 Requirement to apply the RIT-T

ElectraNet is applying the RIT-T to this investment, as none of the exemptions listed in National Electricity Rules (NER) clause 5.16.3(a) apply.

1.4 Submissions and next steps

ElectraNet welcomes written submissions on material contained in this PSCR. Submissions are due on or before 21 July 2017. Submissions are sought on the credible options presented and the potential for non-network options.

Submissions should be marked “Eyre Peninsula Electricity Supply Options PSCR feedback” and emailed to consultation@electranet.com.au

Submissions will be published on the ElectraNet website. If you do not want your submission to be made publicly available, please clearly specify this at the time of lodging your submission.

A PADR, including full options analysis, is expected to be published by the end of October 2017.

Further details in relation to this project can be obtained from:

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2. An overview of the Eyre Peninsula

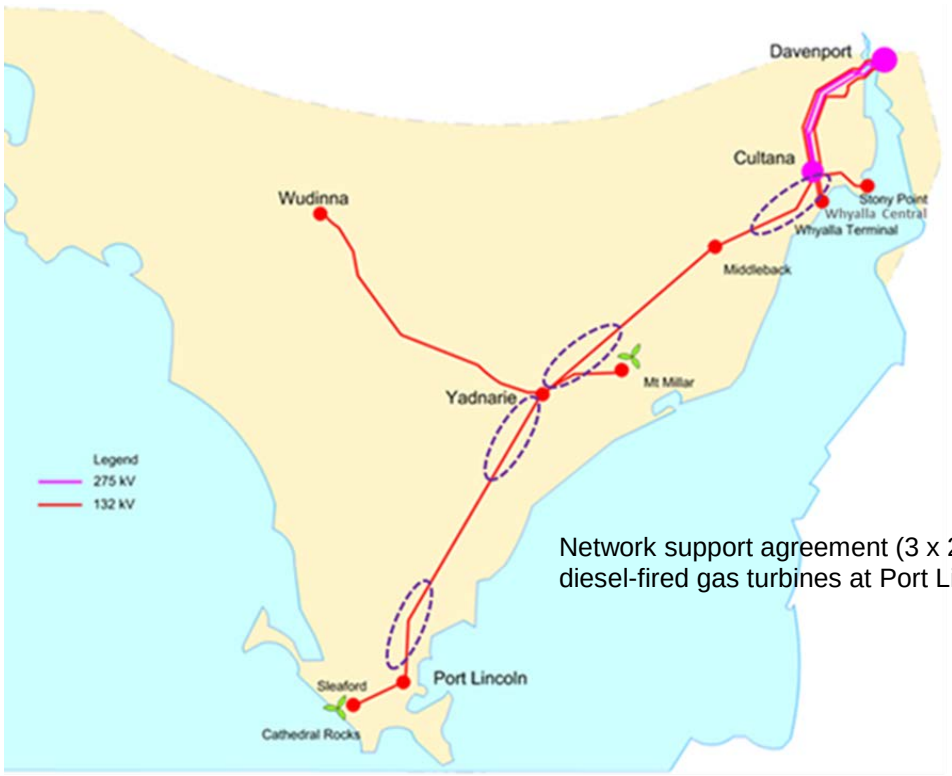
This section provides an overview of the existing electricity supply arrangements, as well as the significant renewable energy and mining opportunities, for the Eyre Peninsula.

2.1 Existing supply a mix of transmission network and network support

The existing electricity transmission network infrastructure on the Eyre Peninsula is represented in Figure 2. It consists of a double circuit 275 kV line from Davenport to Cultana and two single circuit 132 kV lines from Cultana to Whyalla Central 132 kV substation. In addition, radial 132 kV circuits lead from Cultana to Stony Point, and from Cultana to Yadnarie and then to Port Lincoln 132 kV substations. A further 132 kV radial line runs west from Yadnarie to Wudinna 132 kV substation.

Supply to Port Lincoln is supplemented by a network support agreement that allows ElectraNet to call upon the services of three diesel fired gas turbines generators located at Port Lincoln when needed. This contract was entered into to ensure that ElectraNet complies with the South Australian Electricity Transmission Code (ETC) reliability standard for Port Lincoln in the most cost effective way. These reliability standards, the network support contract and the implications for this RIT-T are discussed further in section 3.

Figure 2 Existing electricity transmission supply to the Eyre Peninsula



About 120 km of line conductor needs to be replaced in the 2019 to 2023 regulatory period

The original supply from Whyalla to Port Lincoln was established in 1967 by the Electricity Trust of South Australia. Our recent assessment of the line condition indicates that components of the line are nearing the end of their functional life and will require replacement in the 2018-19 to 2022-23 regulatory control period.

Between 2013 and 2017, ElectraNet has been acquiring new easements suitable for a double-circuit 275 kV line from Cultana to Port Lincoln, to future-proof against land use risks and unavailability that may affect both the timing and the cost of future easement acquisition. These factors could impact optimal construction and commissioning dates of any future transmission reinforcement.

2.2 Significant renewable energy resources and mining opportunities

The Eyre Peninsula is widely renowned as having the best wind resources in Australia. There are currently two wind farms located on the Eyre Peninsula – namely:

- The 70 MW Mount Millar wind farm, located mid-way down the peninsula; and
- The 66 MW Cathedral Rocks wind farm near Sleaford.

While there is the potential for thousands of MW of renewable energy generation on the Eyre Peninsula,[9] the limited capacity of the existing transmission infrastructure acts as a constraint on the amount of generation that can be accommodated, limiting the incentive for new wind generation developments on the Eyre Peninsula.

Further, the two existing wind farms are at times constrained due to limitations on the lines – this, for example, occurred for up to 24 per cent of the time in 2016 and up to 15 per cent of the time in 2015.[10] While ElectraNet has had a number of enquiries from wind farm developers, no new wind farms have been commissioned on the Eyre Peninsula since 2006.

The Eyre Peninsula region also has significant mineral resources and exploration potential, including the Gawler Craton and the Eucla Basin. Over the coming decades mining investment and outputs are expected to grow substantially, and this region is widely recognised as an important new frontier for mineral development in Australia.[11] The Eyre Peninsula currently has limited capacity to accommodate significant additional demand without augmentation.

Prior to many commodity prices taking a downturn in recent years, a number of major mining developments on the Eyre Peninsula had reached a pre-feasibility stage and made formal enquiries with ElectraNet for connection to the transmission network. These loads had requested to connect in the vicinity of Wudinna, Yadnarie, and between Yadnarie and

[9] South Australian Department of Planning, Transport and Infrastructure, *Eyre and Western Region Plan*, June 2011, p.71.

[10] Note that as the wind farms are unscheduled, the constraints are implemented by means of an ElectraNet-owned Generation Dispatch Limiter, rather than by central AEMO dispatch.

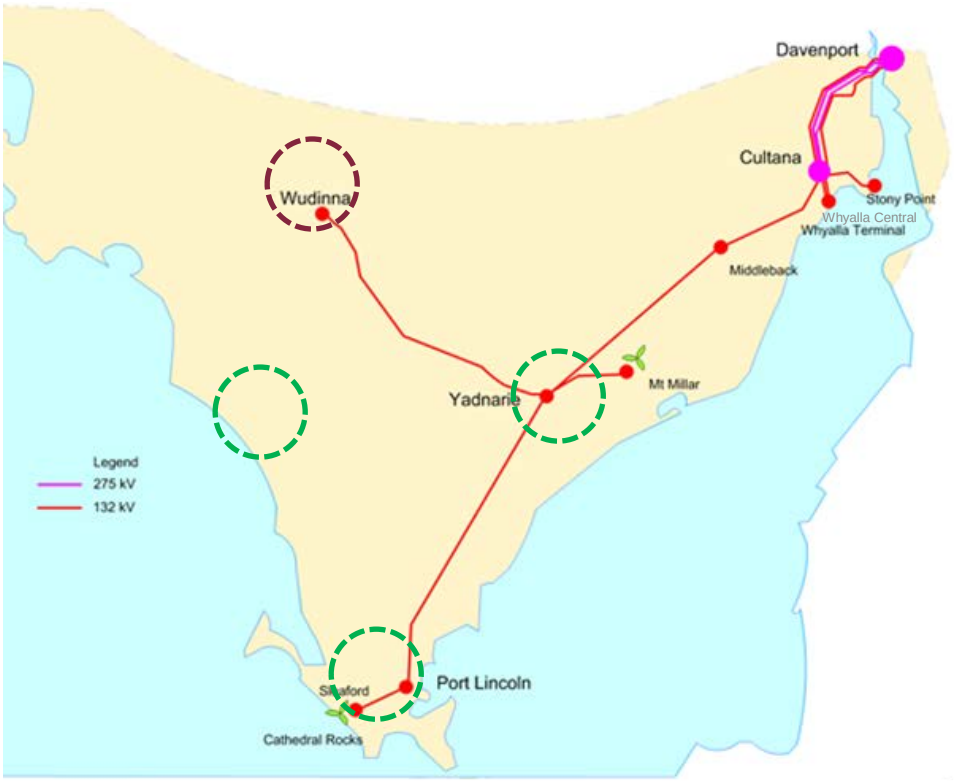
[11] South Australian Department of Planning, Transport and Infrastructure, *Eyre and Western Region Plan*, June 2011, p. 37.

Port Lincoln substations. The existing lower Eyre Peninsula transmission system has limited capacity to accommodate significant additional demand without augmentation.

Investment in the Eyre Peninsula transmission network may also bring the potential for significant market benefits from relieving constraints on existing Eyre Peninsula wind farms, as well as facilitating additional wind generation on the Eyre Peninsula (as opposed to other, lower-quality, regions in the NEM) and the connection of new mining load. These market benefits will be taken into account in the RIT-T assessment.

Figure 3 shows the location of known potential large new mining loads and significant wind resources on the Eyre Peninsula.

Figure 3 Significant wind resources and potential mining load on the Eyre Peninsula



Potential mining load of 300+ MW

Potential wind resource of 300 to 500 MW (per circle)

3. Identified Need

This section provides a description of the identified need for this RIT-T as well as outlining the assumptions used in assessing the identified need and why ElectraNet considers that reliability corrective action is necessary.[12]

3.1 The identified need is to ensure reliable supply to the Eyre Peninsula

The identified need for this RIT-T is to explore electricity supply options for meeting ETC reliability standards at Port Lincoln most efficiently in the future – driven by the need to replace major transmission line components serving the lower Eyre Peninsula in the next few years, and the upcoming expiry of the network support arrangement at Port Lincoln.

The ETC transmission reliability standards are generally expressed in terms of the amount of 'redundancy' that must be built into the network to avoid supply outages. Redundancy is generally expressed in 'N-x' terms, where 'x' reflects the number of elements[13] that could fail on the network without electricity supply being lost. For example:

- 'N-1' means that electricity supply will not be disrupted if one element of the network fails; and
- 'N-2' means that supply will not be disrupted if two separate elements fail.

Generally, the higher the 'x', the more reliable the network, as it means that electricity will continue to be supplied, even with more elements of the network not operating.

The ETC specifies a number of different reliability standards for loads on the Eyre Peninsula, with the highest being the ETC 'Category 3' at Port Lincoln which essentially requires an 'N-1' level of reliability.[14] With the exception of Port Lincoln, ElectraNet meets the ETC reliability requirements for all of the connection points on the lower Eyre Peninsula through transmission assets alone.

For Port Lincoln, the transmission service includes a network support arrangement for the use of three diesel fired open cycle gas generators, to provide equivalent transmission line and transformer capacity in accordance with the ETC requirements. Reliability standards under the ETC are generally expressed as "equivalent" line or transformer capacity standards to allow flexibility for meeting the standards by any means or a combination of means (including network and non-network options).

The upcoming expiry of the network support arrangement provides an opportunity to investigate formally how the ETC reliability standards for the Eyre Peninsula can be most efficiently met in the future.

[12] As required by NER clause 5.16.4(b)(2).

[13] Elements' of the transmission network include lines, transformers and other network equipment.

[14] Section 3.2.1 provides more detail on the specific reliability standards applying to loads on the Eyre Peninsula.

As outlined above, sections of the existing Cultana to Yadnarie, and Yadnarie to Port Lincoln 132 kV transmission lines require reconductoring in the near future. This provides the opportunity to consider broader options for ensuring reliable supply to the Eyre Peninsula, as part of this RIT-T.

In addition to meeting the ETC reliability standard, ElectraNet considers that there may be significant market benefits associated with some credible options. These market benefits are expected to stem from relieving the current output constraints on existing Eyre Peninsula wind farms, as well as facilitating additional wind generation locating on the Eyre Peninsula (as opposed to other, lower-quality, regions in the NEM) and the connection of new mining load.

3.2 Assumptions made in relation to the identified need

This section describes the key assumptions and data underpinning the assessment of the identified need.[15] In particular, it sets out:

- the ETC reliability standards that apply to connection points on the Eyre Peninsula (and how these are currently being reviewed in light of recent outages); and
- the need to replace about 120 km of the existing 132 kV transmission line in the next few years.

The PADR will outline a range of other key assumptions and parameters separate to the identified need that will affect the market benefits of credible options.

3.2.1 The ETC reliability standards applying to the Eyre Peninsula

The reliability requirements for the lower Eyre Peninsula connection points are covered by Section 2 of the ETC and are set out in Table 2.

Following on from recent outages, the South Australian Government has asked the Essential Services Commission of South Australia (ESCOSA) to investigate how electricity companies can improve power reliability on the Eyre Peninsula.[16] While the focus of the ESCOSA review is to investigate and make recommendations on what measures can be taken to incentivise ElectraNet and SA Power Networks to upgrade current infrastructure and reconnect supply quicker after damaging storm events, the review will also look at the existing reliability standards included in the ETC.

There is therefore a possibility that the ETC reliability standards applying to the Eyre Peninsula may be adjusted following the ESCOSA review.

Any change to the reliability standards will be accommodated in the RIT-T process via adapting the credible options considered and assessed in the PADR.

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[15] In accordance with NER clause 5.16.4(b)(2).

[16] Terms of reference available at: http://www.escosa.sa.gov.au/ArticleDocuments/1083/20170407-Inquiry-ReliabilityAndQualityElectricitySupplyEyrePeninsula-TermsOfReference.pdf.aspx?Embed=Y

Table 2 ETC reliability standards applying to loads on the Eyre Peninsula

Load	Level of minimum reliability ElectraNet is required to deliver under the ETC[17]
Middleback	*'Category 1'* (a) provide "N" equivalent line capacity for at least 100% of contracted agreed maximum demand and, in the event of an interruption use its best endeavours to: i. restore "N" equivalent line capacity as soon as practicable; and ii. in any event, restore "N" equivalent line capacity within 2 days of the commencement of the interruption; and (b) provide "N" equivalent transformer capacity for at least 100% of contracted agreed maximum demand and, in the event of an interruption: i. use its best endeavours to restore "N" equivalent transformer capacity as soon as practicable; and ii. in any event, restore "N" equivalent transformer capacity within 8 days of the commencement of the interruption.
Wudinna & Yadnarie	*'Category 2'* (a) provide "N" equivalent line capacity for at least 100% of contracted agreed maximum demand and, in the event of an interruption use its best endeavours to: i. restore "N" equivalent line capacity as soon as practicable; and ii. in any event, restore "N" equivalent line capacity within 2 days of the interruption; and (b) provide "N-1" equivalent transformer capacity for at least 100% of contracted agreed maximum demand and: i. in the event of a failure of any installed transformer or network support arrangement, use its best endeavours to restore "N-1" equivalent transformer capacity as soon as practicable; ii. in the event of an interruption arising from the failure of the installed transformers or network support arrangements: A. restore at least "N" equivalent transformer capacity within 8 days of the commencement of the interruption; and B. use its best endeavours to restore "N-1" equivalent transformer capacity as soon as practicable after the commencement of the interruption.
Port Lincoln Terminal	*'Category 3'* (a) provide "N-1" equivalent line capacity for at least 100% of contracted agreed maximum demand (including through the use of post-contingent operation) and: i. in the event of a failure of any installed transmission line or network support arrangement, use its best endeavours to restore "N-1" equivalent line capacity as soon as practicable; ii. in the event of an interruption arising from the failure of the installed transmission lines or network support arrangements: A. restore at least "N" equivalent line capacity within 1 hour of the commencement of the interruption; and B. use its best endeavours to restore "N-1" equivalent line capacity as soon as practicable after the commencement of the interruption; and (b) provide "N-1" equivalent transformer capacity for at least 100% of contracted agreed maximum demand (including through the use of post-contingent operation) and: i. in the event of a failure of any installed transformer or network support arrangement, use its best endeavours to restore "N-1" equivalent transformer capacity as soon as practicable; ii. in the event of an interruption arising from the failure of the installed transformers or network support arrangements: A. restore at least "N" equivalent transformer capacity within 1 hour of the commencement of the interruption; and B. use its best endeavours to restore "N-1" equivalent transformer capacity as soon as practicable after the commencement of the interruption.

[17] Issue TC/09.

ElectraNet will also, no earlier than 12 months prior to a final investment decision being made, provide ESCOSA with a review of the economic analysis supporting any decision to invest, as required by clause 2.3.2 of the ETC.

In the event that a change in the reliability standard materially affects the scale of the non-network options that may form part of a credible option, ElectraNet may issue a supplementary report seeking updated responses from non-network proponents.

3.2.2 Need to replace sections of the existing 132 kV transmission line

The existing 132 kV Cultana to Yadnarie and Yadnarie to Port Lincoln transmission lines are now over 50 years old.

They were originally constructed by the Electricity Trust of South Australia with a thermal rating based on 49°C (120°F) and were partially uprated in 1998, to rectify specific under-clearance spans. In 2008, the entire line lengths were uprated in order to continue to meet the increasing demand in the area – the uprated design temperatures are as follows:

- 65°C (Cultana to Middleback); and
- 60°C (Middleback to Yadnarie and Yadnarie to Port Lincoln).

These line up-ratings have now exhausted the possible options for further thermal capacity increases on these lines, as a means of meeting additional demand.

Recent condition assessment has recommended that some sections of line conductor need to be replaced in the 2018-19 to 2022-23 regulatory control period. Replacing these asset components requires careful consideration of the potential impacts on customer supply given the radial nature of the Eyre Peninsula transmission network.

3.3 Discussion of the identified need in the NTNDP

Transmission limitations on the existing 132 kV network in the Eyre Peninsula were noted in the 2016 AEMO National Transmission Network Development Plan (NTNDP).

Specifically, the NTNDP noted that high levels of wind/solar generation on the Eyre Peninsula may require rebuilding the 132 kV lines as double circuit lines.[18] While this has been flagged in previous NTNDPs, it has only ever been considered a limitation under a scenario involving high levels of wind generation in the region[19] – the 2016 NTNDP also raised these limitations under the 'neutral' and 'low grid demand' scenarios.

[18] AEMO, *National Transmission Network Development Plan for the National Electricity Market*, December 2016, p. 39.

[19] AEMO, *National Transmission Network Development Plan for the National Electricity Market*, November 2015, p. 21; AEMO, *National Transmission Network Development Plan for the National Electricity Market*, December 2014, p. 20; and AEMO, *National Transmission Network Development Plan for the National Electricity Market*, December 2013, p. APP-3.

4. Potential credible options to address the identified need

This section provides a description of the five credible options ElectraNet has identified to date as part of the PSCR.[20] These options are summarised in Table 3.

Table 3 Summary of potential credible options

Option	Overview of option(s)	Indicative capital cost ($ million, nominal)
Option 1 – Continue network support arrangement at Port Lincoln and component replacement works on the existing 132 kV single-circuit transmission line	132 kV line replacement works combined with network support contract	80*
Option 2 – Double circuit 132 kV line†	Construction of a new double circuit 132 kV transmission line following a Cultana to Yadnarie and Yadnarie to Port Lincoln route^	200-300
Option 3 – two single circuit 132 kV lines†	Construction of two single circuit 132 kV transmission lines following separated routes between Cultana and Port Lincoln	200-350
Option 4 – double circuit 275 kV line†,#	Construction of a double circuit 275 kV transmission line following a Cultana to Yadnarie and Yadnarie to Port Lincoln route^	280-380
Option 5 – two single circuit 275 kV lines†,#	Construction of two single circuit 275 kV transmission lines following separated routes between Cultana and Port Lincoln	400-550

***** This option would also have significant operating costs for ongoing network support at Port Lincoln

^ For these options, we will investigate the potential benefits of additional emergency restoration measures, that may include network support, as well as the possibility of building the double circuit lines to a higher than normal wind loading design level

† For these options, we will also consider the potential benefits of upgrading the Davenport to Cultana 275 kV transmission lines to further improve supply reliability and security to the Eyre Pensinsula

To be operated initially at 132 kV

As options 2 to 5 involve the construction of either a double circuit line or two single-circuit lines, they allow the reliability standard required by the ETC (TC/08 and TC/09) to potentially be met without a network support arrangement at Port Lincoln.

Option 1 will not relieve the existing constraints on the output of wind farms on the Eyre Peninsula, nor will it facilitate any new wind generation locating on the Eyre Peninsula, or the connection of new loads. All other options will relieve, and may eliminate, the constraints on the operation of the existing wind farms.

[20] As required by NER clause 5.16.4(b)(5).

Options other than option 1 will also facilitate new wind generation locating on the Eyre Peninsula, and assist the connection of new mining load. These options will not, in themselves, cause new mining loads to connect (this will be determined by commodity prices and the business cases of individual projects), but they will allow new loads to connect without additional connection costs or delays.

Option assessment will include consideration of how the security of supply to the Eyre Peninsula can be managed if double circuit lines are operationally temporarily reclassified as a credible contingency, such as can happen during a significant storm, or a bushfire.

The scope and capital cost estimates for each of the options are currently being refined (including consideration of any reactive plant needs for each option) and will be updated in the PADR. Annual operating and maintenance costs are estimated to be about 2% of the capital cost for each option, with the exception of option 1, which would also require on-going operating costs for network support.

Each of the credible options are expected to be both technically and commercially feasible and able to be implemented in sufficient time to meet the identified need.[21] Options 2 to 5 will also require relevant statutory environmental approvals and acquisition of some easements for the transmission line routes. Possible commissioning dates listed in this section are subject to obtaining relevant development and environmental approvals.

4.1 Option 1 – Reconductoring of the existing 132 kV single-circuit network and continuation of network support at Port Lincoln

This option involves continuing to meet the Port Lincoln Terminal ETC reliability standards by using a combination of transmission infrastructure and network support at Port Lincoln.

In particular, it involves the following:

- re-conductoring the four sections (totalling 118 km) of the existing 132 kV network that require conductor replacement; and
- continuing to have a network support agreement in place at Port Lincoln, which could be a contract with the existing provider or a new provider.

Capital costs for the reconductoring works are estimated to be in the order of $80 million. Reconductoring is expected to take two years, with commissioning possible by the end of 2020, subject to obtaining necessary environmental and development approvals.

The network support associated with this option may come from the existing provider or a new entrant. Important to note is that any non-network support will have to be able to manage reducing minimum demand as well as absorb power in the medium term (refer Table 4 in Section 5.1).

ElectraNet is interested to hear from parties that are able to provide such solutions and, in particular, the costs associated with providing them.

[21] In accordance with the requirements of NER clause 5.15.2(a).

4.2 Option 2 – Construction of a double circuit 132 kV line

This option involves construction of a double circuit 132 kV line following a Cultana to Yadnarie and Yadnarie to Port Lincoln route.

In particular, it includes:

- building a new double circuit 132 kV circuit lines from Cultana to Yadnarie (about 142 km) and Yadnarie – Port Lincoln (about 130 km);
- establishing an additional 132 kV exit at the Cultana substation;
- establishing two additional 132 kV exits at Yadnarie substation;
- establishing a second 132 kV exit at Port Lincoln Terminal substation; and
- decommissioning the existing single circuit 132 kV lines from Cultana to Yadnarie and Yadnarie to Port Lincoln.

Figure 4 illustrates the network diagram for this option.

This option would utilise the additional easements on the Eyre Peninsula that ElectraNet has acquired.

This option would involve additional generation support during construction, although it would be less than for Option 1 since it would only essentially be required for a short time, that is, when switching supply over to the new line.

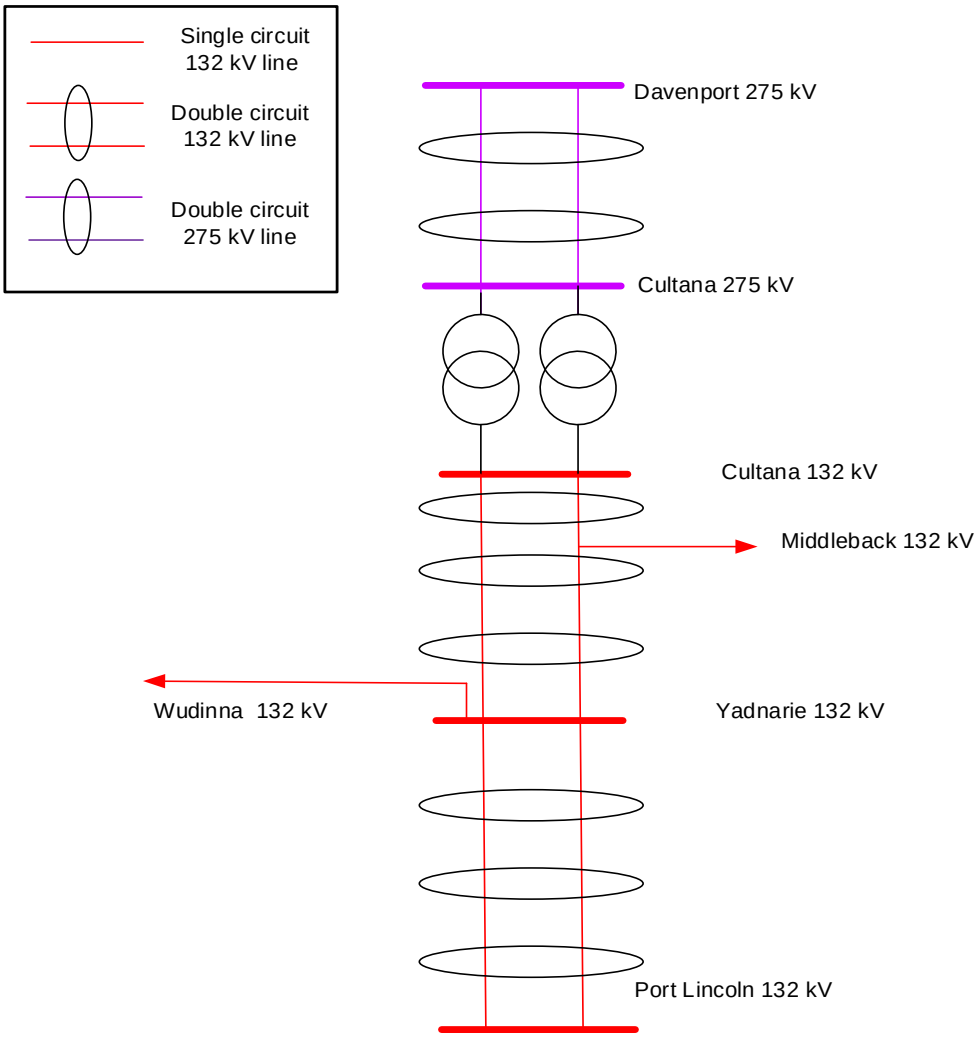
We will also investigate a version of Option 2 in the PADR assessment that is designed to a higher wind loading standard than has typically been applied for South Australian line construction, which would include:

- upgrading the existing Davenport to Cultana 275 kV double circuit line and potentially strengthening it to the higher wind loading standard; and
- building the new 132 kV lines to the higher wind loading standard.

We are currently refining the incremental costs of these strengthening measures and will assess them in the PADR against the incremental market benefits they can be expected to deliver.

Capital costs for this option are estimated to be in the order of $200 to $300 million. Construction is expected to take two years, with commissioning possible by the end of 2020, subject to obtaining necessary environmental and development approvals.

Figure 4 Network diagram for Option 2



4.3 Option 3 – Construction of two single circuit 132 kV lines

This option involves construction of two single circuit 132 kV lines following a Cultana to Yadnarie and Yadnarie to Port Lincoln route.

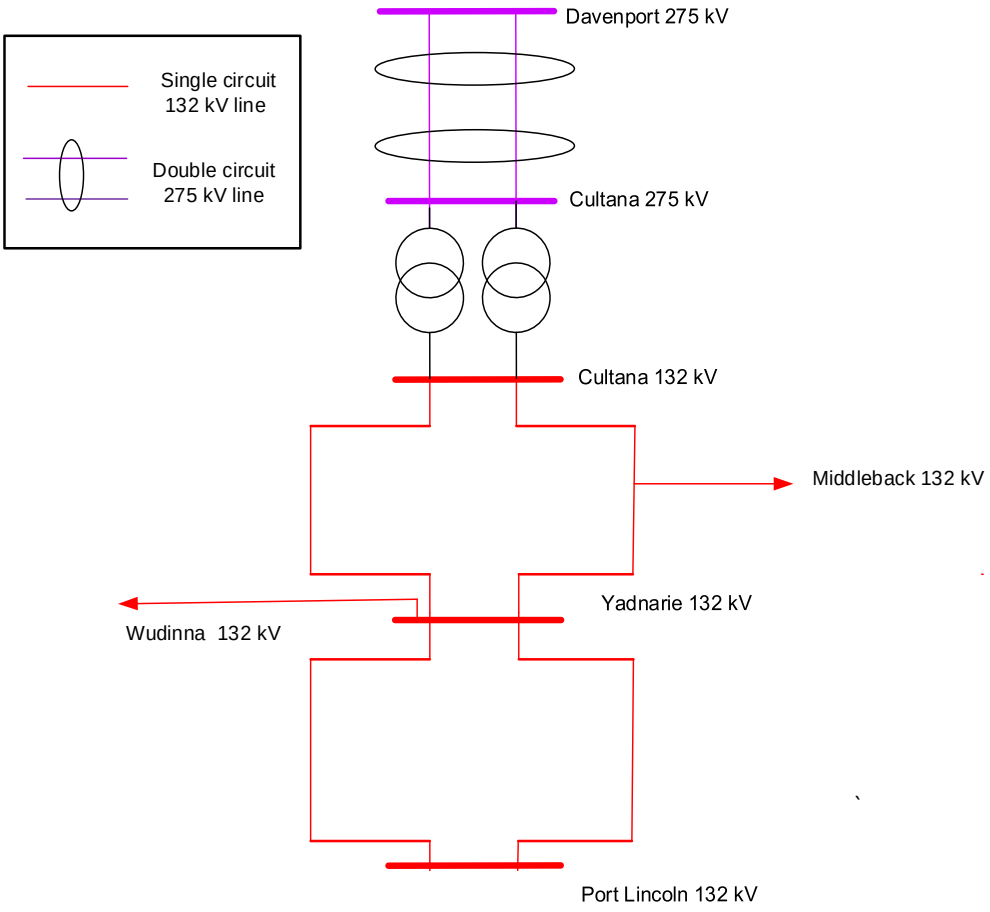
In particular, it includes:

- building two new single-circuit 132 kV lines from Cultana to Yadnarie (about 142 km) and from Yadnarie to Port Lincoln (about 130 km), with each circuit on geographically separated easements
- establishing an additional 132 kV exit at Cultana substation;
- establishing two additional 132 kV exits at Yadnarie substation;
- establishing a second 132 kV exit at Port Lincoln Terminal substation; and
- decommissioning the existing single circuit 132 kV lines from Cultana to Yadnarie and from Yadnarie to Port Lincoln.

Figure 5 illustrates the network diagram for this option.

When analysing this option we will also consider the relative costs and benefits of taking one of the new single-circuit 132 kV lines from Cultana to Port Lincoln via Wudinna, rather than Yadnarie.

Figure 5 Network diagram for Option 3



Under this option, the two new circuits would be constructed on geographically separated easements, sufficiently far apart to reduce the risk of outages from a single weather event.

This option would involve additional generation support during construction, which would be similar to Option 2 in magnitude since it would only essentially be required for a short time, that is, when switching supply over to the new lines.

Capital costs for this option are estimated to be in the order of $200 to $350 million. Construction is expected to take five years, with commissioning possible by the end of 2023, subject to land/easement acquisition and obtaining necessary environmental and development approvals.

As with Option 2, we will also investigate a version of Option 3 in the PADR assessment that includes upgrading the existing Davenport to Cultana 275 kV double circuit line, and potentially strengthening it to a higher wind loading standard. We are currently refining the incremental costs of these strengthening measures, and will assess them in the PADR against the incremental market benefits they can be expected to deliver.

4.4 Option 4 – Construction of a double circuit 275 kV line

This option is similar in route and build design to Option 2, except that it is built to 275 kV as opposed to 132 kV. In particular, this option involves construction of a double circuit 275 kV line (initially operated at 132 kV) following a Cultana to Yadnarie and Yadnarie to Port Lincoln route.

In particular, the scope includes:

- building new double circuit 275 kV lines from Cultana to Yadnarie (about 142 km) and from Yadnarie to Port Lincoln (about 130 km) – lines to be initially operated at 132 kV;
- establishing a second 132 kV exit at Cultana substation;
- establishing two additional 132 kV exits at Yadnarie substation;
- establishing a second 132 kV exit at Port Lincoln Terminal substation; and
- removing existing single circuit 132 kV lines from Cultana to Yadnarie and from Yadnarie to Port Lincoln.

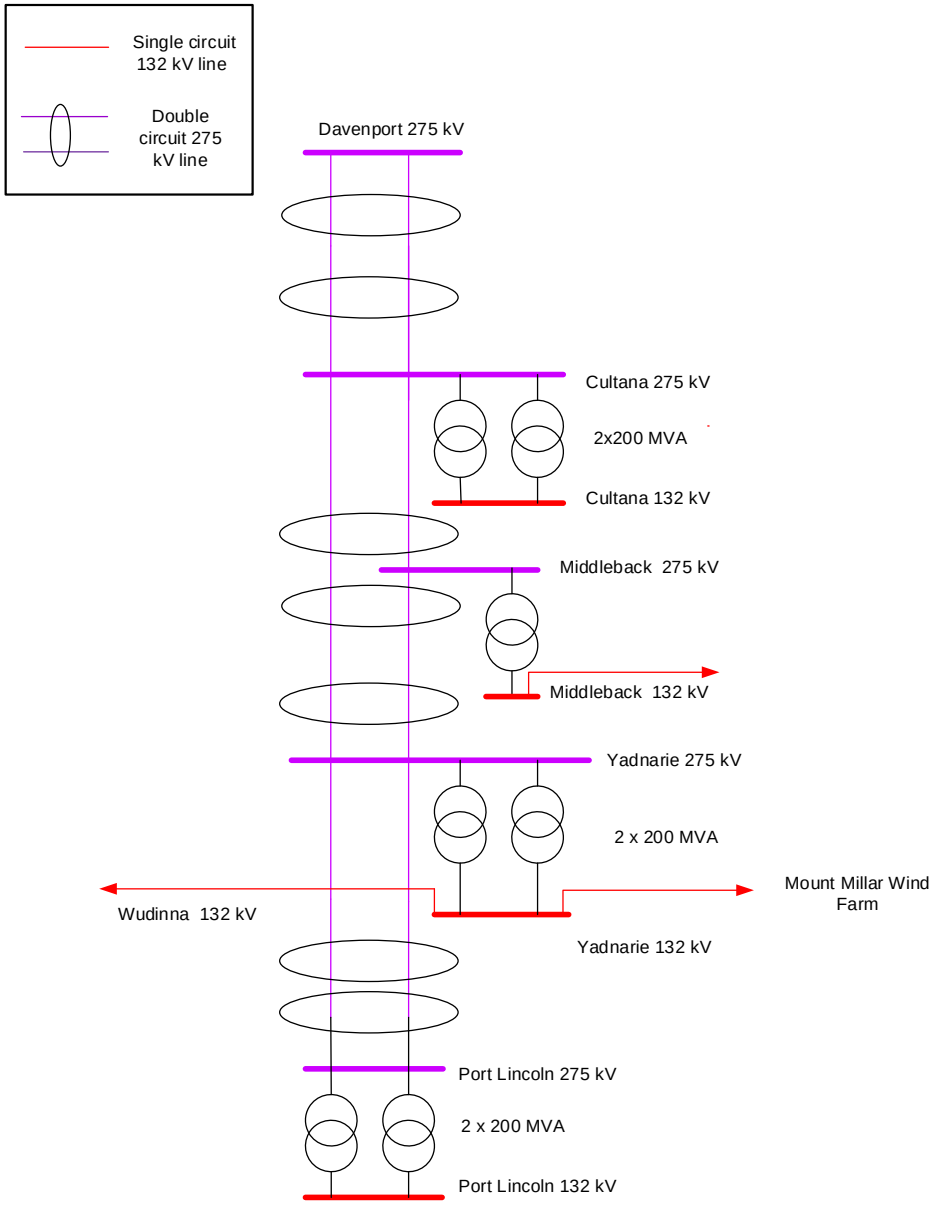
The initial configuration of this option will be the same as for Option 2, as previously shown in Figure 4.

In assessing this option in the PADR analysis, ElectraNet will investigate this option being built to 275 kV capacity but initially operated at 132 kV. Moving from 132 kV operation to 275 kV operation in future involves the following components:

- two new 275 kV exits at Cultana, to provide a 275 kV supply for the Cultana to Yadnarie lines (and consequently also the Yadnarie to Port Lincoln Terminal lines);
- a new 275 kV yard, including 275 kV exits and a 275/132 kV transformer at Middleback;
- a new 275 kV yard, including 275 kV exits and 275/132 kV transformers at Yadnarie; and
- a new 275 kV yard, including 275 kV exits and 275/132 kV transformers at Port Lincoln.

Figure 6 illustrates the network diagram for the ultimate configuration of this option.

Figure 6 Network diagram for Option 4 (ultimate configuration)



This option would utilise the additional easements on the Eyre Peninsula that ElectraNet has acquired.

This option would involve additional generation support during construction of a similar magnitude to Option 2, that is, only for a short time when switching supply over to the new line.

As with Options 2 and 3, we will also investigate a version of Option 4 in the PADR assessment that is designed to a higher wind loading standard than has typically been applied for South Australian line construction, which would include:

- upgrading the existing Davenport to Cultana 275 kV double circuit line and potentially strengthening it to the higher wind loading standard; and
- building the new 275 kV lines to the higher wind loading standard.

We are currently refining the incremental costs of these strengthening measures and will assess them in the PADR against the incremental market benefits they can be expected to deliver.

Capital costs for this option built to 275 kV, but operated at 132 kV initially are estimated to be in the order of $280 to $380 million. Construction is expected to take three years, with commissioning possible by the end of 2021, subject to obtaining necessary environmental and development approvals. The future incremental capital costs of moving from 132 kV operation to 275 kV operation are estimated at about $120 million.

As with Options 2 and 3, Option 4 will relieve, and may eliminate, the existing constraints on the output of the current wind farms on the Eyre Peninsula. In addition, it will also facilitate new wind generation locating on the Eyre Peninsula and may encourage the connection of new mining loads – to a greater extent than Options 2 and 3 due to the higher operating capacity.

4.5 Option 5 – Construction of two single circuit 275 kV lines

This option is similar in route and build design to Option 3, except that it is built to 275 kV as opposed to 132 kV. In particular, this option involves construction of two single circuit 275 kV lines (initially operated at 132 kV) following a Cultana to Yadnarie and Yadnarie to Port Lincoln route.

In particular, the scope includes:

- building two new single circuit 275 kV lines, each on geographically separated easements, from Cultana to Yadnarie (about 142 km) and from Yadnarie to Port Lincoln Terminal (about 130 km) – lines to be initially operated at 132 kV;
- establishing a second 132 kV exit at Cultana substation;
- establishing two additional 132 kV exits at Yadnarie substation;
- establishing a second 132 kV exit at Port Lincoln Terminal substation; and
- removing existing single circuit 132 kV lines from Cultana to Yadnarie and from Yadnarie to Port Lincoln.

The initial configuration of this option will be the same as for Option 3, as shown previously in Figure 5 .

As with Option 4, in assessing this option in the PADR analysis, we will investigate this option being built to 275 kV capacity, but initially operated at 132 kV.

Moving from 132 kV operation to 275 kV operation in future involves the following components:

- two new 275 kV exits at Cultana, to provide a 275 kV supply for the Cultana to Yadnarie lines (and consequently also the Yadnarie to Port Lincoln Terminal lines);
- a new 275 kV yard, including 275 kV exits and a 275/132 kV transformer at Middleback;
- a new 275 kV yard, including 275 kV exits and 275/132 kV transformers at Yadnarie; and
- a new 275 kV yard, including 275 kV exits and 275/132 KV transformers at Port Lincoln.

Figure 7 illustrates the network diagram for the ultimate configuration of this option.

As for option 3, when analysing this option we will also consider the relative costs and benefits of taking one of the new single-circuit lines from Cultana to Port Lincoln via Wudinna, rather than Yadnarie.

Under this option, the two new circuits would be constructed on geographically separated easements, sufficiently far apart to reduce the risk of outages from a single weather event.

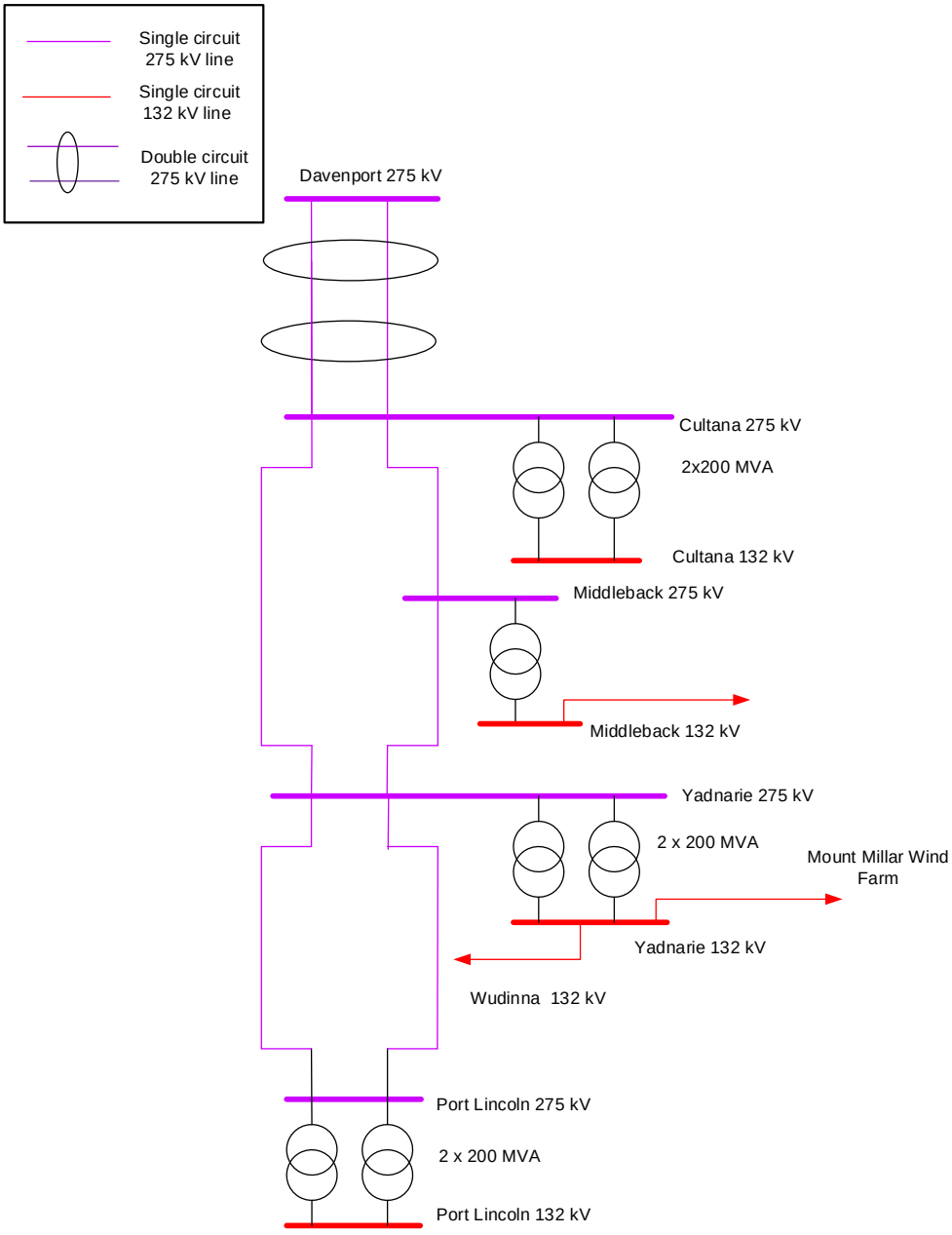
This option would involve additional generation support during construction, which would be similar to Option 2 in magnitude since it would only essentially be required for a short time, that is, when switching supply over to the new lines.

Capital costs for this option are estimated to be in the order of $400 to $550 million. Construction is expected to take five years, with commissioning possible by the end of 2023, subject to land/easement acquisition and obtaining necessary environmental and development approvals. The future incremental capital costs of moving from 132 kV operation to 275 kV operation are estimated at about $120 million.

As with Options 2, 3 and 4, we will also investigate a version of Option 5 in the PADR assessment that includes upgrading the existing Davenport to Cultana 275 kV double circuit line, and potentially strengthening it to a higher wind loading standard. We are currently refining the incremental costs of these strengthening measures and will assess them in the PADR against the incremental market benefits they can be expected to deliver.

Option 5 will relieve, and may eliminate, constraints on the output of the existing wind farms. In addition, it will also facilitate new wind generation locating on the Eyre Peninsula and may encourage the connection of new mining loads – to a greater extent than Options 2 and 3 due to the higher operating capacity.

Figure 7 Network diagram for Option 5 (ultimate configuration)



4.6 Options considered but not progressed

This section discusses additional options which ElectraNet has considered, but does not consider technically and/ or economically feasible, and therefore which are not considered to be credible options.

In relation to economic feasibility, ElectraNet notes that where two potential options provide the same expected quantum of market benefits, if one option is more expensive than the other, it is not considered a credible option for the RIT-T. Where two options are expected to provide a different quantum of benefit, the relative costs of the two options should be similar to the difference in relative benefits. Otherwise the relatively more expensive option will not be considered a credible option for the RIT-T.

4.6.1 De-energised re-conductoring version of Option 1

ElectraNet has considered an alternative version of Option 1 whereby the sections of the existing line that require replacement would be de-energised for an extended period of time (about six months) while they are re-conductored. This would require substantial generation support costs while this work is completed and would likely result in outages to many customers on the Eyre Peninsula. Since this option is not expected to deliver material market benefits over and above Option 1, ElectraNet considers this option to be economically infeasible.

4.6.2 Continuation of generation support at Port Lincoln and staged build of a new double circuit 132 kV line

ElectraNet has considered the option of continuing with a generation support agreement at Port Lincoln, and undertaking a staged build and commission of a new double circuit 132 kV line that addresses the sections of the existing line that require replacement first.

This option is essentially the same as Option 1 above, but involves building a new double circuit 132 kV line instead of re-conductoring.

ElectraNet considers that this option would deliver the same market benefits as Option 1, but at higher costs and so has been deemed economically infeasible. Specifically, the two approaches for achieving this option would be to either:

- decommission the existing sections that need replacing and rebuild them on the existing easement; or
- build replacement sections on the adjacent easement and cut these across to the existing line when complete, then decommission the existing sections.

The first approach would require substantial generation support costs when the new sections are being built and commissioned, in order to ensure continuity of supply to Port Lincoln. The second option involves constructing new lines, which have a significantly greater cost than reconductoring the existing line – it would also use portions of the 'spare' easement and so would forgo that easement being used in the future to house a higher capacity line, if justified.

4.6.3 Decommission existing line and operate the Eyre Peninsula as a series of micro-grids

ElectraNet has considered decommissioning the existing 132 kV single circuit line and serving Eyre Peninsula load with micro-grids. Based on work undertaken, we do not consider that the ETC reliability standards can be economically met through the use of stand-alone micro-grids.

Further, the existing NER mandates the continuing connection of the existing Eyre Peninsula connection points to South Australia's electricity transmission network, and does not accommodate the use of stand-alone micro-grids for that purpose. We therefore consider that this option is not economically feasible for this RIT-T.

4.6.4 500 kV transmission options

ElectraNet has considered high-capacity 500 kV options for reinforcing supply to the Eyre Peninsula, but at this stage does not consider that the substantially greater cost associated with building to this capacity would be justified in terms of the incremental market benefits it might deliver.

4.6.5 High capacity submarine HVDC cable from Port Lincoln to Adelaide via the Yorke Peninsula

ElectraNet has considered a high-capacity submarine cable option for reinforcing supply to the Eyre Peninsula, but at this stage does not consider that the substantially greater cost associated with such an option would be justified by the incremental market benefits it might deliver.

4.7 Material inter-regional impact

ElectraNet has considered whether the credible options above are expected to have a material interregional impact.[22]

A 'material inter-network impact' is defined in the NER as:

> *"A material impact on another Transmission Network Service Provider's network, which may include (without limitation): (a) the imposition of power transfer constraints within another Transmission Network Service Provider's network; or (b) an adverse impact on the quality of supply in another Transmission Network Service Provider's network."*

AEMO's suggested screening test is that a transmission augmentation has no material inter-network impact if it satisfies the following:[23]

- a decrease in power transfer capability between the transmission networks or in another TNSP's network of no more than the minimum of 3 per cent of the maximum transfer capability and 50 MW;
- an increase in power transfer capability between transmission networks of no more than the minimum of 3 per cent of the maximum transfer capability and 50 MW;
- an increase in fault level by less than 10 MVA at any substation in another TNSP's network; and
- the investment does not involve either a series capacitor or modification in the vicinity of an existing series capacitor.

As a consequence, AEMO's screening criteria indicate that there are no material inter-network impacts associated with the credible options included in this PSCR.

[22] In accordance with NER clause 5.16.4(b)(6)(ii).

[23] The screening test is set out in Appendix 3 of the Inter-Regional Planning Committee's Final Determination: Criteria for Assessing Material Internetwork Impact of Transmission Augmentations, Version 1.3, October 2004.

5. Required characteristics of non-network options

This section describes the technical and commercial characteristics that a non-network option would be required to deliver in order to address the identified need.[24]

ElectraNet would be interested to hear from parties regarding potential non-network options to satisfy, or contribute to satisfying, the identified need.

5.1 Assistance meeting the ETC reliability standards at Port Lincoln Terminal

Non-network providers could participate in meeting the required reliability standards from 2018 by providing network support at Port Lincoln consistent with meeting or exceeding the ETC Category 3 standard, as outlined previously in Table 2 above.

In particular, this would require the following:

- in the event of an interruption arising from the failure of the installed transmission lines or network support arrangements – restore at least "N" equivalent line capacity within 1 hour of the commencement of the interruption; and
- in the event of an interruption arising from the failure of the installed transformers or network support arrangements – restore at least "N" equivalent transformer capacity within 1 hour of the commencement of the interruption.

Both of these services are to be provided until the failure is resolved and while ElectraNet and/or SA Power Networks use their best endeavours to restore "N-1" equivalent line capacity as soon as practicable.

Table 4 shows the indicative power required to be supplied (or, at times of minimum demand in future years, absorbed) by non-network solutions at Port Lincoln Terminal in order to meet these requirements, in the absence of any new step loads.

Indicative demand profiles for Port Lincoln Terminal are available in the SA Connection Point Forecasts Report.[25]

Table 4 provides indicative information to propose specific non-network development options in relation to addressing the ETC reliability standards at Port Lincoln. ElectraNet intends to use information provided by non-network proponents in response to this PSCR in the assessment of options for the PADR.

Proposed non-network services must be capable of reliably meeting electricity demand under a range of conditions and, if a generator, must meet all the relevant NER and ETC requirements related to grid connection. Non-network proponents should become familiar with the specific requirements of each connection point and other reliability requirements as set out in the ETC.[26]

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[24] In accordance with NER clause 5.16.4(b)(3).

[25] Available at www.electranet.com.au/what-we-do/network/regulated-network-reports-and-studies.

[26] The ETC is available at: www.escosa.sa.gov.au/industry/electricity/codes-guidelines

ElectraNet has obligations under the ETC and NER to ensure supply reliability is maintained for customers. Failure to meet these obligations may give rise to liability. A proponent of a proposed network support service must offer comparative service delivery levels, including being willing to accept all liability that may arise from the failure to meet these obligations.

Table 4 Indicative non-network load requirements at Port Lincoln Terminal, MW

Year	Minimum demand*	Maximum demand^		
		Weak forecast	Neutral forecast	Strong forecast
2018-19	2.2	32.2	33.6	34.6
2019-20	1.2	32.0	33.5	35.0
2020-21	0.3	32.2	33.4	35.1
2021-22	-0.7	32.0	33.3	35.3
2022-23	-1.7	31.8	33.3	35.9
2023-24	-2.6	31.7	33.2	36.3
2024-25	-3.6	31.7	33.1	35.7
2025-26	-4.6	31.9	33.1	36.6
2026-27	-5.6	31.8	33.2	37.3
2027-28	-6.5	31.3	33.4	38.1
2028-29	-7.5	31.3	33.6	38.8

* Based on a linear extrapolation of daytime minimum demands at Port Lincoln Terminal from 2011-12 to 2016-17.

^ Source: SA Power Networks.

ElectraNet requests proponents of non-network solutions to respond to this PSCR with the costs and operating profiles associated with meeting the ETC reliability standards.

Table 5 sets out the indicative parameters that ElectraNet requests parties to provide in any response.

Table 5 Indicative parameters that non-network proponents should provide

	Parameter
1	**Response time** Guaranteed to provide full islanded supply for Port Lincoln within 1 hour of an upstream transmission fault
2	**Fault level contribution** Able to provide an equivalent source fault level of at least 70 MVA when supplying Port Lincoln Terminal in islanded mode
3	**Frequency Control** Able to maintain applicable SA system frequency standards when supplying Port Lincoln Terminal in islanded condition
4	**Voltage Control** Able to maintain the voltage level at the Port Lincoln 132 kV bus within 100% to 105% of the nominal voltage level during islanded condition
5	**Standby charge** Indicative annual standby charge to ElectraNet for network support arrangement
6	**Operational charges** Indicative operational charges to ElectraNet, on a per call and per duration basis
7	**Term of agreement** Several options are available for the term of the agreement: • 2 years from 1 January 2019 • 5 years from 1 January 2019 • 5 + 5 years from 1 January 2019 Proponents should clearly indicate which timeframe(s) apply to their submission. If 1 January 2019 is an infeasible start date, the proponent should also clearly indicate the earliest feasible start date.
8	**Responsibility and Liability** Able to ensure delivery of services meets required standards at all times and indicative commitment to appropriate liability and indemnification of ElectraNet against any liability arising directly or indirectly from the operation or failure of the non-network solution.
9	**Financial Viability** Indicative demonstration of the proponent's financial viability position

ElectraNet is not initiating a formal tender for non-network solutions at this stage. However, ElectraNet strongly encourages proponents of potential non-network solutions to make a submission to this PSCR. For a non-network solution to be considered a potential option under this RIT-T, indicative costs and timings will need to be evaluated alongside other options in the next stage of this RIT-T assessment (that is, the PADR).

While indicative commitments would be sufficient for responses to the PSCR and for initial options analysis, to be considered further in the RIT-T process will require subsequent binding commitments, which would be expected to include:

- a commitment to price;
- an agreed timetable for implementation;
- measures aimed at ensuring reliability, availability, monitoring and control of the requisite services;[27]
- incentive arrangements to help ensure reliability and availability; and
- responsibility at all times for delivery of services, including appropriate liability and supporting indemnity in favour of ElectraNet arising directly or indirectly from the operation or failure of the non-network solution.

Should the RIT-T assessment identify a non-network solution(s) as the, or part of the, preferred option then we would seek binding offers from the proponent(s) prior to completing the PADR. Note that only proponents that have made submissions to this PSCR will be invited to submit binding offers, through a Request for Tender process that we plan to commence soon after the close of the consultation period for this PSCR.

5.2 Improving regional reliability and energy security

The RIT-T requires that for reliability corrective actions, the quantification of the market benefits associated with changes in voluntary load curtailment and changes in involuntary load shedding must only apply in so far as the market benefit delivered by the credible option exceeds the *minimum* standard; that is, currently Category 3 at Port Lincoln, Category 2 at Wudinna and Yadnarie and Category 1 at Middleback (as outlined in 3.2.1 above).

ElectraNet would therefore like to hear from non-network proponents that consider their solutions can deliver benefits in excess of those associated with meeting the mandated reliability standards on the Eyre Peninsula.

The existing reliability standards are currently being reviewed by ESCOSA at the request of the South Australian Government. There is therefore a possibility that the ETC reliability standards applying to the Eyre Peninsula may change (and in particular may tighten) following this review. ElectraNet notes that any change to the reliability standards will be accommodated in the RIT-T process via adapting the credible options considered and assessed in the PADR.

In the event that a change in the reliability standard materially affects the scale of the non-network options that may form part of a credible option, ElectraNet may issue a supplementary report seeking updated responses from non-network proponents.

[27] Monitoring and control requirements are likely to be broadly consistent with approaches adopted by AEMO, see: AEMO, *Final Determination – Standard for power system data communications*, 2005

6. Materiality of market benefits for this RIT-T assessment

The NER requires that all categories of market benefit identified in relation to the RIT-T are included in the RIT-T assessment, unless the TNSP can demonstrate that a specific category (or categories) is unlikely to be material in relation to the RIT-T assessment for a specific option.[28]

At this stage, ElectraNet consider that all of the categories of market benefit identified in the RIT-T have the potential to be material for this RIT-T assessment, including option value. This section outlines why we expect that option value may be material to the outcome of this RIT-T, and also provides further detail on how we propose to value the benefits associated with reducing the frequency and severity of supply outages to the Eyre Peninsula.

6.1 Option value may be material to the outcome of this RIT-T

ElectraNet considers that this RIT-T should consider the 'option value' of the alternative credible options. Specifically, ElectraNet expects to supplement the traditional NPV scenario analysis of market benefits under the RIT-T with 'decision-tree' tools, used in real options assessments. This will allow a more comprehensive assessment of each option's net market benefits, and expected risks, in the face of the key uncertainties that are expected to affect the size of the market benefits.

Option value analysis essentially extends the range of future states of the world that can be considered, and so enables a more sophisticated treatment of uncertainty. The modelling techniques used consider the relationships between different uncertain parameters, and how probabilities may change over time, in a structured way. Overall, it allows for a far greater number of futures states of the world to be modelled than a simple 'scenario analysis'.

Modelling option value essentially recognises the value of adapting an investment strategy over time, in response to learning about future uncertainties. While this value can typically be picked up through the use of reasonable scenarios in a RIT-T, there are a number of prerequisites that mean that option value techniques can more accurately assess the difference in the net benefit of a fixed and a flexible investment strategy. These prerequisites are when there is:

- significant uncertainty about future conditions;
- 'learning' about that uncertainty;
- flexibility in investment alternatives (e.g. different sizes/stages/costs); and
- the possibility of regret (that is, no 'obvious' best alternative under all future outcomes).

[28] NER clause 5.16.1(c)(6). Under NER clause 5.16.4(b)(6)(iii), the PSCR should set out the classes of market benefit that the NSP considers are not likely to be material for a particular RIT-T assessment.

Each of these apply to this particular RIT-T. First, there is significant uncertainty about future conditions – for example, there is uncertainty over:

- whether or not there will be additional interconnection between South Australia and the rest of the NEM;
- the timing and magnitude of the development of new wind generation on the Eyre Peninsula, which would likely be facilitated should additional interconnection occur and, more broadly, would be affected by future climate change policy announcements;
- the timing and magnitude of future mining developments on the Eyre Peninsula; and
- general future load growth in the Eyre Peninsula, which would be expected to be positively affected by new large loads.

Second, there is expected to be 'learning' about these uncertainties going forward. For example, as time progresses ElectraNet considers that more information will be known about:

- the current South Australian Energy Transformation RIT-T process, once complete, will reduce uncertainty regarding additional interconnection;
- climate change policy may become clearer going forward, as Australia seeks to meet its COP21 commitments;
- increases in commodity prices, and in particular, a rebound in iron ore prices that would make new load development more likely; and
- new load development would make future higher general load growth more likely, and in turn, drive the likelihood of further load growth.

Third, as the credible options outlined in section 4 illustrate, there is flexibility in the investment alternatives being considered for the Eyre Peninsula. For example:

- whether a new transmission line is initially built to accommodate only 132 kV or also a future 275 kV specification;
- whether a new transmission line is built and operated as a single- or double-circuit initially; and
- whether the 'spare' easement is utilised now (forgoing its use for something else in the future), and at what capacity.

Finally, there is the possibility of regret associated with under- or over-building in the case of the Eyre Peninsula. For example, there is the credible outcome that future load growth, or the expansion of wind generation development on the Eyre Peninsula, would require additional transmission development in future if a smaller capacity (132 kV) line is built now. Conversely, there would be an opportunity cost associated with building to 275 kV specification, if the additional capacity is not required in the future.

The PADR will present details on the real options assessment techniques applied.

6.2 Quantification of benefit from reduction in unserved energy

A key benefit for this RIT-T is likely to be a reduction in the amount of load that would need to be shed on the Eyre Peninsula following severe weather events.

It is important that any VCR estimates applied to estimating such a benefit are fit for purpose, and most accurately reflect the costs that electricity supply interruptions impose on the end-use customers in question. In the case of this RIT-T, we do not consider that the application of AEMO's standard VCR estimates,[29] without modification, would be appropriate, since they do not capture the severe and prolonged outages contemplated in this RIT-T and experienced by customers on the Eyre Peninsula.

The inappropriateness of applying AEMO's VCR estimates to assessing the cost to customers of events that cause wide-spread, severe or prolonged supply shortages is noted by AEMO in its VCR Application Guide. Specifically, the AEMO guide notes that, because the VCR may not accurately estimate the impacts of widespread and/or prolonged outages, additional offsets to the VCR might be appropriate to estimate effects not captured through customer surveys. The guide notes that VCR survey respondents are not expected to have a good understanding of the social and safety impacts related to widespread and/or prolonged outages, and so extrapolating survey results to cater for this kind of event might necessitate additional offsets due to the non-linear nature of a VCR over time and space.[30]

We are currently giving consideration to what offsets may be appropriate in deriving a VCR estimate to apply to this RIT-T.

[29] AEMO produces VCR estimates for each jurisdiction in the National Electricity Market, across four customer classifications, as well as a state-wide average. The customer classifications include residential and different sizes of commercial customer.

[30] AEMO, *Value of Customer Reliability – Application Guide*, Final Report, December 2014, p. 20.

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Appendices

28 April 2017

Appendix A Checklist of compliance clauses

This section sets out a compliance checklist which demonstrates the compliance of this PSCR with the requirements of clause 5.16.4(b) of the Rules version 89.

Rules clause	Summary of requirements	Relevant section(s) in PSCR
5.16.4 (b)	A RIT-T proponent must prepare a report (the project specification consultation report), which must include:	-
	(1) a description of the identified need;	3
	(2) the assumptions used in identifying the identified need (including, in the case of proposed reliability corrective action, why the RIT-T proponent considers reliability corrective action is necessary);	3.2
	(3) the technical characteristics of the identified need that a non- network option would be required to deliver, such as: (i) the size of load reduction of additional supply; (ii) location; and (iii) operating profile;	5.1
	(4) if applicable, reference to any discussion on the description of the identified need or the credible options in respect of that identified need in the most recent National Transmission Network Development Plan;	3.3
	(5) a description of all credible options of which the RIT-T proponent is aware that address the identified need, which may include, without limitation, alterative transmission options, interconnectors, generation, demand side management, market network services or other network options;	4
	(6) for each credible option identified in accordance with subparagraph (5), information about: (i) the technical characteristics of the credible option; (ii) whether the credible option is reasonably likely to have a material inter-network impact; (iii) the classes of market benefits that the RIT-T proponent considers are likely not to be material in accordance with clause 5.16.1(c)(6), together with reasons of why the RIT-T proponent considers that these classes of market benefit are not likely to be material; (iv) the estimated construction timetable and commissioning date; and (v) to the extent practicable, the total indicative capital and operating and maintenance costs.	5 & 6

Appendix B Definitions

All laws, regulations, orders, licences, codes, determinations and other regulatory instruments (other than the Rules) which apply to Registered Participants from time to time, including those applicable in each participating jurisdiction as listed below, to the extent that they regulate or contain terms and conditions relating to access to a network, connection to a network, the provision of network services, network service price or augmentation of a network.

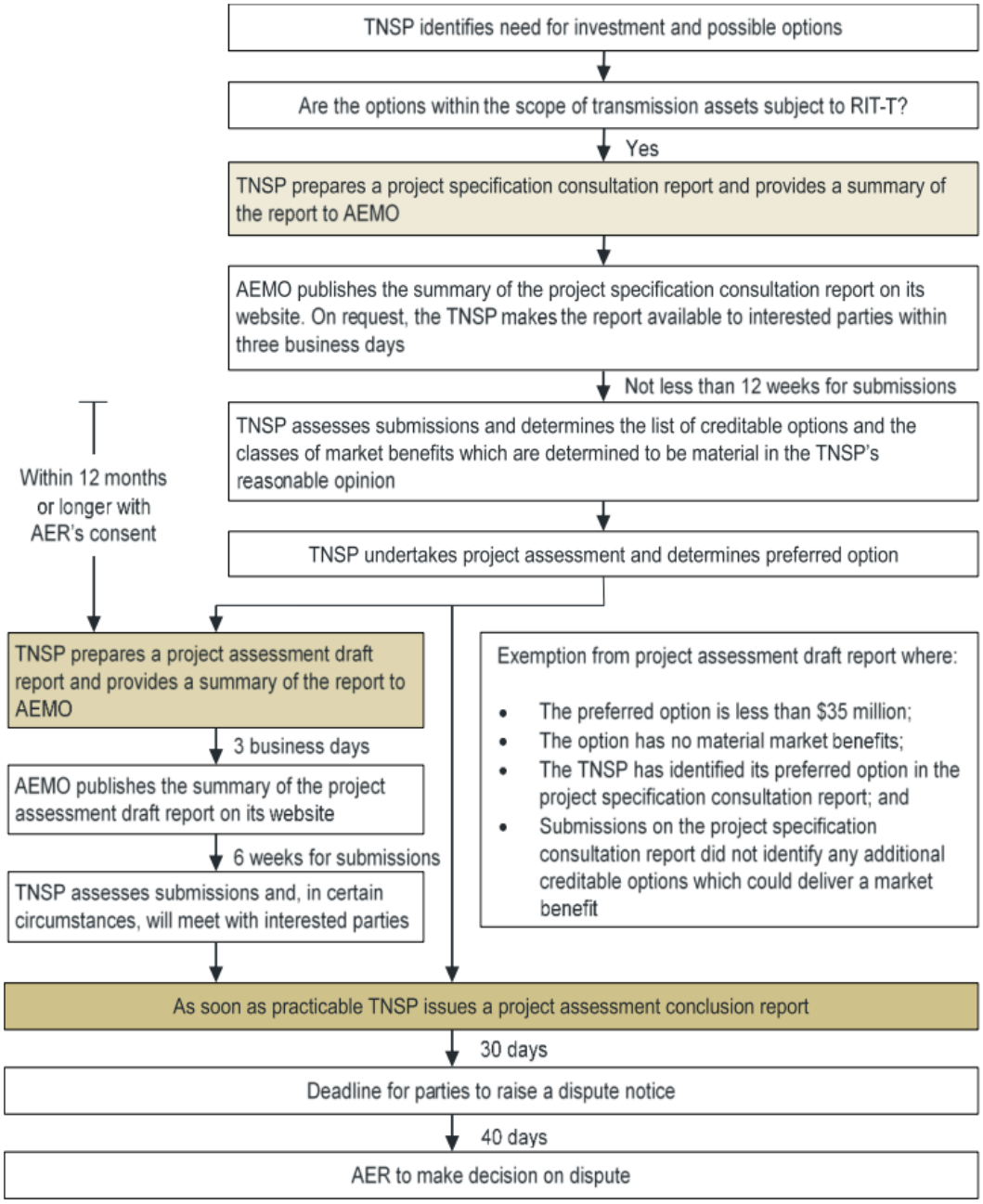
A comprehensive list of applicable regulatory instruments is provided in the Rules.

Applicable regulatory instruments	
AEMO	Australian Energy Market Operator
Base case	A situation in which no option is implemented by, or on behalf of the transmission network service provider.
Commercially feasible	An option is commercially feasible if a reasonable and objective operator, acting rationally in accordance with the requirements of the RIT-T, would be prepared to develop or provide the option in isolation of any substitute options. This is taken to be synonymous with 'economically feasible'.
Costs	Costs are the present value of the direct costs of a credible option.
Credible option	A credible option is an option (or group of options) that: 1. address the identified need; 2. is (or are) commercially and technically feasible; and 3. can be implemented in sufficient time to meet the identified need.
Economically feasible	An option is likely to be economically feasible where its estimated costs are comparable to other credible options which address the identified need. One important exception to this Rules guidance applies where it is expected that a credible option or options are likely to deliver materially higher market benefits. In these circumstances the option may be "economically feasible" despite the higher expected cost. This is taken to be synonymous with 'commercially feasible'.
Identified need	The reason why the Transmission Network Service Provider proposes that a particular investment be undertaken in respect of its transmission network.
Market benefit	Market benefit must be: a) the present value of the benefits of a credible option calculated by: i. comparing, for each relevant reasonable scenario: A. the state of the world with the credible option in place to B. the state of the world in the base case, And ii. weighting the benefits derived in sub-paragraph (i) by the probability of each relevant reasonable scenario occurring. b) a benefit to those who consume, produce and transport electricity in the market, that is, the change in producer plus consumer surplus.
Net market benefit	Net market benefit equals the market benefit less costs.
Preferred option	The preferred option is the credible option that maximises the net economic benefit to all those who produce, consume and transport electricity in the market compared to all other credible options. Where the identified need is for reliability corrective action, a preferred option may have a negative net economic benefit (that is, a net economic cost).
Reasonable Scenario	Reasonable scenario means a set of variables or parameters that are not expected to change across each of the credible options or the base case.

Appendix C Process for implementing the RIT-T

For the purposes of applying the RIT-T, the NER establishes a three stage process: (1) the PSCR; (2) the PADR; and (3) the PACR. This process is summarised in the figure below.

Figure 8 The RIT-T assessment and consultation process



Source: AER, Final Regulatory investment test for transmission application guidelines, June 2010, p.43