



# **Decision**

## **Eyre Peninsula Electricity Supply Options**

**Determination that preferred option  
satisfies the regulatory investment  
test for transmission**

April 2019

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## Executive summary

The Australian Energy Regulator (AER) has determined that the preferred option identified by ElectraNet to provide an efficient and reliable electricity supply to the Eyre Peninsula into the future satisfies the regulatory investment test for transmission (RIT-T) under the National Electricity Rules (NER).<sup>1</sup>

Our determination that the proposed investment satisfies the RIT-T is one of the trigger events for the Eyre Peninsula Reinforcement contingent project in ElectraNet's current revenue determination.<sup>2</sup> These trigger events must be satisfied before ElectraNet can apply to us to amend its revenue determination to recover the costs of the project during the 2018-23 regulatory control period.

We expect that ElectraNet will now apply to us to recover costs associated with upgrading the Eyre Peninsula transmission network during the 2018–23 regulatory control period. We will review ElectraNet's contingent project application, and determine the incremental revenue ElectraNet may recover within the 2018–23 regulatory control period for the efficient costs attributable to this project.

### The regulatory investment test for transmission

The RIT-T is an economic cost benefit analysis that Transmission Network Service Providers use to identify preferred investment options to meet network needs. The purpose of the RIT-T is to identify the credible option that maximises the present value of the net economic benefit to all those who produce, consume and transport electricity in the market (the preferred option).<sup>3</sup>

Fulfilling this purpose contributes to achieving the National Electricity Objective (NEO) to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity.<sup>4</sup> Before investing in a large project to meet a need on the transmission network, a RIT-T proponent must consider all credible options to meet that need, before selecting the option with the highest net economic benefit to the market. This promotes efficient investment outcomes.

The RIT-T further promotes investment efficiency by imposing transparency and accountability on major transmission investment decisions, and by promoting a predictable network development framework around which competitive investments can be made without bearing unnecessary risks arising from inefficient investment.

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<sup>1</sup> National Electricity Rules, clause 5.16.6b).

<sup>2</sup> AER, Final decision, *Attachment 6, ElectraNet transmission final determination 2018–23: Capital expenditure*, April 2018, p. 6-19.

<sup>3</sup> National Electricity Rules, clause 5.16.1.

<sup>4</sup> National Electricity Law, Section 7.

## Eyre Peninsula Electricity Supply Options RIT-T

Between July 2017 and October 2018, ElectraNet conducted a RIT-T to explore options for meeting its reliability standard obligations and providing an efficient electricity supply to the Eyre Peninsula, including 'future proofing' to accommodate potential mining and renewable energy developments.

Through the RIT-T process, ElectraNet considered a range of investment options to provide an efficient and reliable electricity supply to the Eyre Peninsula that increase net market benefits compared to both a 'do nothing' base case and the line reconductoring option allowed for in its 2018–23 revenue determination.

ElectraNet's Project Assessment Conclusions Report (PACR) found that the preferred option to provide an efficient and reliable electricity supply to the Eyre Peninsula is:<sup>5</sup>

- a new double-circuit line from Cultana to Yadnarie, initially energised at 132 kV, but which has the option to be energised at 275 kV if required in future; and
- a new 132 kV double-circuit line from Yadnarie to Port Lincoln.

ElectraNet found the preferred option (Option 4D in the PACR) will deliver net market benefits of around \$140-150 million (in present value terms) over 20 years relative to a 'do nothing' base case, and net benefits of \$50-60 million when compared to the option of reconductoring the existing line and renewing network support arrangements at Port Lincoln.<sup>6</sup> The key benefits associated with the preferred option are: avoiding future network support and reconductoring costs; reduced unserved energy; and wholesale market benefits driven by relieving constraints on existing Eyre Peninsula wind farms.

The initial capital cost of the project is estimated to be \$240 million. Additional capex (approximately \$40 million) would be required in future if the Cultana to Yadnarie line is upgraded to 275 kV and for the future replacement of Yadnarie substation, if justified by future developments on the Eyre Peninsula.

### Assessment approach

For us to make a determination that the preferred option satisfies the RIT-T, the preferred option must be the credible option that maximises the net economic benefit, in present value terms, to all those who produce, consume and transport electricity in the NEM.

When applying the RIT-T, ElectraNet was broadly required to:

- identify the need for investment
- identify the base case and set of credible options to address the identified need

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<sup>5</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 3.

<sup>6</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 5.

- identify a set of reasonable scenarios that are appropriate to the credible options under consideration
- quantify the expected costs and market benefits of each credible option
- identify the preferred option—that is, the option with the highest expected net economic benefit.

If the Eyre Peninsula Electricity Supply Options RIT-T satisfies the requirements of each of these steps and there have been no material errors in calculation, or unreasonable inputs or assumptions applied that affect the ranking of options, then we consider that the credible option identified as the preferred option satisfies the RIT-T.

We engaged an expert consultant, Frontier Economics (Frontier), to assist us in assessing the Eyre Peninsula Electricity Supply Options RIT-T. Frontier assisted us in testing the modelling methodologies, inputs, assumptions, and outcomes of the PACR.

As part of our assessment, we considered concerns raised by stakeholders through the RIT-T process, and how ElectraNet responded to those concerns in the PACR.

Our assessment is based on the findings and material set out in the PACR. We also sought further information from ElectraNet as required. The scope of our assessment included a review of the economic analysis and modelling undertaken by ElectraNet in the RIT-T which underpins the identification of the preferred option. This included an assessment of the reasonableness of inputs and assumptions, the methodology adopted for assessing benefits, and the adequacy of sensitivity analysis included in the analysis. We did not separately undertake our own market modelling or cost benefit analysis of the potential investment options.

### **AER determination**

In accordance with clause 5.16.6(b) of the National Electricity Rules, our determination is that the preferred option identified in the Eyre Peninsula Electricity Supply Options RIT-T satisfies the RIT-T. We consider that:

- the identified need in the Eyre Peninsula Electricity Supply Options RIT-T is consistent with the requirements of the RIT-T.
- the credible options assessed meet the definition of a credible option, and the number and range of credible options is appropriate given the magnitude of the likely costs of the credible options.
- the number, choice and weighting of the reasonable scenarios modelled by ElectraNet satisfies the requirements of the RIT-T.
- the costs of the credible options have been appropriately quantified.
- the selection of material market benefits and the quantification of those material market benefits satisfies the requirements of the RIT-T. To the extent that any of the classes of market benefits may not have been appropriately quantified, this would not have affected which credible option is identified as the preferred option.
- Option 4D was correctly identified as the preferred option.

# 1 Introduction

This section sets out relevant background information to our determination of whether the preferred option satisfies the RIT-T.

## 1.1 Who we are and our role in this process

The Australian Energy Regulator (AER) is the economic regulator for electricity transmission and distribution services in the National Electricity Market (NEM).

We are responsible for developing, publishing and maintaining the regulatory investment test for transmission (RIT-T) and accompanying RIT-T application guidelines.<sup>7</sup> The RIT-T is an economic cost benefit analysis that is used to assess different investment options to address an identified need within a transmission network. The RIT-T application guidelines provide guidance on the operation and application of the RIT-T.

Following the finalisation of a RIT-T through the publication of a PACR, a RIT-T proponent may make a written request to the AER to make a determination on whether the preferred option satisfies the RIT-T. Our determination may then constitute a trigger for a contingent project application, whereby the transmission business can seek to recover efficient costs associated with delivering the project in the current regulatory control period.

## 1.2 Who is ElectraNet?

ElectraNet is the transmission business which plans, owns, builds and operates the electricity transmission network in South Australia. ElectraNet's transmission revenues are regulated through five year transmission determinations. ElectraNet's current transmission determination commenced on 1 July 2018 and will finish on 30 June 2023.

## 1.3 ElectraNet proposal

On 23 November 2018, ElectraNet submitted a written request to the AER for a determination on whether the preferred option identified in the Eyre Peninsula Electricity Supply Options RIT-T satisfies the RIT-T.<sup>8</sup>

## 1.4 The Eyre Peninsula Electricity Supply Options RIT-T

The Eyre Peninsula is served by a radial 132 kV transmission line which runs from Cultana to Port Lincoln via Yadnarie.<sup>9</sup> A radial 132 kV line also extends from Yadnarie

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<sup>7</sup> The RIT-T and RIT-T application guidelines are available on the AER's website.

<sup>8</sup> ElectraNet's proposal is available on the AER's website.

<sup>9</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 23



to Wudinna to supply the West Coast of Eyre Peninsula. The South Australian Electricity Transmission Code (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.<sup>10</sup> Supply to Port Lincoln is supported by network support arrangements which enable ElectraNet to call upon generation at Port Lincoln when needed.

The existing line to Port Lincoln has been in service since 1967.<sup>11</sup> Sections of the line are nearing the end of their functional life and will require replacement in the next few years. To enable this work, ElectraNet included in its 2018–23 revenue proposal forecast capex for the replacement of major transmission line components on the Eyre Peninsula. Our final determination for the 2018–23 regulatory control period included forecast capital expenditure of approximately \$80 million for reconductoring sections of the existing transmission line from Cultana to Yadnarie and Yadnarie to Port Lincoln, and ongoing network support costs of around \$8 to \$9 million per annum to provide backup supply to Port Lincoln.<sup>12</sup>

However, we also recognised that ElectraNet was continuing to explore broader alternatives that may deliver greater net benefits for customers, including full line replacement options, through a RIT-T assessment that was underway at that time. We therefore included a contingent project, the Eyre Peninsula Reinforcement project, that would allow our determination to be varied if a more efficient option was identified through this RIT-T assessment.<sup>13</sup>

The RIT-T process has enabled ElectraNet to explore a range of options and has identified the preferred option of:

- a new double-circuit line from Cultana to Yadnarie initially energised at 132 kV, but which has the option to be energised at 275 kV if required in the future; and
- a new 132 kV double-circuit line from Yadnarie to Port Lincoln.

ElectraNet has identified its preferred option as the most cost effective solution which maximises net market benefits by:<sup>14</sup>

- increasing reliability of electricity supply to customers on the Eyre Peninsula, reducing the frequency of outages;
- removing current network constraints, allowing the market to benefit from more low-cost energy from existing wind farms on the Eyre Peninsula;

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<sup>10</sup> South Australian Electricity Transmission Code TC/09.1, 23 August 2018, p. 9.

<sup>11</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 23.

<sup>12</sup> AER, *ElectraNet Transmission Determination 2018 to 2023, Final Decision, Attachment 6 – Capital Expenditure*, April 2018, pp. 6-11 to 6-15 and Overview pp 24-27.

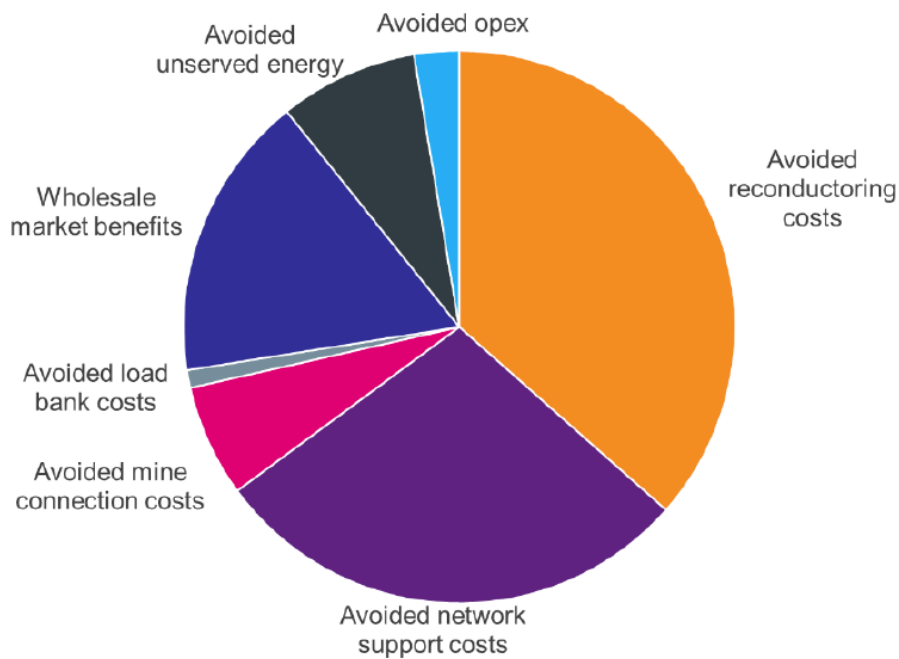
<sup>13</sup> AER, *ElectraNet Transmission Determination 2018 to 2023, Final Decision, Attachment 6 – Capital Expenditure*, April 2018, p. 6-19.

<sup>14</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options RIT-T – Request for determination*, 23 November 2018, pp. 2-10.

- providing greater opportunities for new demand and renewable energy developments on the Eyre Peninsula; and
- allowing for cost-effective expansion of network capacity when needed in the future to accommodate potential larger mining developments and renewable energy investment on the Eyre Peninsula.

The breakdown of benefits provided by the preferred option is shown in Figure 1 below, reproduced from ElectraNet’s PACR.

**Figure 1: Breakdown of benefits for the preferred option (Option 4D)**



Source: ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 5.

ElectraNet’s RIT-T assessment investigated five broad options for supplying the Eyre Peninsula, together with variants of these options, ranging from maintaining equivalent current capacity on the Eyre Peninsula, including a backup generation network support arrangement, through to upgrading the network to 275 kV with two divergent network paths.<sup>15</sup>

The preferred option is estimated to deliver net market benefits of around \$150 million over the next 20 years relative to a ‘do nothing’ base case with a new SA-NSW interconnector in-place, or \$140 million without a new interconnector. The estimated net market benefits are approximately \$60 million and \$50 million more than

<sup>15</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options RIT-T – Request for determination*, 23 November 2018, p. 3.

reconductoring the existing line and renewing a network support contract at Port Lincoln with and without the interconnector respectively.<sup>16</sup>

The estimated capital cost of the preferred option is \$240 million (around \$160 million more than reconductoring sections of the existing transmission line).<sup>17</sup> ElectraNet can deliver the project by the end of 2021, subject to necessary statutory approvals.<sup>18</sup>

ElectraNet considers that the cost of the new transmission line is fully offset by avoiding the cost of replacement works on the existing line and ongoing network support costs of \$8 to \$9 million per year, essentially resulting in a neutral price impact for the average residential electricity customer in South Australia.<sup>19</sup>

## 1.5 Why did ElectraNet request that the AER make this determination?

This determination that the preferred option identified in the Eyre Peninsula Electricity Supply Options RIT-T satisfies the RIT-T is a trigger event for the Eyre Peninsula Reinforcement contingent project in ElectraNet's 2018–23 revenue determination.

Contingent projects are significant network augmentation projects that may arise during the regulatory period but are not yet committed and are not provided for in a capex forecast. Contingent projects are linked to unique investment drivers and are subject to a set of 'trigger events'.<sup>20</sup>

In our final decision on ElectraNet's 2018–23 revenue determination, published in April 2018, we approved the Eyre Peninsula Reinforcement project as a contingent project with the following trigger events:<sup>21</sup>

1. Successful completion of a RIT-T including an assessment of credible options identifying the duplication or replacement of the existing Cultana to Yadnarie and/or Yadnarie to Port Lincoln transmission lines as the preferred option that maximises positive net economic benefits and/or addresses a reliability corrective action.
2. Determination by the AER that the proposed investment satisfies the RIT-T.
3. ElectraNet Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.
4. Clauses 1 and 2 do not apply if a change in the law occurs that allows the inclusion of the proposed investment in ElectraNet's maximum allowed revenue under this revenue determination even if a RIT-T is not carried out.

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<sup>16</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options RIT-T – Request for determination*, 23 November 2018, p. 3.

<sup>17</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 5.

<sup>18</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options RIT-T – Request for determination*, 23 November 2018, p. 3.

<sup>19</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 5.

<sup>20</sup> National Electricity Rules, clauses 6A.8.1(b)(4) and 6A.8.1(c)(5).

<sup>21</sup> AER, *30 April 2018, Final decision - ElectraNet determination 2018–23*, p. 6–19.

The completion of the Eyre Peninsula Electricity Supply Options RIT-T on 18 October 2018, identifying a preferred investment option, satisfied the first trigger event. This determination satisfies the second trigger event.

In respect to the third trigger event, the ElectraNet Board has committed to progress the preferred option, subject to the AER awarding incremental revenue commensurate with the capex and opex costs of the project.<sup>22</sup> The fourth trigger event does not apply.

Once the specified trigger events occur, ElectraNet may submit a contingent project application<sup>23</sup> to us seeking the amendment of its 2018–23 revenue determination to include the cost of the Eyre Peninsula Reinforcement project.

The contingent project application is separate from this determination on whether the preferred option satisfies the RIT-T.<sup>24</sup> The contingent project application would seek a determination by us on the capex and incremental opex that is reasonably required by ElectraNet for the purpose of undertaking the Eyre Peninsula Reinforcement project and the incremental revenue ElectraNet is likely to require as a result.

## 1.6 Structure of this document

This decision is structured as follows:

- section two sets out our assessment approach
- section three sets out our assessment of the application of the RIT-T by ElectraNet
- section four sets out our determination that the preferred option identified by ElectraNet satisfies the RIT-T, including the reasons for the determination.

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<sup>22</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options RIT-T – Request for determination*, 23 November 2018, p. 2.

<sup>23</sup> National Electricity Rules, clause 6A.8.2.

<sup>24</sup> That is, any future decision on a contingent project application relating to the Eyre Peninsula Reinforcement project is a separate decision that will be made independently of the analysis in this determination.

## 2 Assessment approach

This section outlines our assessment approach.

In making this determination, we have used the findings and recommendations in the PACR, sought further information from ElectraNet,<sup>25</sup> and had regard to other matters that we consider to be relevant.<sup>26</sup>

In order to make a determination that the preferred option identified satisfies the RIT-T, we must be satisfied that the preferred option is the credible option which maximises the net economic benefits, in present value terms, for all those who produce, consume and transport electricity in the NEM. In making this assessment, we have not sought to undertake our own modelling of costs and benefits or replicate the work undertaken by ElectraNet through the RIT-T process. This would effectively place the AER in the role of the RIT-T proponent or transmission planner. Rather, our approach involves us assessing:

- the process—whether ElectraNet has followed the RIT-T process in accordance with the requirements of the NER and the RIT-T application guidelines; and
- the outcome—whether the preferred option identified in the PACR is likely to be the option that maximises the net economic benefit, in present value terms, for the market, with regard to the reasonableness of the inputs, assumptions and methodologies applied to identify the preferred option. This includes a review of how the PACR has addressed issues raised in stakeholder submissions through the RIT-T process.

As set out in the RIT-T application guidelines, the broad steps involved in applying the RIT-T are:<sup>27</sup>

1. Identify the need for investment. The identified need may be for reliability corrective action or to increase the sum of consumer and producer surplus in the NEM.
2. Identify the base case and a set of credible options to address the identified need.
3. Identify a set of reasonable scenarios that are appropriate to the credible options under consideration. A reasonable scenario is a set of variables or parameters that are not expected to change across each of the credible options or base case.<sup>28</sup>
4. Quantify the expected costs of each credible option.
5. Quantify the expected market benefits of each credible option.
6. Quantify the expected net economic benefit of each credible option and identify the preferred option as the option with the highest expected net economic benefit.

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<sup>25</sup> We issued an information request to ElectraNet on 1 February 2019. ElectraNet responded on 22 February 2019.

<sup>26</sup> National Electricity Rules, clause 5.16.6(b)(2)-(4).

<sup>27</sup> AER, *Final - Regulatory investment test for transmission application guidelines*, 29 June 2010, p. 7.

<sup>28</sup> AER, *RIT-T*, June 2010, paragraph 15.

We have assessed whether the Eyre Peninsula Electricity Supply Options RIT-T satisfies the requirements of each of the above steps, and whether there have been any material errors made or unreasonable inputs, assumptions or approaches applied by ElectraNet in undertaking the RIT-T.

Where we have identified a potential issue, we have then considered whether the issue was likely to affect the identification of the preferred option as set out in the in the Eyre Peninsula Electricity Supply Options PACR.

## 2.1 Our expert consultant

To assist in our review, we engaged Frontier to undertake an independent review of the findings and conclusions presented in the Eyre Peninsula Electricity Supply Options PACR. In particular, Frontier considered the reasonableness of ElectraNet's:<sup>29</sup>

- inputs and assumptions used in the RIT-T
- methodology for assessing the net economic benefits of credible options
- sensitivity analysis, to test whether the identification of the preferred option is robust to changes in key parameters.

Frontier's report is available on our website.

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<sup>29</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019.

## 3 AER assessment of RIT-T application

In accordance with the assessment approach outlined in section 2, this section outlines our assessment of whether the preferred option identified through the Eyre Peninsula Electricity Supply Options RIT-T satisfies the requirements of the RIT-T. Where the assessment identifies a concern with any aspect of the Eyre Peninsula Electricity Supply Options RIT-T, we have considered whether this will affect the selection of the preferred option. The structure of this section follows the broad steps involved in applying the RIT-T, as set out in section 2 above and in the RIT-T application guidelines.

### 3.1 Identified need

The identified need is the objective which the RIT-T proponent seeks to achieve by investing in its transmission network.<sup>30</sup> The identified need may consist of meeting reliability standards or an increase in the sum of consumer and producer surplus.<sup>31</sup>

The identified need in the Eyre Peninsula Electricity Supply Options RIT-T is to meet the South Australian ETC reliability service standards at Port Lincoln most efficiently into the future, and to ensure reliable electricity supply to the entire Eyre Peninsula.<sup>32</sup>

#### 3.1.1 AER's assessment and conclusion

As outlined in the RIT-T application guidelines, the identified need is to be expressed as the achievement of a desired end or objective and not simply the means to achieve a desired objective or end.<sup>33</sup>

We consider the identified need in the Eyre Peninsula Electricity Supply Options RIT-T, which includes both meeting the reliability service standards in the ETC and exploring options to increase the sum of producer and consumer surplus in the NEM, is consistent with the requirements of the RIT-T and the RIT-T guidelines.

### 3.2 Identification of credible options and the base case

When applying the RIT-T, the proponent must consider all options that could reasonably be considered as credible options. A credible option is an option that addresses the identified need, is commercially and technically feasible, and can be implemented in sufficient time to address the identified need.<sup>34</sup>

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<sup>30</sup> National Electricity Rules, chapter 10.

<sup>31</sup> This means that the investment option must increase the welfare of all who produce, consume and transport electricity in the NEM as a whole and not merely transfer wealth from one class in the NEM (i.e. consumers) to another (i.e. producers).

<sup>32</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 27.

<sup>33</sup> RIT-T application guidelines, p. 7.

<sup>34</sup> National Electricity Rules, clause 5.15.2.

The Eyre Peninsula Electricity Supply Options PACR assessed twelve credible options, covering a range of different network configurations and capacities.<sup>35</sup> Table 3.1 below summarises the credible options considered by ElectraNet.

**Table 3.1: Summary of credible options considered**

Description of credible option	
Option 1	Option 1 involves reconductoring of four sections (totalling 118 km) of the existing 132 kV network. It also involves the continuation of a network support agreement at Port Lincoln. Capital costs for the reconductoring works are estimated to be in the order of \$80 million. Additional capital costs to reconnector the remaining sections of the 132 kV line are estimated to be in the order of \$90 million, expected around 2033.
Option 2	This option involves construction of a double-circuit 132 kV line following a Cultana to Yadnarie to Port Lincoln route. Capital costs for this option are estimated to be in the order of \$225 million.
Option 2B	Option 2B is a new lower capacity option introduced since the PADR in response to submissions received. Option 2B involves reconductoring sections of the existing line and building a new 132 kV line on a separate easement from Cultana to Port Lincoln, via Yadnarie. Capital costs for this option are estimated to be in the order of \$215 million. Additional capital costs to reconnector the remaining sections of the old 132kV line are estimated to be \$25 million, expected around 2033.
Option 4A	Option 4A is a high-capacity 'set and forget' option where the entire double-circuit line is built and operated at 275 kV initially. Option 4A has been included to investigate whether it is ever efficient to build and operate the entire double-circuit line to 275 kV initially – in particular, where it is expected that mining developments will come online with a high probability. Capital costs for this option are estimated to be in the order of \$330 million
Option 4B	Option 4B is a low cost 275 kV 'set and forget' option where the Cultana to Yadnarie double-circuit line is built and operated at 275 kV initially while the Yadnarie to Port Lincoln double-circuit line is built and operated at 132 kV (and cannot be upgraded to 275 kV later). Capital costs for this option are estimated to be in the order of \$275 million.
Option 4C	This option is similar in route and build design to options 2, 4A and 4B with the main difference being that, while built to operate at 275 kV if required, it is initially operated at 132 kV. Option 4C therefore allows the option of being able to upgrade the network capacity to 275 kV later, if it is efficient to do so. Capital costs for this option are estimated to be in the order of \$250 million. The additional cost build associated with exercising the 'option' of upgrading the full network to 275 kV at a later date if mining and/or wind develop, is estimated as \$80 million. If only the Cultana to Yadnarie section is upgraded to 275 kV operation, the upgrade cost is estimated as \$40 million.
Option 4D	This option is similar in route and design to options 2, 4A and 4B with the main difference being that, while initially operated at 132 kV, the section from Cultana to Yadnarie is built to operate at 275 kV, if required. The remainder of the Eyre Peninsula (i.e. Yadnarie to Port Lincoln) is only ever built and operated at 132 kV. Option 4D therefore allows the option upgrading the Cultana to Yadnarie network capacity to 275 kV later, if efficient to do so. Capital costs for this option built to 275 kV but operated at 132 kV initially are estimated to be in the order of \$240 million.
Option 3	This option involves construction of two single-circuit 132 kV lines from Cultana to Port Lincoln route, with one going via Yadnarie and another going via Wudinna. Capital costs for this option are estimated to be in the order of \$405 million.
Option 3B	Option 3B involves reconductoring sections of the existing line and building a new 132 kV line on a separate easement from Cultana to Port Lincoln, via Wudinna. Capital costs for this option are estimated to be in the order of \$295 million.

<sup>35</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, pp. 8-9.



Option 5A	Option 5A is a high-cost/capacity 'set and forget' option where both circuits are built and operated at 275 kV initially (one via Wudinna). Capital costs for this option are estimated to be in the order of \$560 million.
Option 5B	Option 5B has been included as a 'set and forget' version where the Cultana to Wudinna single-circuit line is built and operated at 275 kV initially while the rest of the Eyre Peninsula is built and operated at 132 kV (and cannot be upgraded to 275 kV later). Capital costs for this option are estimated to be in the order of \$450 million.
Option 5C	This option is similar in route and build design to options 3, 5A and 5B with the main difference being that, while it is built to be able to operate at 275 kV if need be, it is initially operated at 132 kV. Option 5C, like 4C and 4D, therefore allows the option of being able to upgrade the network capacity to 275 kV later, if it is efficient to do so. Capital costs for this option are estimated to be in the order of \$455 million. The additional cost build associated with exercising the 'option' of upgrading the network (or part of it) to 275 kV at a later date if mining and/or wind develop, is estimated as \$110 million

Source: ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, pp. 78-93.

In addition to the 12 credible options considered in the PACR, ElectraNet also considered but did not progress a number of other options because they were not considered to be technically or economically feasible.<sup>36</sup> These other options included consideration of de-energised reconductoring, a staged build supported by network support, a submarine cable between Adelaide and Port Lincoln via the Yorke Peninsula, battery network support, and micro-grids.

### 3.2.1 Frontier's assessment

Frontier noted that ElectraNet had opted for a 'business as usual' base case, in place of a 'do nothing' case. The business as usual base case modelled in the PACR incorporates a partial reconductoring of the existing 132 kV line serving the Eyre Peninsula in the 2018–23 regulatory control period.<sup>37</sup> Table 3.2 below illustrates the costs and benefits of the reconductoring works. The benefits of the works stem from reduced 'risk costs' – the product of the probability of failure, likelihood of consequence, and the cost of consequence – which were estimated by external consultant AMCL.

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<sup>36</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 37.

<sup>37</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 3.

**Table 3.2: Do nothing vs ‘BAU’ net benefits**

Cost and benefits for options relative to the ‘do nothing’ case (PV \$millions, 2017)		
Costs/benefits	Option 1	Option 1A
	(47.9)	(29.5)
Costs	None	None
	6.9	5.5
Benefits <sup>155</sup>	55.8	46.0
	73.2	61.3
<b>Total net present benefits</b>	<b>88.1</b>	<b>83.3</b>

Source: ElectraNet, *Eyre Peninsula Electricity Supply Options Project Assessment Draft Report*, 16 November 2017, p. 112.

Frontier considered that the net benefits of the identified options should be assessed against a ‘do nothing’ case.<sup>38</sup> Since the reconductoring works have not been committed, Frontier advised that the ‘do nothing’ case should be a case in which the reconductoring is not undertaken. However, Frontier concluded that this may make no difference to the conclusions of the PACR.<sup>39</sup>

As ElectraNet’s analysis assessed the incremental costs and benefits relative to the reconductoring case, ElectraNet treated ‘avoided’ reconductoring costs as a benefit, but did not treat the reduced risks costs discussed above as a benefit.

Frontier concluded that as long as these reduced risk costs still occur under each of the identified options, and are greater than ‘avoided’ reconductoring costs, ElectraNet’s analysis would not be affected by treating the reconductoring option as the base case.<sup>40</sup>

### 3.2.2 AER’s assessment and conclusion

We are satisfied that ElectraNet considered a reasonable range of credible options to address the identified need, and that the options assessed meet the definitional requirements of a credible option under the National Electricity Rules.<sup>41</sup>

ElectraNet assessed a broad set of investment options, including options involving non-network alternatives. The PACR models 12 credible options: a ‘business as usual’ base case and 11 options that reflect a variety of different network capacities and

<sup>38</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 5.

<sup>39</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 6.

<sup>40</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 6.

<sup>41</sup> As defined in clause 5.15.2 of the NER.

routes. ElectraNet considered two additional credible options in the PACR in response to submissions received on the PADR – options 2B and 3B.<sup>42</sup>

In regard to ElectraNet’s selection of the ‘business as usual’ base case rather than the ‘do nothing’ option as the primary point of comparison for assessing the net benefits of credible options, we consider this to be reasonable in the circumstances. The ‘business as usual’ base case involves reconductoring sections of the existing transmission line and establishing a new backup generation network support arrangement at Port Lincoln. The ‘do nothing’ option involves no reconductoring of the existing line, and therefore reflects a reliance on increasing reactive maintenance and ongoing network support.

ElectraNet’s revenue determination for the 2018–23 regulatory control period included an allowance for capital expenditure to replace sections of the existing transmission line, consistent with the ‘business as usual’ base case in the PACR. Therefore, ElectraNet will commence recovering those costs in the current regulatory control period unless they are ‘avoided’ through an alternative investment option. Also, as shown in Table 3.2, ElectraNet has demonstrated that the ‘business as usual’ reconductoring option provides significant benefits over and above the ‘do nothing’ option. These benefits, which are driven by reduced cost arising from equipment failures, are common to all investment options. It is therefore reasonable to conclude that ElectraNet’s use of the ‘business as usual’ base case does not affect the outcomes of ElectraNet’s analysis in the PACR.

### 3.3 Reasonable scenarios considered

The RIT-T requires a proponent to model reasonable scenarios to assess the market benefits of the credible options under consideration.<sup>43</sup> A reasonable scenario is a set of variables or parameters of relevant market supply and demand characteristics and conditions which is not expected to change across each of the credible options or the base case.<sup>44</sup> The number and choice of reasonable scenarios must be appropriate to the credible options under consideration.<sup>45</sup> Therefore, the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect the ranking of credible options or the sign of the net economic benefits of any of the credible options.<sup>46</sup>

A weighting to each reasonable scenario must be assigned that reflects the probability of the reasonable scenario occurring.<sup>47</sup>

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<sup>42</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 34.

<sup>43</sup> AER, *RIT-T*, June 2010, paragraph 4.

<sup>44</sup> AER, *RIT-T*, June 2010, paragraph 15.

<sup>45</sup> AER, *RIT-T*, June 2010, paragraph 16.

<sup>46</sup> AER, *RIT-T*, June 2010, paragraph 16.

<sup>47</sup> AER, *RIT-T*, June 2010, paragraph 4(a)(ii).

ElectraNet engaged HoustonKemp to undertake market modelling to assess the market benefits expected to arise for each of the options under a range of scenarios. The Eyre Peninsula Electricity Supply Options RIT-T modelled three scenarios: the base scenario, the low scenario, and the high scenario.<sup>48</sup>

The modelled scenarios were also tested against a range of sensitivities including two ‘discretionary parameters’. These are parameters which represent a material uncertainty with regards to the market modelling. The market modelling and option value analysis was recalculated for each set of discretionary parameters, namely:

- with / without a new interconnector between New South Wales and South Australia; and
- with / without a 52 per cent national emissions reduction target by 2030, rather than a 28 per cent emissions reductions target.

A summary of weightings and parameters of each of the reasonable scenarios is outlined in table 3.3 below.

**Table 3.3: Eyre Peninsula Electricity Supply Options RIT-T reasonable scenarios**

	CENTRAL (BASE) SCENARIO	LOW SCENARIO	HIGH SCENARIO
WEIGHTING (%)	50%	25%	25%
DEMAND GROWTH	Neutral	Weak	Strong
MINING LOAD	Iron Road	No mining	Iron Road and Other
GAS PRICES	Neutral	Low	High
EMISSIONS REDUCTION BY 2030	28% / 52%	28% / 52%	28% / 52%
ADDITIONAL INTERCONNECTION	With / Without	With / Without	With / Without

Source: ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 43.

<sup>48</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 42.

The PACR also modelled a number of additional sensitivities, including:<sup>49</sup>

- zero probability of the Iron Road Central Eyre Iron Project (CEIP) being developed and zero probability of other mines being developed
- 5.8 per cent probability of Iron Road being developed and 1.0 per cent probability of other mines being developed
- 30% higher / lower annual network support costs
- 15% higher / lower capital costs
- a high discount rate of 8.50 per cent, and a low discount rate of 3.63 per cent.

### 3.3.1 Frontier's assessment

Frontier assessed the scenarios and sensitivities that ElectraNet used to model the market benefits of the identified options.

Frontier found that while many of the scenarios and sensitivities do affect the size of the net economic benefit, for the most part they do not affect the ranking of the credible options or the sign of the net economic benefit. Frontier therefore concluded that the scenarios and sensitivities were generally appropriate.<sup>50</sup>

Frontier considered whether there might be other sensitivities that affect the ranking of credible options or the sign of the net economic benefit.<sup>51</sup> Frontier noted that the key drivers of wholesale market benefits and avoided unserved energy are assumptions about:

- changes in unserved energy (USE) to customers
- differences in assumptions about marginal loss factors (MLFs)
- differences in the assumption about the existence of constraints on the existing wind farms on the Eyre Peninsula.

Frontier considered that the differences in demand incorporated in the reasonable scenarios would result in differences in USE. Frontier found, based on the PACR, that it was not clear whether ElectraNet had assessed whether there are plausible sensitivities for MLFs or for constraints on existing wind farms. However, Frontier concluded that these sensitivities were unlikely to affect the ranking of the credible options or the sign of the net economic benefit, or change the overall economic assessment of the credible options.<sup>52</sup>

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<sup>49</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, pp. 66-70.

<sup>50</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 14.

<sup>51</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 14.

<sup>52</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 14.

### 3.3.2 AER's assessment and conclusion

We consider that the number, choice and weighting of the reasonable scenarios modelled by ElectraNet satisfies the requirements of the RIT-T.

The number of reasonable scenarios was appropriate to the credible options considered by ElectraNet and HoustonKemp. We also consider that the weighting assigned to the scenarios reasonably reflects the probability of each relevant scenario occurring. The base scenario has been weighted more heavily given it is considered more likely, while the high and low scenarios are equally weighted as there is no evidence to weight one as more likely than the other.

The choice of variables and parameters in the reasonable scenarios selected sufficiently reflected those which were likely to affect the ranking of the credible option or the sign of the net economic benefit of any of the credible options. These variables, as outlined in Table 3.3, capture within the market modelling the likely drivers of key benefits, including the triggers for network upgrades in the flexible options (4C, 4D and 5C) and increasing demand associated with possible mining loads.

In preparing the PACR, ElectraNet updated many of the variables and parameters in the reasonable scenarios from the PADR to align with AEMO's 2018 Integrated System Plan (ISP). These include the 'state of the world' assumptions around gas prices and electricity demand, as well as assumptions around the relative quality of the wind resource on the Eyre Peninsula. We consider this to be a reasonable approach in the circumstances, as the 2018 ISP represented the most current and credible source for these assumptions at that time. While we note that while many of the 2018 ISP assumptions are likely to be updated in future iterations of the ISP, generally the reasonableness of any assumptions in the RIT-T should be assessed by reference to the information available to the RIT-T proponent at the time of the RIT-T assessment.

There are likely to be plausible variations to some of the variables and parameters in the reasonable scenarios, such as the fuel cost assumptions. However, as outlined by Frontier they are not likely to be material enough to affect the ranking of the credible options. Wholesale market benefits are not particularly significant to the overall economic assessment of the credible options.

#### *Mining load assumptions*

Our assessment included a specific review of the mining load assumptions, as the PACR states that the results of the RIT-T are sensitive to the underlying assumptions around the likelihood of future mining load developing on the Eyre Peninsula.<sup>53</sup>

The probabilities given to mining load scenarios are based on independent advice from mining advisory firm AME Research on the likelihood of the various potential mining

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<sup>53</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 33.

developments on the Eyre Peninsula progressing. AME estimated a greater than 50 per cent chance of the CEIP coming online over the next 15 years (equivalent to an approximate annual likelihood of 5.8 per cent), while other potential mining loads on the Eyre Peninsula are not expected to come online over this period. This suggests that the only potential mining load driving these market benefits is the CEIP.

Sensitivity testing of the likelihood of mining load development indicates that Option 2 becomes the preferred option where the likelihood of mine development is set to zero.<sup>54</sup>

In light of this uncertainty, we tested ElectraNet's modelling assumptions and requested more detailed modelling data and mining scenario information. ElectraNet provided more detailed information on annual costs and benefits, including avoided mine connection costs, for its preferred option (4D).

On 29 January 2019, Iron Road announced a revised mine plan for the CEIP which reduced forecast mine electrical power demand and transmission capacity requirements.<sup>55</sup> Following this announcement, we sought further information in relation to the impact of the revised mine plan on the ElectraNet modelling and selection of the preferred option.<sup>56</sup>

Following consultation with Iron Road, ElectraNet advised that the updated information regarding the future mine plan for the CEIP did not affect the identification of the preferred option set out in the PACR and had not resulted in a material change in circumstances that impacts on the identified need or the outcomes of the RIT-T assessment. ElectraNet advised that, while the revised mine plan reduced the power requirement for mining operations, the ultimate power requirement for the processing plant, port and ancillary activities associated with processing the ore remained substantially unchanged.<sup>57</sup>

ElectraNet investigated the CEIP demand levels at which identification of the preferred option would change, assuming all other PACR inputs and assumptions remained unchanged. Based on an assessment of thermal capability, ElectraNet considered that 275 kV lines between Cultana and Yadnarie would be needed to support new loads above 150 MW. The revised CEIP total peak demand remains above the level sufficient to require 275 kV line capacity, and trigger the benefits associated with the higher capacity flexible network options.

Based on the additional information provided by ElectraNet and Iron Road, we consider that Iron Road's announcement of a new mine plan for the CEIP does not

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<sup>54</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 64.

<sup>55</sup> Iron Road, *ASX announcement: Investor Strategy Drives New Mine Plan*, 29 January 2019.

<sup>56</sup> AER, *Information request to ElectraNet*, 1 February 2019.

<sup>57</sup> ElectraNet, *Response to AER information request*, 22 February 2019, p. 6.

constitute a material change in circumstances such that the preferred option identified in the PACR is no longer the preferred option.

We consider that, in light of the issues identified above not being material to ElectraNet’s analysis, the scenarios and sensitivities assessed in the PACR are consistent with the requirements of the RIT-T.

### 3.4 Quantification of costs

The RIT-T requires the proponent to quantify, for each credible option, the costs and all material classes of market benefit.<sup>58</sup> Costs are defined as the present value of the direct costs of the credible option and include classes such as the costs incurred in constructing or providing the credible option.<sup>59</sup>

An important distinction between the Eyre Peninsula Electricity Supply Options RIT-T and a contingent project application is that the quantification of costs in the RIT-T does not need to conform to the capital and operating expenditure criteria and factors in the NER. ElectraNet’s proposed expenditure on the project will be assessed against these factors when and if ElectraNet makes an application to the AER under rule 6A.8.2.

The network capital cost component of the credible options in the Eyre Peninsula Electricity Supply Options RIT-T was developed by ElectraNet. These costs were estimated with a ±15 per cent level of accuracy in the PACR. Expected network support costs were based on information submitted by network support providers in response to a formal request for tender, and subsequent negotiations.

The PACR assesses the sensitivity of the credible options to capital cost estimates of ±15 per cent, while the annual network support costs have been subjected to ±30 per cent sensitivities.<sup>60</sup>

Table 3.4 below outlines the total capital cost of each credible option.

**Table 3.4: Total capital cost of the credible options**

Option	Estimated capital cost (\$)
1 ('base case')	\$80 million (reconductor initial sections)
	\$90 million (reconductor remaining sections in 2033)
	\$25 million (future replacement of Yadnarie substation in 2037)
2	\$225 million
	\$20 million (future replacement of Yadnarie substation in 2037)

<sup>58</sup> AER, *RIT-T*, June 2010, paragraph 1.

<sup>59</sup> AER, *RIT-T*, June 2010, paragraph 2(a).

<sup>60</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, pp. 65-69.



	\$215 million
2B	\$25 million (reconductor remaining sections in 2033) \$20 million (future replacement of Yadnarie substation in 2037)
4A	\$330 million
4B	\$275 million
4C (flexible option)	\$250 million Plus \$40 million if the Cultana to Yadnarie line is upgraded to 275 kV operation Or, plus \$80 million if all lines are upgraded to 275 kV operation \$20 million (if needed for future replacement of Yadnarie substation in 2037)
4D (flexible option)	\$240 million \$40 million (if the Cultana to Yadnarie line is upgraded to 275 kV) \$20 million (if needed for future replacement of Yadnarie substation in 2037)
3	\$405 million \$25 million (replacement of Yadnarie substation in 2037)
3B	\$290 million \$25 million (reconductor remaining sections in 2033) \$25 million (future replacement of Yadnarie substation in 2037)
5A	\$560 million
5B	\$450 million \$25 million (future replacement of Yadnarie substation in 2037)
5C (flexible option)	\$455 million Plus \$25 million if the Cultana to Wudinna line is upgraded to 275 kV operation Or, plus \$65 million if the Cultana to Wudinna line AND the Cultana to Yadnarie lines are upgraded to 275 kV operation Or, plus \$110 million if all lines are upgraded to 275 kV operation \$25 million (if needed for future replacement of Yadnarie substation in 2037)

Source: ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, pp. 8-9.

The initial capital cost of the preferred option (4D) is estimated to be \$240 million. Additional capex (approximately \$40 million) would be required in future to energise the Cultana to Yadnarie line at 275 kV, if justified by future developments on the Eyre Peninsula.<sup>61</sup>

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<sup>61</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 89

### 3.4.1 AER's assessment and conclusions

We consider that the costs of the credible options have been appropriately quantified by ElectraNet for the purposes of the RIT-T process.

We consider ElectraNet's methodology to estimate the capital costs to be reasonable. Given ElectraNet owns and operates the South Australian transmission network, we consider it is appropriate for ElectraNet to rely upon its internal expertise and cost data to estimate the likely capital costs of network augmentation.

ElectraNet refined its estimated transmission costs in the PACR from those assumed in the PADR. These costs included the capital costs for the options; the connection costs associated with connecting new mining loads; and the operating and maintenance costs associated with reconductoring of the existing line under the base case. ElectraNet refined the capital cost estimates of each of the options to a greater level of accuracy ( $\pm 15$  per cent compared to  $\pm 25$  per cent in the PADR) and updated them based on the latest cost input drivers.<sup>62</sup>

ElectraNet investigated the impact of changes in capital costs for all options relative to Option 1 through the sensitivity analysis in the PACR. ElectraNet's sensitivity analysis found that even when costs were assumed to be 15 per cent higher this did not affect the finding of the RIT-T that Option 4D is the preferred option and has positive net market benefits. Given that all the credible options considered in the PACR largely comprise network capex in different configurations and capacities, any intrinsic error or bias in ElectraNet's cost estimates is likely to affect all options similarly and is therefore unlikely to affect the ranking of options.

ElectraNet's PADR consultation process did not identify any significant issues in relation to the quantification of costs raised by stakeholders.

It is important to note that we have not assessed ElectraNet's estimated capex or opex costs for each credible option in detail at this stage. Should ElectraNet submit a contingent project application to recover the costs associated with delivering this project, at that time we will assess the capex and incremental opex that is reasonably required by ElectraNet for the purpose of undertaking the preferred investment option. This will include a detailed assessment of whether the forecasts costs reasonably reflect the capex and opex criteria under the NER.

## 3.5 Quantification of market benefits

The RIT-T proponent is required to quantify, for each credible option, all classes of market benefit that are material. A market benefit is material if it is likely to affect the outcome of the assessment of the credible options under the RIT-T.<sup>63</sup> A market benefit

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<sup>62</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 51.

<sup>63</sup> AER, *RIT-T*, June 2010, paragraph 8(a).

may not be quantified if the estimated cost of undertaking the analysis to quantify the market benefit is likely to be disproportionate to the scale, size and potential benefits of each credible option assessed.<sup>64</sup>

The market benefits of each credible option are calculated by comparing for each reasonable scenario the state of the world with the credible option in place to the state of the world in the base case where no option is implemented, and weighting the benefits derived by the probability of each reasonable scenario occurring.<sup>65</sup> A market benefit must be a benefit to those who consume, produce and transport electricity in the NEM and not include a transfer of surplus between consumers and producers.<sup>66</sup>

ElectraNet and HoustonKemp distinguished between two types of identified options:<sup>67</sup>

- Standard options are options that involve a single upfront investment decision.
- Flexible options are options that allow optimisation of future investment decisions. The three identified options that include this option to upgrade are Option 4C, Option 4D and Option 5C.

The approach that HoustonKemp adopted to assessing market benefits was different for the standard options and flexible options.

For the standard options, HoustonKemp applied an electricity market dispatch model to assess market benefits. The market benefits that have been accounted for in this market modelling are changes in fuel consumption in the NEM and changes in other costs for generators. Market benefits for these standard options have been assessed using standard scenario analysis, where different scenarios have included different assumptions for demand, gas prices, mining load and network configuration.

For the flexible options, HoustonKemp used its electricity market model within the context of a real options framework. The real options framework was adopted in order to reflect the option value available from the three identified options that involve building additional network capacity now in order to gain the option of upgrading the network at a later date in response to external triggers.

HoustonKemp constructed a decision tree based on the assumption that decisions about upgrading the network can be made annually, and additional information about demand, gas prices, mining load and network configuration will become available over time. For each outcome on this decision tree, HoustonKemp used its electricity market model to assess market outcomes. Using these electricity market outcomes, HoustonKemp calculated the option value provided by the identified option.

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<sup>64</sup> AER, *RIT-T*, June 2010, paragraph 8(b).

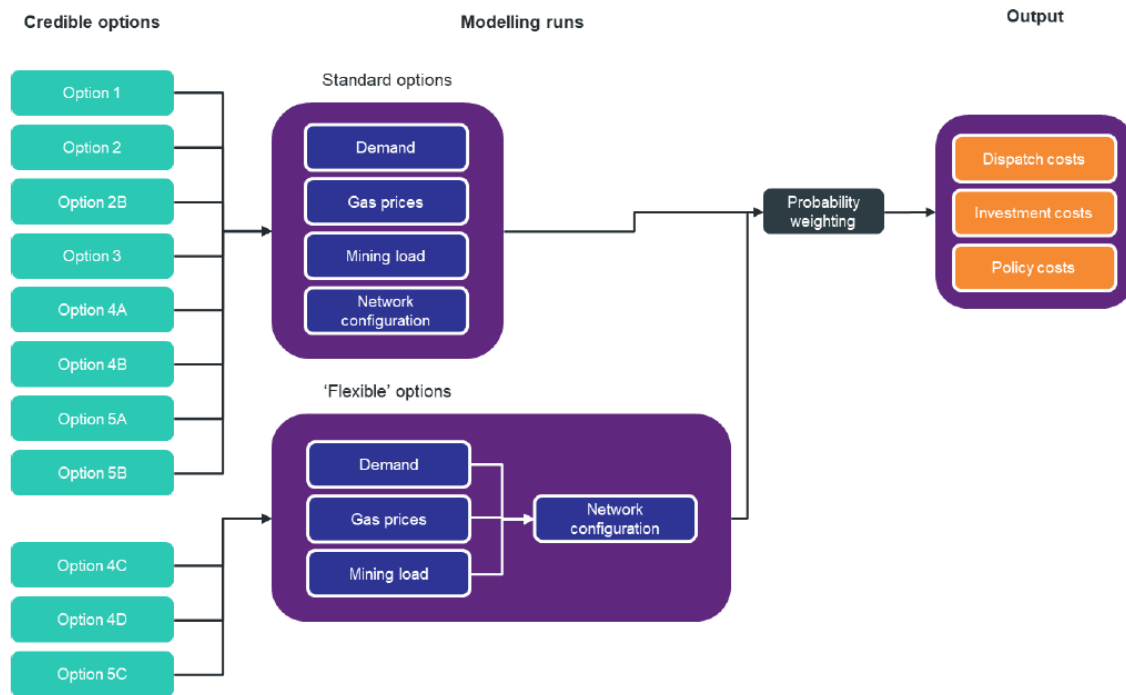
<sup>65</sup> AER, *RIT-T*, June 2010, paragraph 4.

<sup>66</sup> AER, *RIT-T*, June 2010, paragraph 6.

<sup>67</sup> ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, pp. 46-48.

This approach is summarised in Figure 2, reproduced from ElectraNet’s Eyre Peninsula PACR.

**Figure 2: Overview of modelling framework**



Source: ElectraNet, *Eyre Peninsula Electricity Supply Options – Project Assessment Conclusions Report*, 18 October 2018, p. 47.

In order to make this real options framework tractable, ElectraNet applied a moderately simplified electricity market model to facilitate the large number of simulations to be run with the electricity market model. The model optimised for both investment decisions and dispatch decisions. The market model involves a least cost modelling approach, including spreadsheets with results for generation investment and generation dispatch, which is a fairly standard approach to undertaking long-term modelling of investment and dispatch outcomes in the NEM.

The state of the world is a reasonable and mutually consistent description of all the relevant market supply and demand characteristics and conditions that may affect the calculation of market benefits if a credible option proceeds or, for the base case, where the credible option does not proceed.<sup>68</sup>

ElectraNet identified the following benefits of the preferred option against the business as usual base case:

- avoided future costs of reconductoring the existing lines
- avoided costs associated with future network support contracts (which are no longer needed)

<sup>68</sup> AER, *RIT-T*, June 2010, paragraph 17.

- wholesale market benefits (principally due to increasing output from existing wind farms)
- reductions in unserved energy
- avoided costs of future mining connections (adjusted for the probability of mining load emerging in the future).

Table 3.5 below summarises the wholesale market benefits for each credible option in the Eyre Peninsula Electricity Supply Options RIT-T.

**Table 3.5: Wholesale market benefits for credible options assessed (present value \$)**

Option	SA-NSW interconnector - Neutral demand	SA-NSW interconnector - Weak demand	SA-NSW interconnector - Strong demand	SA-NSW interconnector - Base
2	\$29,820,267	\$20,568,365	\$38,337,949	\$29,636,712
2B	\$29,820,267	\$20,568,365	\$38,337,949	\$29,636,712
3	\$29,820,267	\$20,568,365	\$38,337,949	\$29,636,712
3B	\$29,820,267	\$20,568,365	\$38,337,949	\$29,636,712
4A	\$49,992,887	\$27,665,520	\$70,485,968	\$49,534,315
4B	\$49,992,887	\$27,665,520	\$70,485,968	\$49,534,315
4C	\$41,044,134	\$23,712,643	\$55,994,811	\$40,448,930
4D	\$41,044,134	\$23,712,643	\$55,994,811	\$40,448,930
5A	\$36,924,802	\$22,103,868	\$49,623,278	\$36,394,187
5B	\$36,924,802	\$22,103,868	\$49,623,278	\$36,394,187
5C	\$36,089,925	\$22,099,288	\$47,294,504	\$35,393,410

Source: ElectraNet, *PACR Appendices J and K, NPV results and summary of wholesale market benefits*, 12 October 2018.

### 3.5.1 Frontier's assessment

Frontier undertook a review of the market benefits modelling methodology, inputs and assumptions used in the Eyre Peninsula Electricity Supply Options RIT-T.

Frontier reviewed the investment and dispatch results released by ElectraNet and compared them with comparable modelling results, including AEMO's ISP modelling.

Frontier concluded that its high level review did not highlight any obvious concerns with the electricity market modelling approach that HoustonKemp has undertaken.<sup>69</sup>

Based on the information that ElectraNet provided, Frontier considered that the rationale for undertaking a real options analysis was sound, as there is likely to be an option value associated with those credible options that incorporate an upgrade option. Frontier also advised that the overall approach to conducting the real options analysis was sound in that the analysis reasonably accounted for the potential decision points available and for additional information about key drivers of investment decisions.<sup>70</sup>

Frontier assessed the input assumptions applied by ElectraNet and HoustonKemp, and concluded that they have generally come from credible sources and are reasonable.

Frontier had some reservations regarding specific input assumptions, including:<sup>71</sup>

- the coal price assumptions for existing generators in the NEM from AEMO's ISP are based on a report by Wood Mackenzie that is dated May 2016. Since then the international price of coal has roughly doubled, which raises the prospect that the coal price forecasts should be updated.
- there appears to be no investment option for new hydro plant, including new pumped-storage hydro. New hydro plant may reasonably be expected to form part of the future generation mix.
- there is some concern about the ability of the demand clustering approach applied to reasonably reflect periods of low wind and/or solar generation and to reasonably reflect actual dispatch outcomes.
- the build limits relating to technology limits on a regional level are outdated, originating from the 2016 and prior NTNDPs, and their inclusion is unusual given that the rest of the assumptions generally adhere to the ISP.

While Frontier had reservations about some of the input assumptions that have been relied on by ElectraNet and HoustonKemp, the key result was that there are market benefits associated with reduced USE for customers on the Eyre Peninsula and improved MLFs for wind generators on the Eyre Peninsula.<sup>72</sup>

Frontier concluded that as long as ElectraNet's assumptions about the extent of reduced USE, the extent of improved MLFs and the extent to which constraints on existing wind farms are relieved are reasonable, it is reasonable to expect that there will be wholesale market benefits associated with the preferred option. Further, Frontier concluded that the reservations highlighted above would be unlikely to materially affect the estimation of these market benefits.<sup>73</sup>

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<sup>69</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 6.

<sup>70</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 6.

<sup>71</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 10.

<sup>72</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 11.

<sup>73</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 11.

### 3.5.2 AER's assessment and conclusions

We consider the approach taken by ElectraNet and HoustonKemp to quantify wholesale market benefits, involving least cost electricity market modelling, and including a real options analysis, is consistent with the requirements of the RIT-T.

Our view has been informed by Frontier Economics' advice that, based on the information available, it did not identify issues with ElectraNet and HoustonKemp's electricity market modelling approach. The methodology reflects a standard approach to undertaking long-term modelling of investment and dispatch outcomes in the NEM. Frontier Economics also found that the input assumptions relied upon in the modelling generally come from credible sources and are reasonable.<sup>74</sup> Frontier Economics did identify some concerns with specific assumptions such as outdated coal price forecasts and regional technology build limits.

However, while there are some concerns regarding certain inputs and assumptions used by ElectraNet and HoustonKemp in modelling the wholesale market benefits, these were not expected to have a significant impact on the estimated benefits. We are satisfied that the key assumptions driving the modelled wholesale market benefits (relieving constraints on existing wind farms, reduced unserved energy, and improvements to marginal loss factors) are reasonable.

Also, in the context of the Eyre Peninsula RIT-T, the impact of market modelling inputs and assumptions is not likely to be material or affect the identification of the preferred option. Wholesale market benefits are not particularly significant to the overall economic assessment of the credible options.

Even if wholesale market benefits are assumed to be zero (which Frontier Economics does not consider to be a reasonable assumption) the preferred option continues to provide a positive net economic benefit.

We therefore consider that the selection of material market benefits and the quantification of those material market benefits satisfies the requirements of the RIT-T. Where issues have been identified with the quantification of wholesale market benefits, we do not consider they are likely to affect the outcome of the Eyre Peninsula Electricity Supply Options RIT-T.

## 3.6 Identification of the preferred option

The final step in the RIT-T assessment is the identification of the preferred option. The preferred option is the credible option which maximises the net economic benefit compared to all other credible options. The net economic benefit of a credible option is the market benefit minus the cost.

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<sup>74</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 10.

The Eyre Peninsula Electricity Supply Options RIT-T identified Option 4D as the preferred option. Table 3.6 summarises the net economic benefit (in present value terms) of each credible option in the Eyre Peninsula Electricity Supply Options RIT-T.

**Table 3.6 Net economic benefit of credible options assessed (present value \$), SA-NSW Interconnector scenario**

Option	Costs (Capex and Opex)	Market Benefit	Net economic benefit	Ranking under the RIT-T
2	-\$155,745,040	\$207,929,590	\$52,184,550	2
2B	-\$154,085,303	\$202,830,336	\$48,745,033	3
3	-\$289,979,498	\$212,585,225	-\$77,394,273	9
3B	-\$209,539,983	\$207,485,970	-\$2,054,012	7
4A	-\$240,096,013	\$244,829,888	\$4,733,875	6
4B	-\$196,791,876	\$244,829,888	\$48,038,012	4
4C	-\$201,130,552	\$235,328,191	\$34,197,639	5
4D	-\$175,839,396	\$235,328,191	\$59,488,795	1
5A	-\$416,443,450	\$252,292,812	-\$164,150,638	11
5B	-\$324,042,578	\$250,780,155	-\$73,262,422	8
5C	-\$368,579,692	\$250,744,255	-\$117,835,437	10

Source: ElectraNet, *PACR Appendices J and K, NPV results and summary of wholesale market benefits*, 12 October 2018.

The preferred option identified through the RIT-T process changed between the PADR and the PACR. The preferred option identified in the PACR, Option 4D, is a more flexible and lower cost variant of the preferred option initially identified in the PADR. It allows for future augmentation of the Cultana to Yadnarie section of the line to occur at a lower cost should it be required in future, without customers incurring the full cost of this augmentation upfront.

### 3.6.1 Frontier's assessment

Frontier did not identify any material issues that would suggest that Option 4D is not the preferred option.

Frontier found that, while ElectraNet and HoustonKemp had not provided a great deal of detail about the approach to modelling the wholesale electricity market benefits, the information provided suggests that the approach, inputs, scenarios and sensitivities



ElectraNet and HoustonKemp used are reasonable.<sup>75</sup> Any potential issues with the modelling inputs and scenarios were unlikely to materially affect ElectraNet's conclusions and the identification of the preferred option.

Frontier also observed that even if wholesale market benefits are assumed to be zero (which it did not consider to be a reasonable assumption), Option 4D would continue to provide a net economic benefit.<sup>76</sup>

Frontier concluded that the reservations that they have highlighted would be unlikely to materially affect the estimation of these market benefits.<sup>77</sup>

### 3.6.2 AER's assessment and conclusions

We are satisfied that ElectraNet has correctly identified Option 4D in the PACR as the preferred option. Option 4D is the credible option that maximises the net economic benefit compared to all other credible options.

The analysis presented in the PACR demonstrates that Option 4D remains the preferred option, and provides positive net economic benefits, across a range of reasonable scenarios and sensitivities.

Our conclusion is supported by Frontier's advice that:

- the modelling approach, inputs, scenarios and sensitivities ElectraNet has used to identify the preferred option are reasonable
- any potential issues identified in relation to the modelling inputs and scenarios are unlikely to materially affect ElectraNet's conclusions
- Option 4D continues to provide a net economic benefit even when wholesale market benefits are assumed to be zero (which is not itself a reasonable assumption).

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<sup>75</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 17.

<sup>76</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 17.

<sup>77</sup> Frontier, *RIT-T Assessment: Eyre Peninsula Supply Options*, 29 March 2019, p. 11.

## 4 AER determination

In accordance with clause 5.16.6(b) of the National Electricity Rules, our determination is that the preferred option identified in the Eyre Peninsula Electricity Supply Options RIT-T satisfies the RIT-T. We consider:

- the identified need in the Eyre Peninsula Electricity Supply Options RIT-T is consistent with the requirements of the RIT-T.
- the credible options assessed meet the definition of a credible option, and the number and range of credible options is appropriate given the magnitude of the likely costs of the credible options.
- the number, choice and weighting of the reasonable scenarios modelled by ElectraNet satisfies the requirements of the RIT-T.
- the costs of the credible options have been appropriately quantified.
- the selection of material market benefits and the quantification of those material market benefits satisfies the requirements of the RIT-T. To the extent that any of the classes of market benefits may not have been appropriately quantified, this would not have affected which credible option is identified as the preferred option.
- 'Option 4D' was correctly identified as the preferred option.