South Australia Energy Transformation

RIT-T Project Assessment Draft Report Summary

ElectraNet has investigated interconnector and network support options aimed at reducing the cost of providing secure and reliable electricity to South Australia in the near term, while facilitating the longer-term transition of the energy sector across the National Energy Market (NEM) to low emission energy sources.

We are applying the Regulatory Investment Test for Transmission (RIT-T)[1] to this identified need. This Project Assessment Draft Report (PADR) has been prepared as the second formal step in the South Australia Energy Transformation (SAET) RIT-T process.[2]

Our investigation has been undertaken in consultation with, and with the support of, the Australian Energy Market Operator (AEMO) as the national planning body and Jurisdictional Planning Bodies AEMO (Victoria), Powerlink (Queensland) and TransGrid (New South Wales).

A new high capacity interconnector between South Australia and New South Wales would deliver substantial economic benefits as soon as it can be built

Our RIT-T assessment shows that of all options considered a new 330 kV interconnector between mid-north South Australia and Wagga Wagga in New South Wales, via Buronga, is expected to deliver the highest net market benefits. This finding is robust across a wide range of future scenarios and sensitivity tests.

The preferred option[3] is estimated to deliver net market benefits of around $1 billion over 21 years (in present value terms) [4], including wholesale market fuel cost savings of around $100 million per annum putting downward pressure on wholesale electricity prices with flow on benefits to customer pricing. Independent modelling by ACIL Allen estimates an overall reduction in the average annual residential customer bill of up to about $30 in South Australia and $20 in New South Wales.

The new interconnector is estimated to cost $1.5 billion across both South Australia and New South Wales and could be delivered by 2022 to 2024.

Our work has been closely coordinated with the development of AEMO's Integrated System Plan (ISP)

1 The Regulatory Investment Test for Transmission (RIT-T) is the economic cost benefit test that is overseen by the Australian Energy Regulator (AER) and applies to all major network investments in the NEM.

2 ElectraNet obtained approval from the AER to extend the timeframe for publishing the PADR to 30 June 2018.

3 The preferred option is defined as the option that maximises net market benefits under the RIT-T framework.

4 Broader benefits to the wider economic are additional to and beyond the scope of this RIT-T assessment, which is required to focus on the direct benefits to consumers and producers of electricity.

A key development since the publication of the Project Specification Consultation Report (PSCR) in November 2016 has been the development by AEMO of an Integrated System Plan (ISP) that provides a 'roadmap' for the transition of the energy sector, in response to a recommendation of the Finkel review.[5] Finkel highlighted that additional interconnection within the NEM was likely to form a key feature of the transition, and would help to unlock low emission generation Renewable Energy Zones (REZs).

ElectraNet considers it essential that the outcomes of the RIT-T are fully coordinated with the ISP to deliver outcomes that are best for the NEM as a whole, and in the interests of electricity customers. We have been working closely with AEMO to achieve the required coordination.

A new interconnector between South Australia and New South Wales has been confirmed by AEMO in the ISP[6] as an important element of the 'roadmap' for the NEM and as one of its immediate priorities that would deliver positive net market benefits as soon as it can be built.

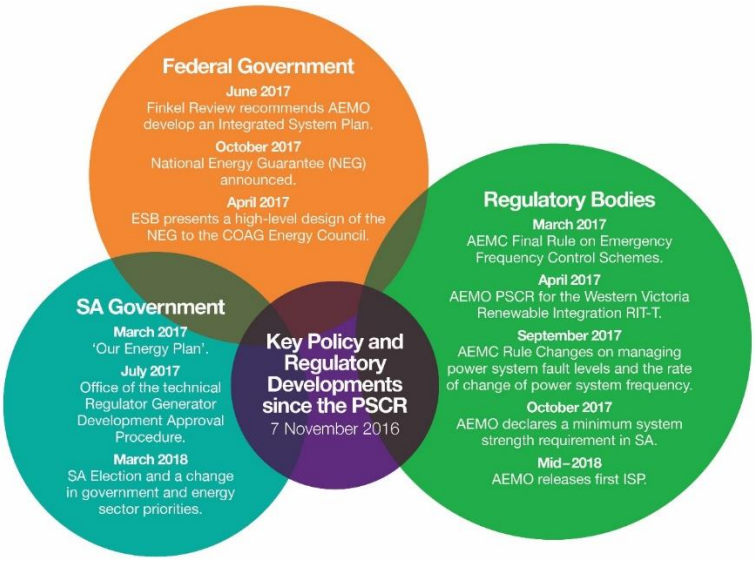
This RIT-T is the process through which a more detailed economic cost-benefit assessment is undertaken to identify the most appropriate option that delivers the greatest net market benefits.

In assessing options under this RIT-T, we have reflected the assumptions adopted by AEMO in the ISP in all material respects. We have also taken into account the complementary investments identified by AEMO as part of the ISP, in particular the investments being considered by AEMO's Western Victoria Renewable Integration RIT-T and the identification of priority REZ zones in the Riverland and Murray River areas of South Australia and New South Wales.

This RIT-T assessment has been undertaken in an environment of significant regulatory and policy changes, which have been taken into account

In addition to the development of the ISP, there have been many other important changes to regulations and policies since publication of the PSCR, affecting both the NEM as a whole, and South Australia specifically, as highlighted in Figure E.1.

Figure 1 – Key policy and regulatory developments since release of the PSCR



[5] Finkel, A., *Independent Review into the Future Security of the National Electricity Market – Blueprint for the Future, June 2017*

[6] AEMO, Integrated System Plan, June 2018. AEMO refers to this new interconnector as 'Riverlink' in the ISP.

These changes have had a material impact on both the identified need for the investment being considered in this RIT-T, as well as the assessment of the costs and benefits of different options to meet this need.

The identified need for this RIT-T, as stated in the PSCR, is to deliver net market benefits and support energy market transition through:

- lowering dispatch costs, initially in South Australia, through increasing access to supply options across regions.
- facilitating the transition to a lower carbon emissions future and the adoption of new technologies, through improving access to high quality renewable resources across regions.
- enhancing security of electricity supply, including management of inertia, frequency response and system strength in South Australia.

Given the substantive and at times uncertain nature of recent policy changes, we have delayed publication of this PADR to ensure that the changes are properly understood and reflected in our analysis and to ensure our work is fully coordinated with national planning processes.

We are now releasing the draft results of our assessment, which take into account the above changes, in conjunction with publication by AEMO of the inaugural ISP.

ElectraNet has investigated four broad credible options

We have investigated variants of four credible options to address the identified need, comprising both a local South Australian 'non-interconnector' option (comprising both network and non-network components) as well as options involving new interconnectors to each of the three neighbouring NEM states, as shown in Figure E.2.

We engaged engineering consultants Entura to provide technical insight into how network support technologies could assist, particularly in relation to providing system security, and to develop a least cost, standalone 'non-interconnector' option to be considered in the RIT-T assessment. Submissions to the PSCR from network support proponents helped shape the non-network components of this option.

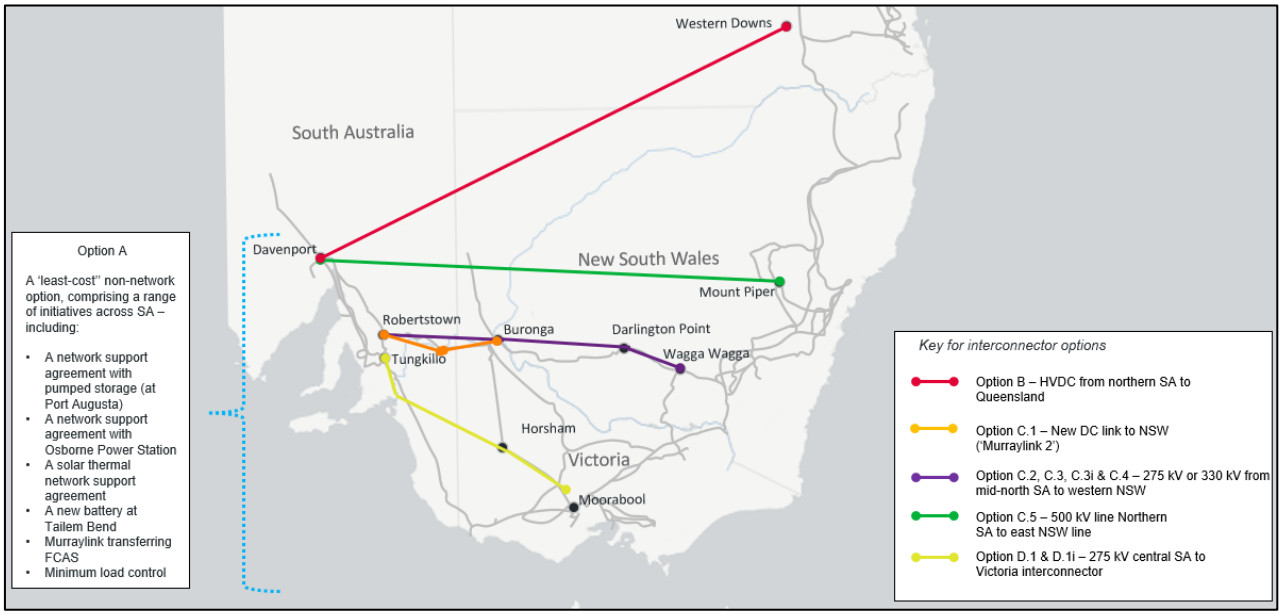
For the interconnector options, both HVAC[7] and HVDC[8] options have been considered, with line lengths varying from 350 km to 1,450 km. These options have additional capacity varying from 300 MW to 1,000 MW, with indicative costs of $0.8 billion to $2.9 billion. Potential energisation could occur from 2022 to 2024.

The broad routes of the interconnector options remain the same as set out in the PSCR, with additional analysis having enabled the options to be better defined.

7 High voltage alternating current

8 High voltage direct current

Figure 2 – Overview of the options (and variants) assessed



The preferred option delivers positive net benefits across all reasonable future scenarios

Future uncertainty is captured under the RIT-T framework through the use of scenarios, which reflect different assumptions about future market development, as well other factors that are expected to affect the relative market benefits of the options being considered. The key variables affecting the current RIT-T assessment include long-term gas prices, electricity demand, emissions reduction policy targets (at both state and Federal levels), and any change in the rate of change of frequency (RoCoF) security settings for South Australia.

Three scenarios have been considered, which are intended to cover a wide range of possible futures. These are summarised at a high-level in Table E.1. These scenarios are generally aligned with the ISP's slow change, neutral and fast change scenarios, although a wider range of future gas prices has been assessed in the RIT-T analysis, as well as a potential future change in security of supply settings and increasing load in South Australia.

Table 1 – Summary of future scenarios considered

High Scenario	Central Scenario	Low Scenario
Intended to represent the upper end of the potential range of realistic net benefits from the options	Reflects the best estimate of the evolution of the market going forward	Intended to represent the lower end of the potential range of realistic net benefits associated with the various options

We have also tested the robustness of the assessment to a wide range of sensitivities, including the outcomes of the concurrent Western Victoria RIT-T, the assumed timing of gas generator retirements in South Australia, differences in assumed future mining load developments in South Australia and the estimated costs of the various options.

The results of the RIT-T assessment show that AC interconnection options between mid-North South Australia and central and western New South Wales at either 275 kV or 330 kV are expected to have a material positive net market benefit across all future scenarios -– with particularly large net market benefits estimated under the high scenario (see Figure E.3).

Overall, new interconnection at 330 kV between mid-north South Australia and Wagga Wagga in New South Wales via Buronga (Option C.3i) is expected to deliver the highest net market benefit in all three scenarios, providing a 'no regrets' solution. This option has therefore been identified as the preferred option in the RIT-T assessment.

Option C.3i has net benefits that are materially higher than the next highest ranked option in each scenario, and so the results of the RIT-T are not dependent on particular scenario weightings.

Figure 3 – Estimated net market benefits for each scenario

The relatively higher costs of 500 kV interconnection, as well as a new DC link between South Australia and **New South Wales** ('Murraylink 2'), which was proposed in response to the PSCR, are not outweighed by materially higher market benefits, except in the high scenario. These options result in negative net market benefits in the other scenarios.

New interconnection between South Australia and Victoria was found to have only marginal net benefits or negative net benefits, except in the high scenario. Similarly, new interconnection with Queensland only provides materially positive net benefits in the high scenario.

The non-interconnector option is generally estimated to deliver negative net market benefits, except in the high scenario – this option only contributes to enhancing system security outcomes and does not materially lower dispatch costs, or facilitate the transition to lower carbon emissions compared to the interconnector options, with the consequence that the benefits do not in general outweigh the expected cost.

Market benefits of new interconnection are driven in the near term by lowering generation dispatch costs in South Australia

A key component of the overall benefits for all new interconnector options across all scenarios is the ability to utilise lower cost generation on the east coast of the NEM to supply South Australia in the near term, reducing reliance on expensive gas-fired generation in South Australia. This would result in the wholesale price of electricity reducing in South Australia as soon as interconnection is established. It will also result in a reduction in gas consumption for power generation in South Australia, freeing up gas for other uses, although the flow-on benefit of this is not formally captured in the RIT-T.

We have assessed the sensitivity of our findings to underlying gas price assumptions, given the importance of reduced gas generation in driving the market benefit assessment. We have tested a value of $7.40/GJ (Adelaide) in the low scenario, based on advice from independent analysts EnergyQuest[9] on a realistic future low gas price. This gas price is lower than the $8.00/GJ assumed by AEMO in its ISP 'slow change' scenario, although it is above the more extreme $5.89/GJ tested by AEMO as a sensitivity in the ISP.[10] We do not consider such a low price to be a plausible outcome.

We find that that there remain positive net market benefits for a new South Australia to New South Wales 330 kV interconnector, for all future gas prices even down to the extreme $5.89/GJ tested by AEMO.

In the medium to longer term, new interconnection provides diverse low cost renewable generation sources to New South Wales

As the electricity sector transitions, coal generators are expected to retire from the market over the medium to longer term. The retirement of coal generation is expected to be most rapid in New South Wales, with the ISP highlighting that Eraring and Bayswater are expected to retire by 2034 and 2035, leaving Mount Piper as the sole remaining coal fired generator in New South Wales.

New interconnection between South Australia and New South Wales results in additional market benefits compared to options involving interconnection with other states, arising from the retirement of New South Wales black coal plant.

9 EnergyQuest is an Australian-based energy advisory firm, which specialises in independent energy market analysis, including on Australian oil and gas.

10 The $5.89/GJ assumption is reflected in the 'Increased role for gas' scenario in the ISP.

Our assessment shows that a new interconnector between South Australia and New South Wales allows greater exports from existing and new high quality renewable generation sources in South Australia and from existing South Australian gas generators, that enables supply requirements in New South Wales to be met at a lower cost than if New South Wales was required to draw on other generation sources, including new gas generation, to fill the gap. Any earlier retirement of coal generation in New South Wales would accelerate delivery of these benefits.

New interconnection also provides benefits through enabling greater integration of renewables in the NEM

The interconnection options between South Australia and New South Wales provide a benefit through being able to avoid the intra-regional transmission costs that AEMO estimates in the ISP would otherwise be required to unlock additional renewable generation resources in the Murray River and Riverland REZs. We have used the results of AEMO's ISP modelling of these potential REZs to identify the extent of transmission costs that could be avoided.

Similar 'REZ benefits' do not arise under the interconnection options between South Australia and either Queensland or Victoria, as there are no identified REZ transmission augmentations that are expected to be impacted by these options.

New interconnection further enhances the security of supply for South Australia

Both the interconnector and non-interconnector options contribute to improving system security. These improvements are captured in the RIT-T assessment through alleviating two existing network constraints: the RoCoF constraint on the operation of the existing Heywood interconnector and the cap on non-synchronous generation output in South Australia.

The benefit of relieving these constraints is captured in the cost benefit analysis as part of the fuel cost savings in South Australia, as alleviating these constraints reduces the need to dispatch higher cost gas generation in South Australia.

We are interested to hear feedback on this PADR

ElectraNet welcomes written submissions on the information presented in this PADR. Submissions are due by 10 August 2018.

Submissions should be marked "South Australian Energy Transformation PADR feedback" and emailed to **consultation@electranet.com.au.**

The next formal stage of this RIT-T involves publication of a Project Assessment Conclusions Report (PACR). We currently anticipate that a PACR will be released by November 2018.