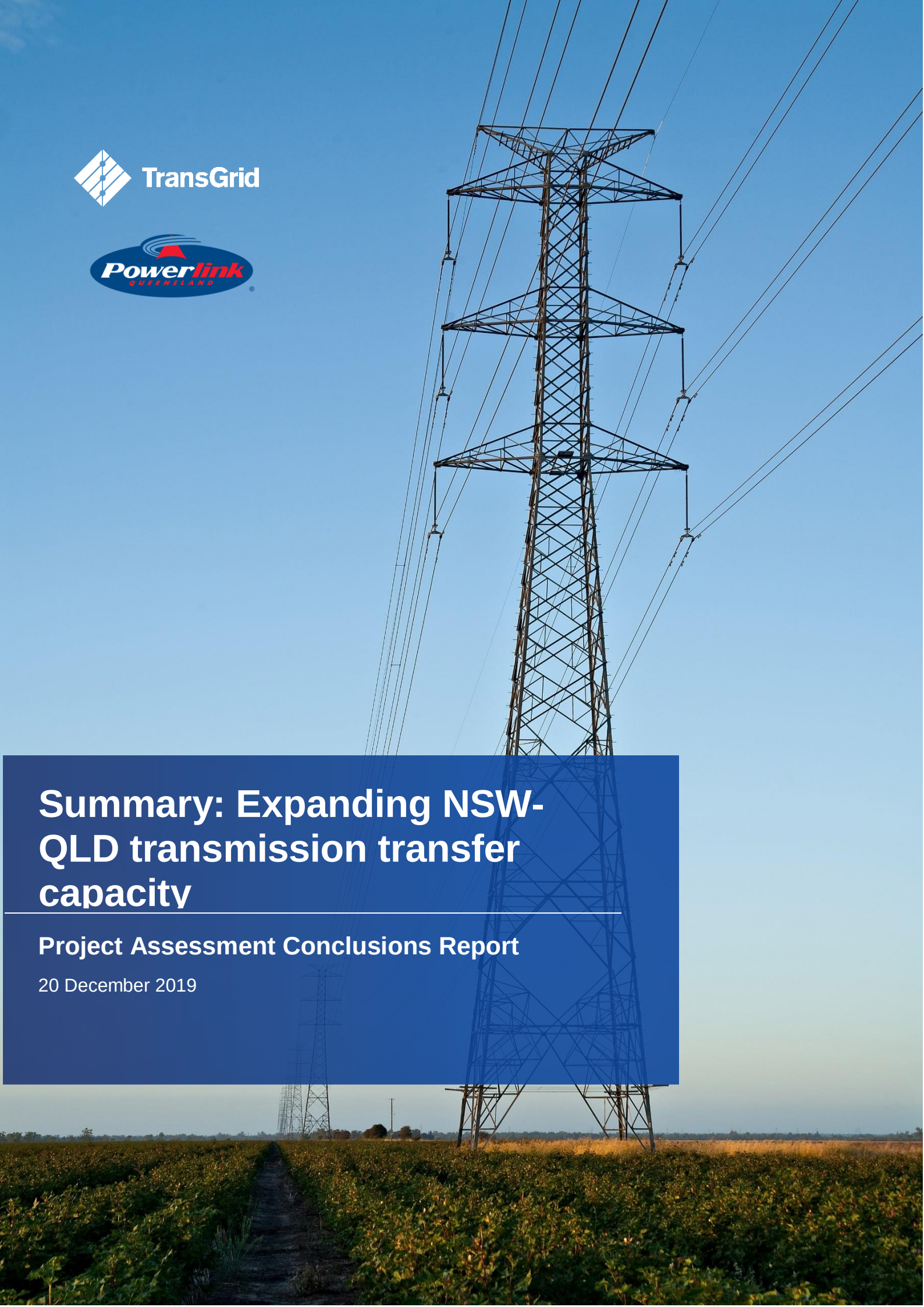


Summary: Expanding NSW-QLD transmission transfer capacity

Project Assessment Conclusions Report

20 December 2019

Summary

TransGrid and Powerlink have explored options for expanding transfer capacity between New South Wales (NSW) and Queensland necessary to support the long-term interests of consumers for safe, secure, reliable electricity, at the least cost, across a range of plausible futures.

This analysis builds on the assessment in the 2018 Integrated System Plan (ISP) prepared by the Australian Energy Market Operator (AEMO) and its findings are consistent with the draft 2020 ISP results released by AEMO on 12 December 2019 (which reconfirms the proposed network upgrade and labels it a 'no regret' action).[1] In addition, the 2019 AEMO Electricity Statement of Opportunities (ESOO) reconfirmed the importance of completing an incremental upgrade to the Queensland to NSW Interconnector (QNI), as well as a minor upgrade of VNI,[2] ahead of the forecast closure of Liddell Power Station, stating that the upgrades will improve the supply-demand balance in NSW and reduce the likelihood of unserved energy.[3]

The Regulatory Investment Test for Transmission (RIT-T)[4] has been applied to this identified need based on net market benefits, rather than reliability corrective action. Reliability of supply has been considered as one class of market benefits in the overall benefits assessment. This Project Assessment Conclusions Report (PACR) has been prepared as the final formal document in the 'expanding NSW-QLD transmission transfer capacity' RIT-T process and follows the Project Assessment Draft Report (PADR) released in September 2019 and the Project Specification Consultation Report (PSCR) released in November 2018.

This PACR focusses on options for increasing transfer capacity between NSW and Queensland in the near-term, consistent with the assessment of the 'Group 1' QNI expansion in the 2018 ISP and the 'QNI minor' upgrade in the draft 2020 ISP, as well as guidance from the Australian Energy Regulator (AER).[5] This near-term focus ensures that the consideration of medium-term options (i.e., 'Group 2' QNI expansion in the 2018 ISP and 'QNI Medium' in the draft 2020 ISP) does not delay the consideration of near-term options required to ensure the greatest net benefits to NEM participants, whilst increasing transmission transfer capacity, particularly in light of the forecast closure of Liddell Power Station over 2022 and 2023.

The medium-term options included in the PSCR will be assessed as part of a separate RIT-T in the future. This RIT-T's PADR is expected to be published by 10 December 2021 at the latest, in-line with the draft 2020 ISP recommendations.[6]

Overview

The PACR continues to find that the preferred option[7] is expected to deliver significant net benefits associated with expanding transfer capacity between NSW and Queensland in the near-term. This aligns with both the 2018 ISP recommendations and the draft 2020 ISP recommendations.

It finds that uprating the Liddell to Tamworth lines and installing new dynamic reactive support at Tamworth and Dumaresq and shunt capacitor banks delivers the greatest expected net benefits of all options considered and is the 'preferred option' as part of this RIT-T.

The analysis shows that the preferred option is expected to:

1 AEMO, *Draft 2020 Integrated System Plan*, 12 December 2019, p. 50.

2 'VNI minor' is the proposed incremental increase in transmission transfer capacity between Victoria and New South Wales.

3 AEMO, *2019 Electricity Statement of Opportunities*, August 2019, pp.4 & 93.

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

5 AER, *Queensland-NSW Interconnector RIT-T guidance notice and engagement process*, available at: https://www.aer.gov.au/communication/queensland-nsw-interconnector-rit-t-guidance-notice-and-engagement-process

6 AEMO, *Draft 2020 Integrated System Plan*, 12 December 2019, p. 67.

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

- deliver approximately $170 million in net benefits over the assessment period, which includes significant wholesale market cost savings that will put downward pressure on electricity prices with flow-on benefits to customers;
- reduce the need for new generation and large-scale storage in New South Wales to meet demand following Liddell Power Station's forecast retirement over 2022 and 2023;
- lower the aggregate generator fuel costs required to meet demand in the National Electricity Market (NEM) going forward;
- avoid capital costs associated with enabling greater integration of renewables in the NEM; and
- generate sufficient benefits to recover the project capital costs seven years after the option is commissioned.

Benefits from expanding transmission transfer capacity between NSW and Queensland

The driver for the investment options considered as part of this RIT-T is to create a net benefit to consumers and producers of electricity and to support energy market transition through:

- allowing for more efficient sharing of generation across the NEM, thereby avoiding the use of higher cost generators and deferring, or avoiding, the construction of new, more expensive generation and/or storage capacity;
- continuing to provide reliable supply at the lowest cost by deferring the need to build new generation and storage capacity in NSW ahead of the forecast retirement of Liddell Power Station; and
- 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, which further avoids the use of high-cost generators and defers, or avoids, the need to build new generation.

The 2018 ISP concluded that market benefits associated with an expansion of transfer capacity in the near-term can be realised as soon as this can be provided due to it reducing the need for new gas-fired generation in NSW to meet demand once Liddell Power Station retires, as well as benefits from allowing more efficient generation sharing between NSW and Queensland. The 2018 ISP conclusions have been reinforced by the assessment in this PACR and the draft 2020 ISP findings released by AEMO on 12 December 2019.[8]

This PACR finds that the net benefit gained by expanding transfer capacity between NSW and Queensland allows for a lower cost 'filling of the gap' in electricity supply following Liddell Power Station's forecast closure, compared to what might otherwise occur.

The findings of this RIT-T have benefited from extensive stakeholder consultation

TransGrid and Powerlink have undertaken extensive consultation and engaged with stakeholders on various aspects of this RIT-T process. Following publication of the PADR and the accompanying modelling material on 30 September 2019, we held a webinar in October 2019 to help explain the assessment to stakeholders and to seek their views. TransGrid and Powerlink also presented on the RIT-T progress at their relevant Customer Panels and planning forums.

Eight formal submissions were received in mid-November 2019 of which five proposed 'virtual transmission line' solutions.

TransGrid and Powerlink have clarified a number of points raised in submissions and provided submitters the opportunity to better understand the RIT-T assessment process. Where 'virtual transmission line' solutions have been proposed, this has also involved a number of follow-up emails with proponents of these solutions in order for us to better understand these proposals.

[8] AEMO, *Draft 2020 Integrated System Plan*, 12 December 2019, p. 50.

We have taken all feedback raised in submissions into account in undertaking our PACR analysis, as explained throughout this document (together with an appendix providing a comprehensive list of key points raised through stakeholder engagement and responses to each).

This PACR assessment focuses on the four incremental network upgrades

The table below summarises the credible options assessed in this PACR. All credible options are able to be delivered, and inter-network testing completed, by June 2022.

Table E-1 Summary of credible options assessed as part of this PACR

Option description	Indicative total transfer capacity (MW)[9]		Estimated capex ($m)
	Northward	Southward	
Incremental upgrades to the existing network to increase transfer capacity			
Option 1A – Uprate Liddell to Tamworth lines and install new dynamic reactive support at Tamworth and Dumaresq and shunt capacitor banks	690	1,120	230
Option 1B – Uprate Liddell to Tamworth lines only	570	1,070	43
Option 1C – Install new dynamic reactive support at Tamworth and Dumaresq and shunt capacitor banks	480	1,120	187
Option 1D – Sapphire substation cut into line 8C and a mid-point switching station between Dumaresq and Bulli Creek	480	1,110	59

Option 1A is the 2018 ISP recommended 'Group 1' investment and the draft 2020 ISP recommended 'QNI minor' investment. The other network options have been developed based on additional studies and consultation undertaken since the 2018 ISP, including on this RIT-T's PSCR. These options reflect alternate, lower cost options targeting different transfer limits that would provide different market benefits.

The procurement and contracting process for Option 1A that TransGrid has progressed in parallel to this PACR[10] has resulted in the capital costs of this option being revised since the PADR. The proportionate increases in the cost of each of this option's key components have been applied to the other options involving incremental upgrades to the existing network to increase transfer capacity for consistency (i.e., Option 1B, Option 1C and Option 1D), as TransGrid considers that the factors that have driven the higher costs would apply equally to these options.

'Virtual transmission line' solutions have not been assessed as part of this PACR due to their untested nature at this scale in Australia (and hence unproven technical feasibility at this point in time). We have set out important information for proponents of these solutions below, including how they can be assessed going forward as part of the QNI medium upgrade process, which will allow time for AEMO, TransGrid and Powerlink to test the technical feasibility of these options.

[9] The transfer capacities shown in this table are indicative for one operating state only (daytime, medium demand) and serve to summarise the notional differences between options. Appendix D of the PADR and section 5.1 to 5.4 of this PACR provides additional detail on the modelled transfer capacities of the options, across a range of operating states. As outlined in the Inputs and Methodology Consultation Paper in December 2018, System Technical Analysis undertaken since the PSCR was released resulted in refining the definition of the QNI transfer capacity.

[10] Consistent with the timelines in the AER guidance note for this RIT-T, see: AER, *Queensland-NSW Interconnector RIT-T guidance notice and engagement process*, available at: https://www.aer.gov.au/communication/queensland-nsw-interconnector-rit-t-guidance-notice-and-engagement-process

The PACR continues to find that 'Option 1A' is the preferred option

Uncertainty is captured under the RIT-T framework through the use of scenarios, which reflect different assumptions about future market development, and other factors that are expected to affect the relative market benefits of the options being considered.

Four scenarios have been considered as part of this PACR, which are intended to cover a wide range of possible futures and are generally aligned with the AEMO 2020 ISP 'slow change', 'neutral' and 'fast change' scenarios. The four scenarios are the same as applied in the PADR and differ in relation to key variables expected to affect the market benefits of the options considered, including demand outlook, assumed generator fuel prices, assumed emissions targets, retirement profiles for coal-fired power stations, and generator and storage capital costs.

The results of the PACR assessment find that uprating the Liddell to Tamworth lines, installing new dynamic reactive support at Tamworth and Dumaresq and shunt capacitor banks ('Option 1A') is expected to deliver approximately $170 million in net benefits over the assessment period (on a weighted-basis). While Option 1A is effectively ranked equally with Option 1B on a weighted-basis, TransGrid and Powerlink note that:

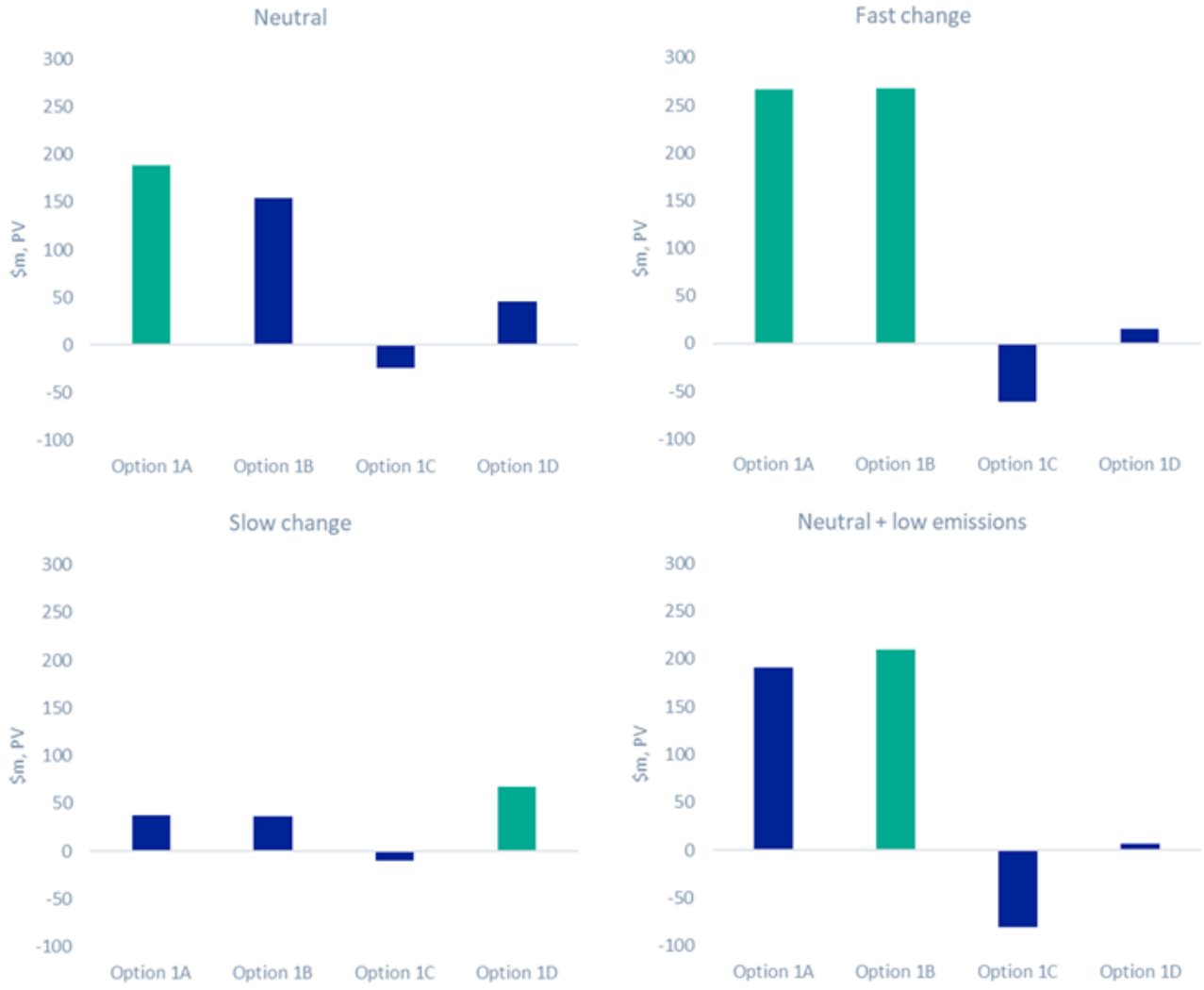
- Option 1A is expected to provide materially higher net benefits than Option 1B under the neutral scenario, which is considered the most likely scenario of the four scenarios investigated;
- we have run a threshold test that shows that the neutral scenario would only need to be given a weighting of 36 per cent (with the other three scenarios weighted equally) for Option 1A to deliver at least five per cent greater net benefits than Option 1B on a weighted basis;
- the only scenario where Option 1B is expected to deliver materially higher net benefits than Option 1A is the 'neutral + low emissions' scenario, which is a bespoke scenario developed to further stress test the RIT-T assessment following feedback from TransGrid's NSW & ACT Transmission Planning forum in November 2018 (i.e., before the ISP scenarios were finalised); and
- Option 1A provides more transmission capacity at times of peak demand in NSW (Option 1B on its own does not increase southerly capacity between Queensland and NSW).

In addition, while Option 1D is found to have the greatest estimated net benefits under the slow-change scenario, it has very low net benefits under the other three scenarios (as well as on a weighted basis) and so is not considered a contender for the preferred option.

Overall, Option 1A is the preferred option identified under this RIT-T. Option 1A is also the option assessed and recommended by AEMO in both the 2018 ISP and the draft 2020 ISP.

The market benefits of all options are primarily derived from the avoided or deferred costs associated with generation and storage in NSW, compared to the base case. This benefit arises since the expanded transfer capacity between NSW and Queensland under each option allows Queensland generation to export to NSW, reducing the need for new investment in generation in NSW.

Figure E.1 – Estimated net benefits for each scenario



Further information and next steps

This PACR represents the final stage in the RIT-T process.

TransGrid is now in the midst of the pre-investment activities necessary to proceed with the preferred option and will be seeking a determination by the AER that the proposed investment satisfies the RIT-T as well as seeking AER approval of a contingent project allowance for this investment.

The box below summarises important information for proponents of 'virtual transmission line' solutions on how they can engage with AEMO, TransGrid and Powerlink as part of the separate assessment process for the 'QNI medium' upgrade.

Further details in relation to this project can be obtained from regulatory.consultation@transgrid.com.au

Opportunities for proponents of 'virtual transmission line' solutions

While consultation with proponents of 'virtual transmission line' options since the PADR has resulted in the stated costs of these technologies falling (meaning they are more likely to be 'economically feasible'), credible options under the RIT-T are also required to be 'technically feasible'.

A proportionate approach to assessing technical feasibility of these solutions was adopted in the PADR, which effectively assumed that these options were technically feasible. This approach was taken in order to compare all options simply on their expected net market benefits (i.e., putting aside technical feasibility) and had no bearing on the conclusion at the PADR stage since these options were not found to be the top-ranked options.[11]

This approach has not been taken as part of the PACR since the assessment is required to identify the preferred credible option. A 'virtual transmission line' comprised of grid-connected battery systems and/or braking resistors of this magnitude would be the first in Australia and there is substantive additional network testing that is required in order to comprehensively determine technical feasibility. TransGrid and Powerlink consider that determining whether these solutions are likely to be technically feasible will require around twelve months of further work and consultation with proponents.

TransGrid and Powerlink envisage that 'virtual transmission lines' may form a potential option considered as part of the medium term QNI upgrade recommended in the draft 2020 ISP, for which a PADR is required by 10 December 2021. This timeframe does allow for a comprehensive assessment of the technical feasibility of these options.

TransGrid and Powerlink therefore encourage proponents of these solutions to respond to the current draft 2020 ISP consultation, both in relation to:

- the capabilities of these technologies generally (to inform the ISPs consideration of these technologies as network solutions); and
- if they propose non-network solutions.

This will enable consideration of those technologies by AEMO as part of the final 2020 ISP. AEMO's deadline for submissions on the draft 2020 ISP is 21 February 2020 and their deadline for non-network submissions in relation to the QNI medium upgrade is 13 March 2020.[12]

TransGrid and Powerlink would welcome technical discussions with proponents before this date to help inform their submissions. This could include types of models and information which would help inform the technical feasibility of a 'virtual transmission line' solution.

Proponents should provide detailed technical information on their proposed option, including PSSE and PSCAD models and complete technical performance information, to enable them to be fully assessed.

A copy of the Project Assessment Conclusions Report can be obtained from TransGrid's website or Powerlink's website or by emailing regulatory.consultation@transgrid.com.au

[11] Specifically, at the PADR stage, while Option 5B was the top-ranked 'virtual transmission line' option, and had the greatest estimated gross benefit of all options, it was only expected to deliver around 60 per cent of the expected net benefits of Option 1A (on a weighted-basis). This was driven by the relatively high costs associated with Option 5B based on submissions from proponents at the time, which include high upfront costs and as the need to reinvest during the assessment period due to the comparatively shorter life of the energy storage components.

[12] AEMO, *Draft 2020 Integrated System Plan*, 12 December 2019, pp. 16 & 82.