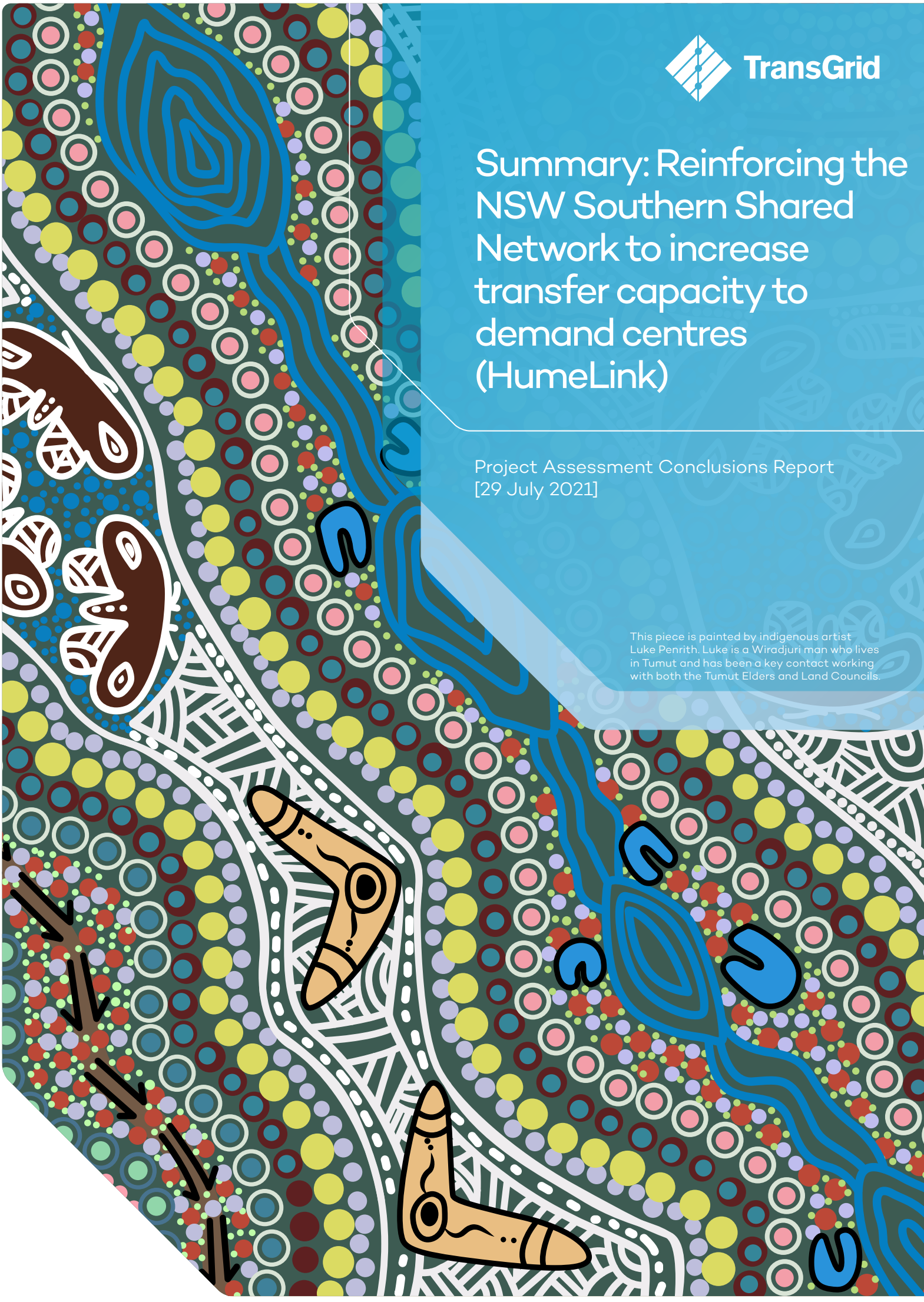
TransGrid

# Summary: Reinforcing the NSW Southern Shared Network to increase transfer capacity to demand centres (HumeLink)

Project Assessment Conclusions Report
[29 July 2021]



This piece is painted by indigenous artist Luke Penrith. Luke is a Wiradjuri man who lives in Tumut and has been a key contact working with both the Tumut Elders and Land Councils.

# Summary

TransGrid has investigated options for reinforcing the New South Wales (NSW) Southern Shared Network to increase transfer capacity to the state's major load centres of Sydney, Newcastle and Wollongong.

The driver for reinforcing the Southern Shared Network is to deliver a net economic benefit to consumers and producers of electricity and support energy market transition through:

- increasing the transfer capacity between southern NSW and major load centres of Sydney, Newcastle and Wollongong;
- enabling greater access to lower cost generation to meet demand in these major load centres;
- facilitating the development of renewable generation in high quality renewable resource areas in southern NSW as well as the southern states, which will further lower the overall investment and dispatch costs in meeting NSW demand whilst also ensuring that emissions targets are met at the lowest overall cost to consumers; and
- increasing the competitiveness of bidding in the wholesale electricity market.

In January 2020, we released a Project Assessment Draft Report (PADR) as part of the Regulatory Investment Test for Transmission (RIT-T) to progress the assessment of investments that increase transfer capacity of the shared transmission network between southern NSW and the major load centres within the state. The PADR followed the Project Specification Consultation Report (PSCR) released in June 2019. The Project Assessment Conclusions Report (PACR) represents the final stage in the RIT-T consultative process.

## Overview

The PACR finds that Option 3C, comprised of new 500 kV lines in an electrical 'loop' between Maragle, Wagga Wagga and Bannaby, provides the greatest net benefit of all options considered across the four scenarios investigated.

Option 3C is therefore the preferred option identified under this RIT-T and is found to have approximately 23 per cent greater estimated net benefits than the second ranked option (Option 2C), on a weighted basis across the four scenarios investigated.

The analysis shows that the preferred option is expected to:

- deliver net benefits of approximately $491 million over the assessment period, in present value terms, which increases further if alternate scenario weightings are assumed, in-line with recent commentary by the Australian Energy Market Operator (AEMO) and the Energy Security Board (ESB);
- reduce the need for new dispatchable generation investment to meet demand going forward;
- avoid capital costs that would otherwise be required associated with enabling greater integration of renewables in the National Electricity Market (NEM);
- lower the aggregate generator fuel costs required to meet demand in the NEM going forward; and
- provide significant 'competition benefits' by increasing the efficiency of bidding in the wholesale market.

The preferred option identified over the course of this RIT-T is consistent with the network topology and operating capacity of HumeLink in the final AEMO 2020 Integrated System Plan (ISP).

All lines are to be constructed in a double-circuit configuration to minimise the overall costs to consumers. This reflects a change since the PADR and represents a refinement of the ISP candidate option, which reduces the investment cost. This has been enabled through undertaking a detailed assessment of the risks involved with adopting double-circuit lines for the specific options considered, compared to single-circuit, and how these can be mitigated to an acceptable level.

## This RIT-T has examined reinforcing the Southern Shared Network to increase transfer capacity to key demand centres in New South Wales

TransGrid operates and maintains the transmission network in NSW. The shared transmission network between the Snowy Mountains and Bannaby carries power from all generation across southern NSW to the major load centres of Sydney, Newcastle and Wollongong. It also carries all electricity that is imported from Victoria to the major load centres in NSW. The main transmission lines in this area are heavily congested at times of high demand and will become more congested as new generation connects in southern NSW.

In NSW, where the existing coal-fired generators are retiring progressively from 2022, there is a pressing need for new sources of supply to meet the community's growing energy demand.

There are currently substantial new renewable generation developments anticipated in southern NSW, with projects in construction or under development currently totalling 1,900 MW. In addition, Snowy 2.0 will provide a new source of generation to meet future demand in the major load centres of NSW and to 'firm' supply from the new renewable generation.

However, reinforcement of the Southern Shared Network will be required to allow the transfer of energy to demand centres. Existing congestion at times of high demand limits access to the existing generation capacity of the Snowy Mountains Scheme at times of peak demand. Access to the additional 1,900 MW of new renewable generation and 2,000 MW capacity of Snowy 2.0 in southern NSW would be severely limited, without reinforcement to the Southern Shared Network.[1]

## Benefits from reinforcing the Southern Shared Network compared to the status quo

The RIT-T must demonstrate that there is an overall net market benefit to the NEM from increasing the transfer capacity of the transmission network – the Southern Shared Network between southern NSW and the major demand centres of Sydney, Newcastle and Wollongong.

The analysis in the PACR shows that the investments considered in this RIT-T are expected to:

- open up additional capacity for new generation (primarily renewable generation) in areas of southern NSW, which have recognised high-quality wind and solar resources;
- increase the transfer capacity between Victoria and NSW, which would provide NSW with access to additional generation from Victoria;
- allow the additional transfer capacity between South Australia and NSW provided by EnergyConnect and the additional transfer capacity between Victoria and NSW provided by the Victoria-NSW Interconnector Upgrade to flow to major demand centres; and
- increase the competitiveness of bidding in the wholesale market by relieving existing transmission constraints.

In the absence of investment under this RIT-T, alternative investment by market participants in peaking plant and other generation technologies in NSW would be required to continue to meet the State's demand, system stability and security requirements, as existing dispatchable generation in NSW retires.

Increasing access to generation capacity in southern NSW therefore has the potential to benefit the market and consumers through lowering the overall dispatch and investment costs required to meet demand from households and businesses in NSW, as well as to provide significant 'competition benefits' by increasing the competitiveness of bidding in the wholesale market.

[1] New generators will connect to the transmission network at various locations. The connection works are funded by the respective generator and are outside the scope of this RIT-T, which examines reinforcing the shared network.

## Key developments since the PADR was released have been reflected in the PACR

The PADR for this RIT-T was published in January 2020, along with an accompanying market modelling report. On 12 February 2020, we held a public forum on the PADR that was attended by representatives from 17 organisations.

Formal submissions from eight parties were received in response to the PADR, seven of which have been published on our website (one submitter requested confidentiality).[2] While submissions covered a range of topics, there were six broad topics that were most commented upon, namely:

- timing and scope of the options included in the assessment;
- assumptions used in the market modelling;
- modelling outcomes;
- cost of the options;
- the incidence of market benefits;
- diversity benefits from an electrical 'loop'; and
- use of double-circuit versus single-circuit.

In addition, prior to, as well as after, receiving submissions, we held bilateral meetings with interested parties in order to further discuss the RIT-T assessment. These have played a pivotal role in being able to define and undertake the assessment in the PACR.

We have taken all feedback raised in submissions and stakeholder feedback sessions into account in undertaking our PACR analysis and have reflected two key points raised by submitters directly in the wholesale market modelling undertaken (i.e., applying 'realistic bidding' and whether modular power flow control can be expected to increase the net market benefits expected from the preferred option).

There have been a number of other key developments since the release of the PADR in January 2020, including:

- Snowy 2.0 receiving environmental approval and construction approval from the Federal government in mid-2020;
- the final 2020 ISP being released by AEMO in July 2020, which concluded that HumeLink is a 'low regret' investment and represents an 'actionable ISP project';
- the NSW Government publishing its Electricity Infrastructure Roadmap in November 2020, which was legislated in December 2020, setting out a commitment to a number of minimum objectives in terms of developing Renewable Energy Zones (REZs) in NSW;
- the new actionable ISP framework being finalised under the National Electricity Rules (NER) and the Australian Energy Regulator (AER) finalising the new cost benefit analysis guideline to make the ISP actionable;
- the announcement of new gas plants in NSW, the early retirement of Yallourn power station in Victoria and the Victorian 'Big Battery';
- clarification from the AER over September and October 2020 regarding applying a multi-stage contingent project application (CPA) to HumeLink (in order to provide certainty regarding funding for deriving more accurate costings);
- the AER approving the EnergyConnect contingent project at the end of May 2021; and

[2] https://www.transgrid.com.au/what-we-do/projects/current-projects/Reinforcing%20the%20NSW%20Southern%20Shared%20Network

- progression of ecological surveys and community and stakeholder engagement activities in parallel to the RIT-T process to inform the subsequent Environmental Impact Statement (EIS) for HumeLink.

The assessment in the PACR reflects these developments. It also builds on the analysis in the PADR through:

- expanding the analysis in response to submissions on the PADR;
- focussing the RIT-T analysis on the seven options with the greatest expected net market benefits;
- refining the option cost estimates, including the estimation of the environmental offset costs required for each network topology;
- undertaking the studies required to inform a view on lightning and bushfire risks, and how they can be mitigated, for options involving double-circuit portions;
- updating the assessment to fully align with the assumptions and outcomes in the 2020 ISP and Inputs, Assumptions and Scenarios Report, as well as the 2020 Electricity Statement of Opportunities; and
- further investigating competition benefits and finding that they are material to the assessment.

## Seven options have been assessed in the PACR

Based on the net present value (NPV) assessment in the PADR, and further detailed screening of the options considered, the list of credible options has been refined since the PADR to ensure that the top-ranked options are able to be assessed at a greater level of detail as part of the PACR.

The analysis in the PACR focuses on seven options that are expected to have the greatest net market benefits overall. Specifically, the PACR assesses options across the following three different topologies:

1. Topology 1 – a 'direct' path between Maragle and Bannaby:
   - Option 1A, Option 1B and Option 1C from the PADR
2. Topology 2 – a path between Maragle and Bannaby via Wagga Wagga that would open up additional capacity for new renewable generation in southern NSW:
   - Option 2B and Option 2C from the PADR
3. Topology 3 – a wider footprint via Wagga Wagga, that would open up both direct and additional capacity for new renewable generation in southern NSW:
   - Option 3B and Option 3C from the PADR

The PACR does not assess the 'Topology 4' options from the PADR (involving new transmission lines in an electrical 'loop' between Maragle, Wagga Wagga and Bannaby and direct between Bannaby and Sydney). These options have significantly greater revised costs than the other options (in the order of $4.7 billion to $5 billion) and are not expected to provide commensurately greater market benefits than the other options.

The PACR also does not assess Option 2A or Option 3A from the PADR (the two 330 kV build and operate options of these network topologies) since they were found to have significantly lower benefits than the other options.

We have investigated different circuit configurations of the top performing network topologies and operating capacities in the PADR and PACR analysis. The outcome of this process is that Option 2C and Option 3C from the PADR are presented in the PACR as complete double-circuit options, which allows significant cost reductions relative to where they are constructed as either a single-circuit, or a combination of single- and double-circuit, configuration. Additional work undertaken since the PADR to assess the risks involved with double-circuit configuration, compared to single-circuit, and how these risks can be mitigated, has enabled these two options to be refined as part of the PACR.

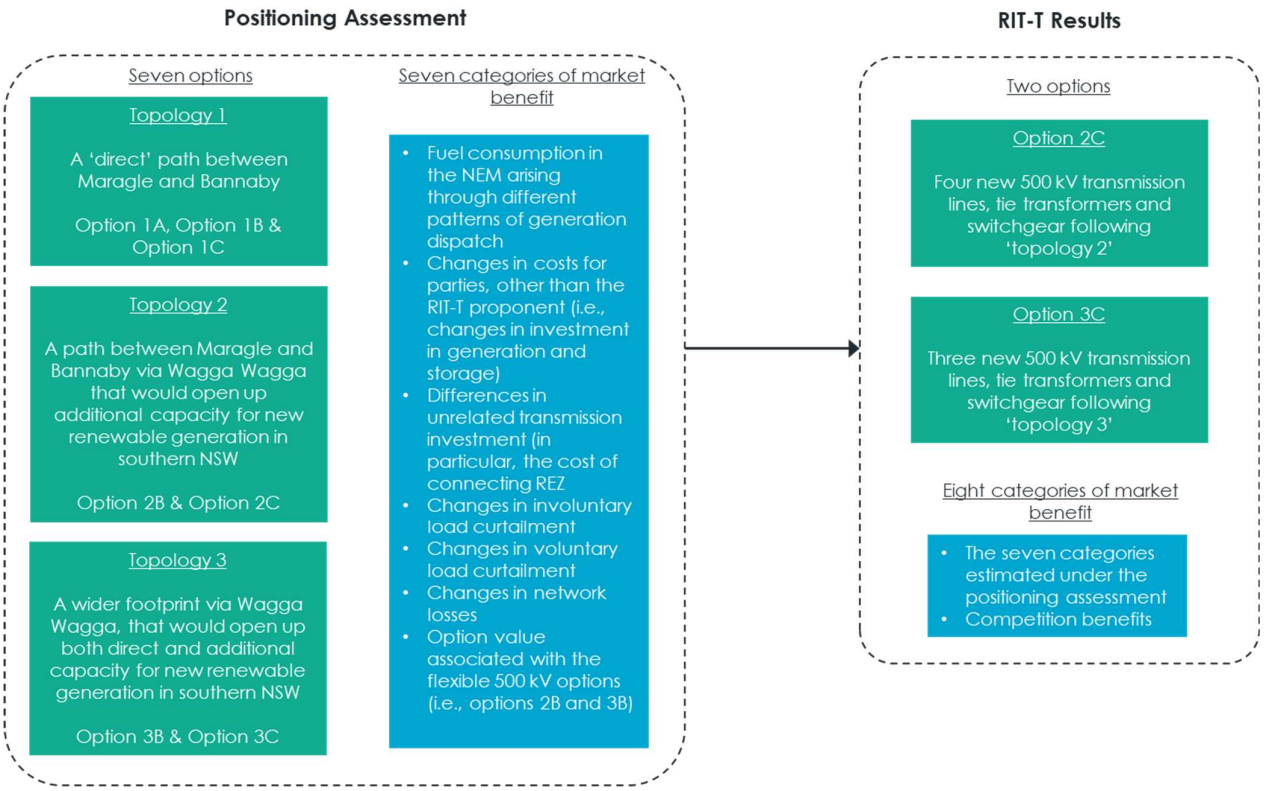
## We have undertaken a positioning assessment to inform the ultimate RIT-T analysis

We have undertaken a positioning assessment in the PACR that assesses all seven credible options across each of the four scenarios included in AEMO's 2020 ISP. This positioning analysis covers all market benefits with the exception of competition benefits, since the modelling required to estimate competition benefits is considerable for each option, whilst the outcome is not expected to be materially different across options. Competition benefits have then been estimated for the two top-ranked options coming out of the positioning assessment. We consider this to be a proportionate approach for this RIT-T.

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 core scenarios have been considered as part of the PACR. These scenarios are intended to cover a wide range of possible futures and are aligned with the AEMO 2020 ISP 'central', 'slow-change', 'fast-change' and 'step-change' scenarios. The four scenarios differ in relation to key variables expected to affect the market benefits of the options considered, including demand outlook, Distributed Energy Resources uptake, assumed generator fuel prices, assumed emissions targets, retirement profiles for coal-fired power stations, timing of major transmission augmentations and generator and storage capital costs.

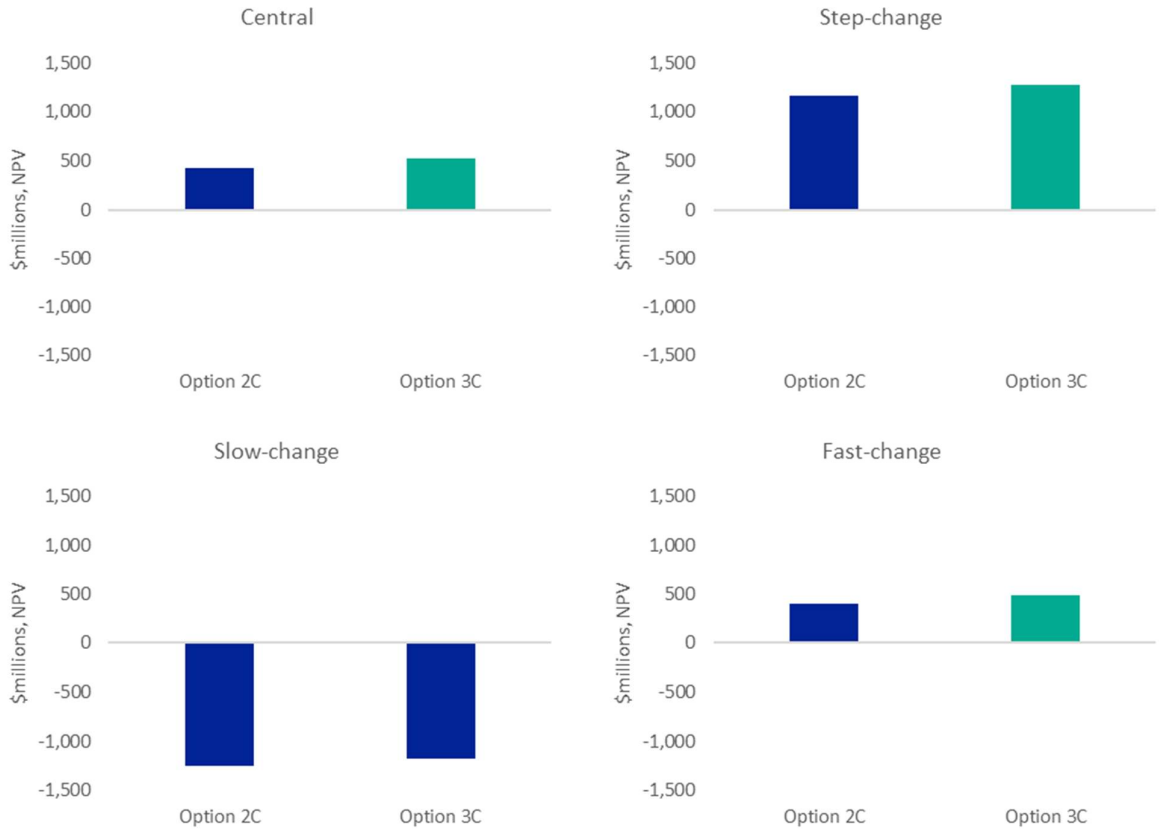
**Figure E.1 – Structure to the PACR assessment**



## The preferred option is new 500 kV double-circuit lines in an electrical 'loop' between Maragle, Wagga Wagga and Bannaby

The results of the PACR assessment find that Option 3C, comprised of new 500 kV double-circuit lines in an electrical 'loop' between Maragle, Wagga Wagga and Bannaby, provides the greatest net benefits across all scenarios. Option 3C is found to have positive net benefits under all scenarios investigated, except for the slow-change scenario.

**Figure E.2 – Estimated net benefits for each scenario, $2020/21[3]**




*Note: The two options shown above reflect those with the greatest expected net benefits based on a positioning assessment undertaken across the full seven credible options. The net market benefits estimated for each of the other five options are presented in the body of the PACR.*

While the slow-change scenario finds negative net benefits for both options, we note that this scenario is considered the least likely of the four scenarios and is given a 10 per cent weighting in the analysis, consistent with the recommended weighting in the 2020 ISP.[4] In addition, we note that recent commentary from the ESB suggests that the NEM is in fact tracking closest to the step-change currently.[5]

Under all scenarios, the benefits for Option 3C are primarily driven by avoided, or deferred, costs associated with generation and storage build. Avoided generator fuel costs, competition benefits and avoided transmission

[3] All dollars presented in this report are $2020/21, unless otherwise stated.

[4] AEMO, 2020 Integrated System Plan, July 2020, p. 86

[5] See Renew Economy, *"We are headed for step change:" ESB's Kerry Schott on new market design,* Parkinson, G., 30 September 2020 (accessed via https://reneweconomy.com.au/we-are-headed-for-step-change-esbs-kerry-schott-on-new-market-design-89487/ on 7 July 2021), Argus Media, Australia tops step-change energy transition scenario, Morrison, K., 7 May 2021 (accessed via https://www.argusmedia.com/en/news/2212777-australia-tops-stepchange-energy-transition-scenario on 7 July 2021) & ESB, *The Health of the National Electricity Market 2020*, Volume 1: The ESB Health of the NEM Report, 5 January 2020, p. 8.

capital costs to connect new REZs make up the vast majority of other market benefits estimated, with their relativities varying across the scenarios.

On a weighted-basis, Option 3C is expected to deliver approximately $491 million of net benefits and is ranked first out of the options assessed (with estimated net benefits that are 23 per cent greater than the second-ranked option, Option 2C). Option 3C is therefore the preferred option overall under the RIT-T.

## Further information and next steps

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

Activities not related to the RIT-T but necessary to progress assessment of the project in order to achieve approval, are also being undertaken, including preparation of an EIS under the NSW planning approval pathway, managed by the Department of Planning, Industry and Environment (DPIE).

Following clarification from the AER over September and October 2020,[6] we are intending to submit two CPAs to the AER in relation to the regulatory cost recovery for the project, namely:

- 'Initial CPA' – will seek cost recovery for works to-date and the cost of the works necessary to develop a robust cost estimate for the project, based on the preferred option; and
- 'Final CPA' – will seek cost recovery for the implementation costs, including construction cost of the project, once a final estimate is available (this CPA will cover the bulk of the project cost).

In each case, AEMO's 'feedback loop' will be applied to the estimated costs of the entire project, in line with the new actionable ISP Rules. This will provide stakeholders with additional confirmation that the project remains consistent with AEMO's ISP 'optimal development path', at the costs included in the CPA. For the initial CPA we envisage that the cost estimate used for the feedback loop will reflect the cost of the option included in the RIT-T PACR. The feedback loop may then need to be applied again for the final CPA, based on the final cost estimate for the project.[7]

We note that the RIT-T does not address line route specifics for the preferred option[8] and, instead, these are scoped by the Transmission Network Service Provider and assessed within the EIS. Planning approval would only be granted by the NSW Minister for Planning and Public Spaces following extensive, genuine community and stakeholder consultation and demonstration that environmental impacts can be effectively managed or mitigated. This process is currently underway and will continue following the conclusion of this RIT-T.

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

[6] https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/contingent-projects/transgrid-humelink-contingent-project/aer-position

[7] TransGrid letter to AER - Humelink - Staging of the regulatory process, 14 September 2020, p. 2. AEMO would not apply the feedback loop at the final CPA stage if the total cost of the project remains at or below that used for the feedback loop for the initial CPA.

[8] Instead, the RIT-T approval process reviews, and publicly consults on, a TNSP's application for new investment to meet an identified need. Overall, it identifies the technical solution to the need that provides the greatest net benefit to the NEM overall. This RIT-T process is undertaken in consultation with consumers, AEMO, Registered Participants and other interested parties regarding the investment options under consideration.