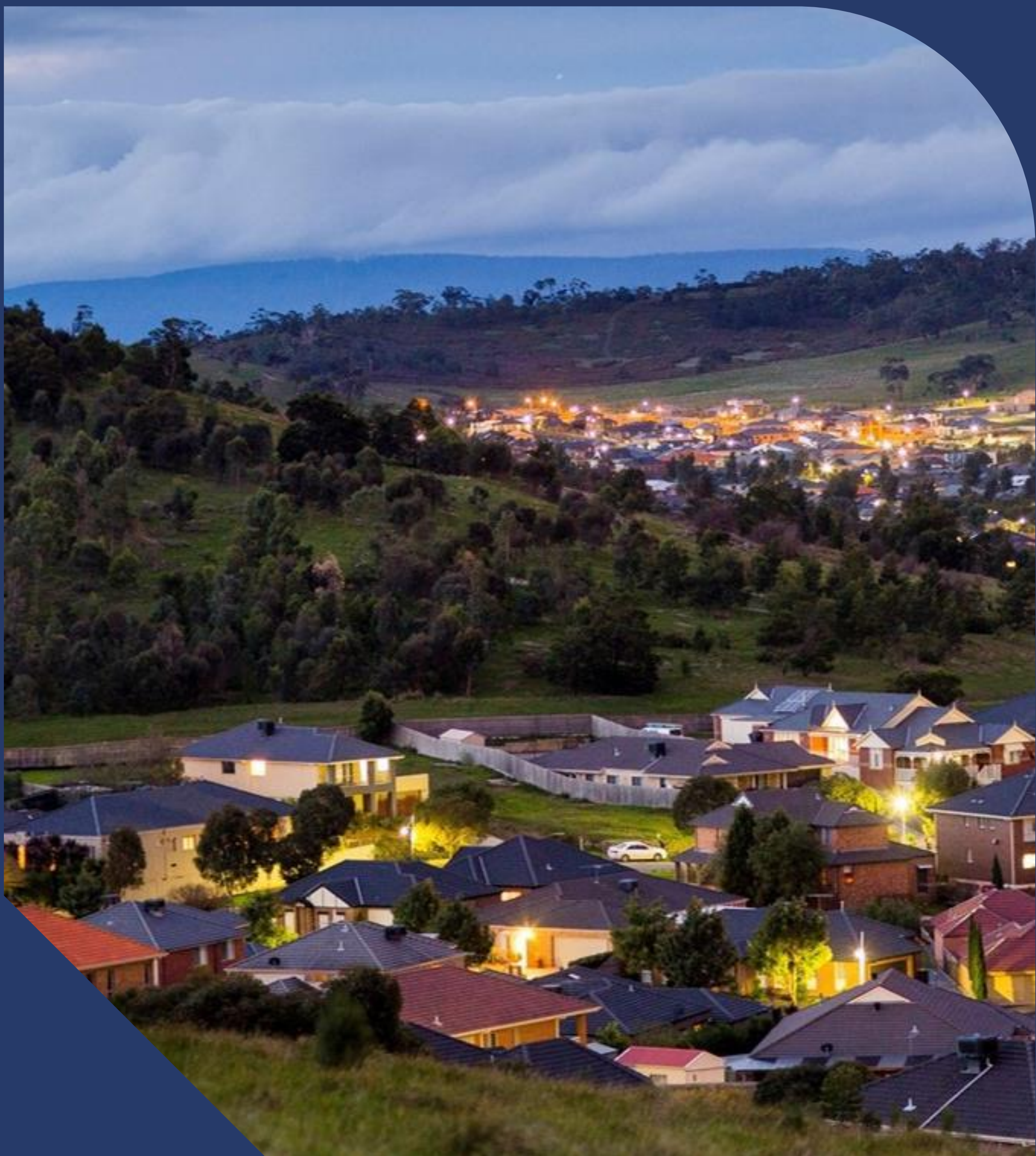
AusNet

Connection Enablement: Wodonga – Barnawartha in North-Eastern Victoria

Regulatory Investment Test for Transmission (RIT-T)

Project Assessment Draft Report

Tuesday, 2 July 2024



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1. Executive summary

AusNet owns and operates the electricity transmission network in Victoria, which transports electricity from large coal, gas and renewable generators across Victoria and interstate, to terminal stations that supply large customers and the distribution networks. AusNet also owns and operates the electricity distribution network in eastern Victoria and parts of northern and eastern Melbourne metropolitan area. As the Distribution Network Service Provider (DNSP) in Wodonga – Barnawartha area, AusNet is responsible for planning the transmission connection assets and distribution network in this area.

AusNet has received connection inquiries to connect a total of 390 MW of renewable generation to Wodonga Terminal Station (WOTS) sub-transmission (66 kV) system. The WOTS sub-transmission system was originally planned, built, and maintained to meet the rural load in that area and does not have sufficient capacity to connect this renewable generation.

The Regulatory Investment Test for transmission (RIT-T) is an economic cost-benefit test used to assess and rank credible options that are capable of meeting an identified need. The purpose of the RIT-T is to identify the credible option that addresses the identified need and maximises the present value of net economic benefit to all those who produce, consume and transport electricity in the National Electricity Market (the preferred option).

AusNet initiated this RIT-T by publishing the Project Specification Consultation Report (PSCR) in January 2024 in accordance with clause 5.16 of the NER and section 4.1 of the AER's RIT-T Application Guidelines to address the constraints in the WOTS sub-transmission system to enable more renewable connections to AusNet's sub-transmission and distribution network in North-eastern Victoria (Wodonga - Barnawartha area). Publication of this Project Assessment Draft Report (PADR) represents the second step in the RIT-T process.

AusNet received no non-network option or submissions in response to the PSCR consultation.

AusNet followed the AER's RIT-T application guidelines to analyse and rank the economic cost and benefits of the investment options considered in this RIT-T. The robustness of the ranking was investigated through scenario analysis and sensitivity testing in accordance with the RIT-T requirements.

AusNet evaluated following network options to select the option that provides the highest net economic benefits:

1. Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 19/4.75 conductor
2. Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 37/3.75 conductor
3. Commission the WOTS spare transformer and add a second circuit to the existing WO-BWA 66 kV line
4. Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line

A fifth option was also considered, but not progressed further as it was clearly inferior to options 3 and 4 which are lower cost and provide higher capacity.

The economic analysis shows that the Option 4 "Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line" provides the highest net economic benefits for the two ISP scenarios that we have adopted in this PADR, as shown in the table below. Further information on the scenario selection is provided in section 6.5 of this PADR.

The following points should be noted in relation to the data provided in the table below:

- Financial data are expressed in present value terms and $M, real 2024 prices; and
- The assessment period is over 48 years (2024/25 to 2071/72)

Table 1: Net economic benefit of each option for the assessed ISP scenarios in present value terms ($M, real 2024)

Option	Progressive Change ISP Scenario	Step Change ISP Scenario
Option 1 - Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 19/4.75 conductor	$7.02M	$20.79M
Option 2 - Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 37/3.75 conductor	$19.26M	$30.52M
Option 3 - Commission the WOTS spare transformer and add a second circuit to the existing WO-BWA 66 kV line	$14.30M	$50.66M
Option 4 - Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line	**$25.45M**	**$61.81M**

AusNet tested the robustness of the investment decision against six inputs in the sensitivity analysis. As shown in the diagram below, Option 4 provides the highest net economic benefit for all the sensitivities considered.

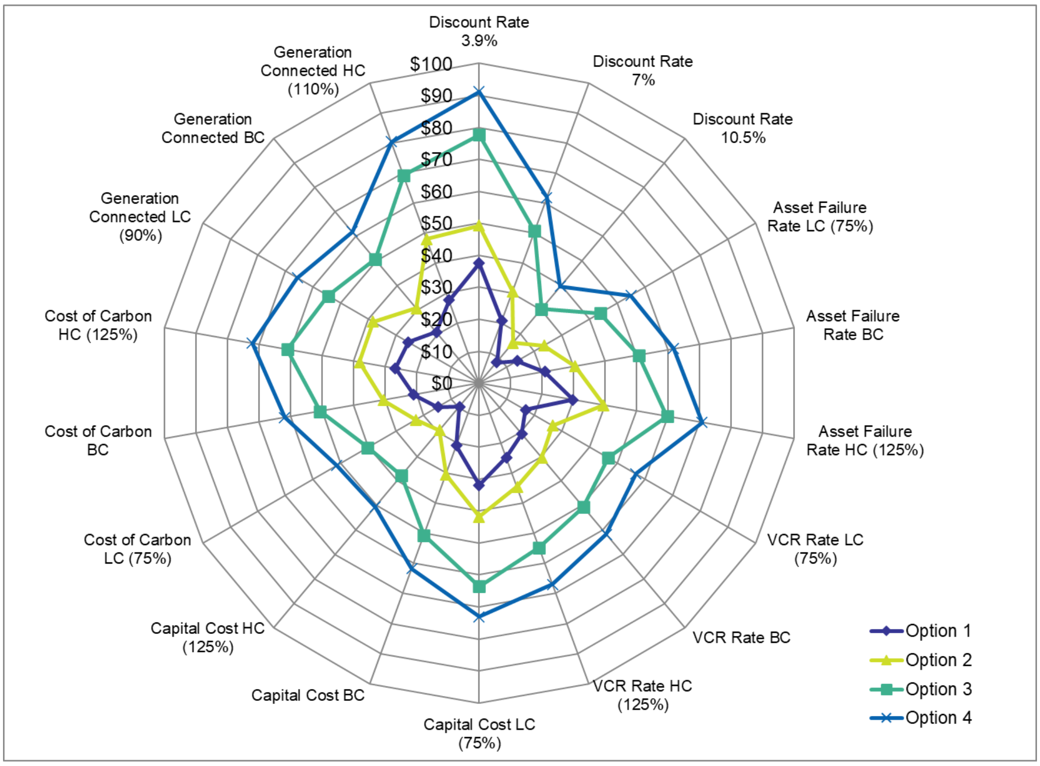

Figure 1: Sensitivity analysis of the six shown inputs on the net present value of each option ($M, real 2024)

On the basis of the analysis presented in this PADR, AusNet concludes that the Option 4 "Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line with 37/3.75 conductor" is the preferred option to address the identified need described in this RIT-T. In reaching this conclusion, we note that a second line to Barnawartha Zone Substation would increase the reliability of Barnawartha area significantly as there is only one line at present. This additional value is the principal reason why Option 4 is preferred to Option 3 and this additional value will remain the same for each ISP scenario.

AusNet welcomes written submissions on the credible option evaluation and draft conclusion presented in this PADR. Submissions should be emailed to rittconsultations@ausnetservices.com.au by Friday 16 August 2024. In the subject field, please reference 'RIT-T PADR CE WOTS-BWA'. AusNet's preference is that these submissions would be published on its website and AEMO's website. If you do not want your submission to be made public, please clearly stipulate this at the time of lodgement.

AusNet expects to publish the Project Assessment Conclusions Report (PACR) with the responses to the submissions received in September 2024.

2. Introduction

AusNet owns and operates the electricity transmission network in Victoria, which transports electricity from coal, gas and renewable generators across Victoria and interstate, to terminal stations that supply large customers and the distribution networks.

The RIT-T is an economic cost-benefit test used to assess and rank potential investments capable of meeting an identified need. The purpose of the RIT-T is to identify the credible option that addresses the identified need and maximises the present value of net economic benefit to all those who produce, consume and transport electricity in the National Electricity Market (the preferred option).

The Project Specification Consultation Report (PSCR) for the 'Connection Enablement: Wodonga – Barnawartha in North-Eastern Victoria' project was published in January 2024 in accordance with clause 5.16 of the Rules and section 4.1 of the AER's RIT-T Application Guidelines[1]. Publication of this Project Assessment Draft Report (PADR) represents the second step in the RIT-T process and describes the following:

- the identified need that AusNet is seeking to address;
- credible network options that may address the identified need;
- a summary of any submissions to the PSCR;
- the assessment approach and assumptions that AusNet has employed for this RIT-T assessment as well as the specific categories of market benefits that are unlikely to be material; and
- the identification of the proposed preferred option and the draft conclusion.

The appendix provides an overview of the RIT-T assessment and consultation process.

[1] Australian Energy Regulator, Application Guidelines, Regulatory Investment Test for transmission, August 2020.

3. Background and technical characteristics

Wodonga Terminal Station (WOTS) is the main source of supply for a significant part of north-eastern Victoria. The supply is via two 330/66/22 kV three-winding transformers with a nominal rating of 75 MVA each. As these transformers are unique and due to the condition of the transformers, AusNet purchased a spare transformer with the same voltage ratio and capacity recently. This spare transformer is now stored at the WOTS as a cold spare (not energised or connected to the network).

AusNet is responsible for planning the transmission connection facilities and distribution network for this region.

WOTS consists of three switchyards operating at voltages of 330 kV, 66 kV and 22 kV as shown below. The 330 kV switchyard interconnects a transmission line from Dederang Terminal Station (DDTS) and a transmission line from Jindera Substation in New South Wales.

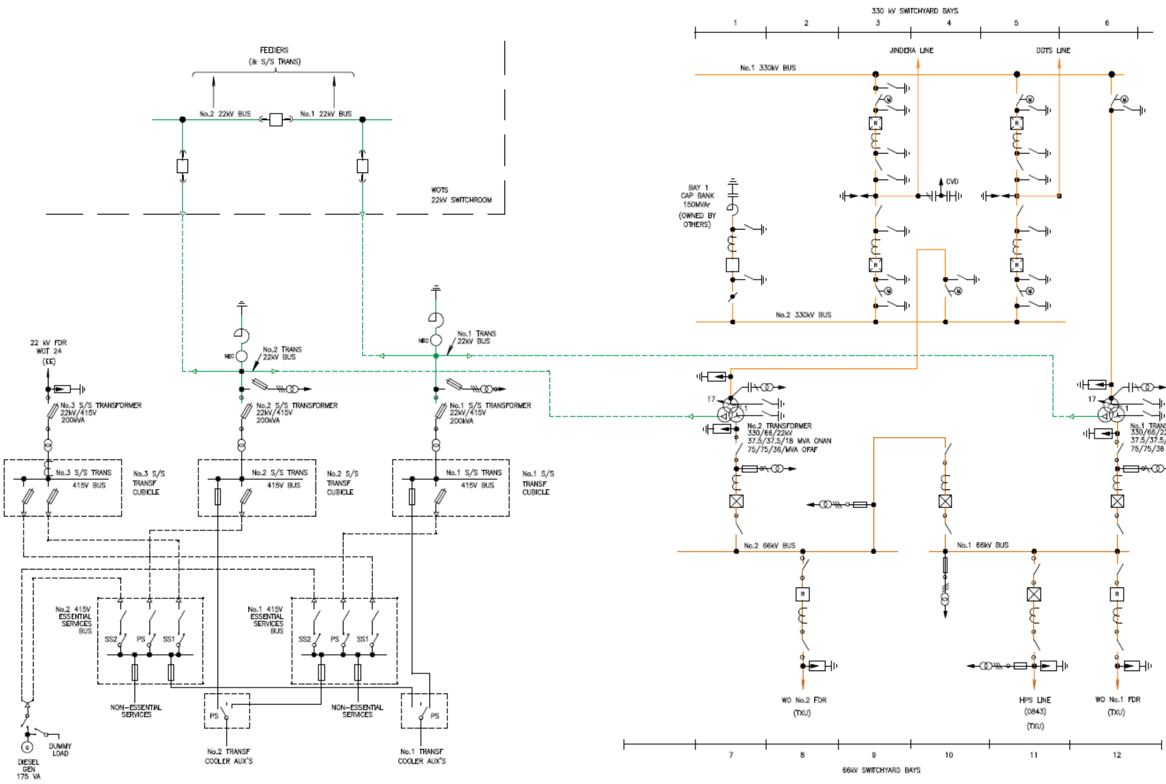

Figure 2: Network diagram showing Wodonga Terminal Station 330 kV, 66 kV and 22 kV Switchyards

Most of the time, total station demand (66 kV and 22 kV demand) at WOTS is below the N-1 station summer rating of 81 MVA. The maximum demand on the station reached 107.4 MVA in summer 2008/09, which was followed by a period of decline before recently flattening. The recorded maximum demand in summer 2022/23 was 80.6 MW (81.9 MVA).

A total of 115.3 MW of embedded generation capacity is installed on the AusNet sub-transmission and distribution systems connected to WOTS. It consists of:

- 60 MW of large-scale embedded generation; and
- 55.3 MW of rooftop solar PV, including all the residential and small-scale commercial rooftop PV systems that are smaller than 1 MW.

Hume Power Station (HPS) is connected to the WOTS 66 kV bus 1 via a 66 kV line from HPS. HPS generation can also be connected to the TransGrid 132 kV network in New South Wales. Hume can dispatch output to both the Victorian and New South Wales wholesale electricity markets from the Hume switching station which is connected to the Albury terminal station in NSW. The nameplate capacity of the HPS is 58 MW.

WOTS supplies Wodonga centrally as well as the area from Rutherglen in the west to Corryong in the east. Wodonga Zone Substation (WO ZSS) is connected to the WOTS via two 66 kV feeders connected to 66 kV bus 1 and 2 of WOTS for improved reliability.

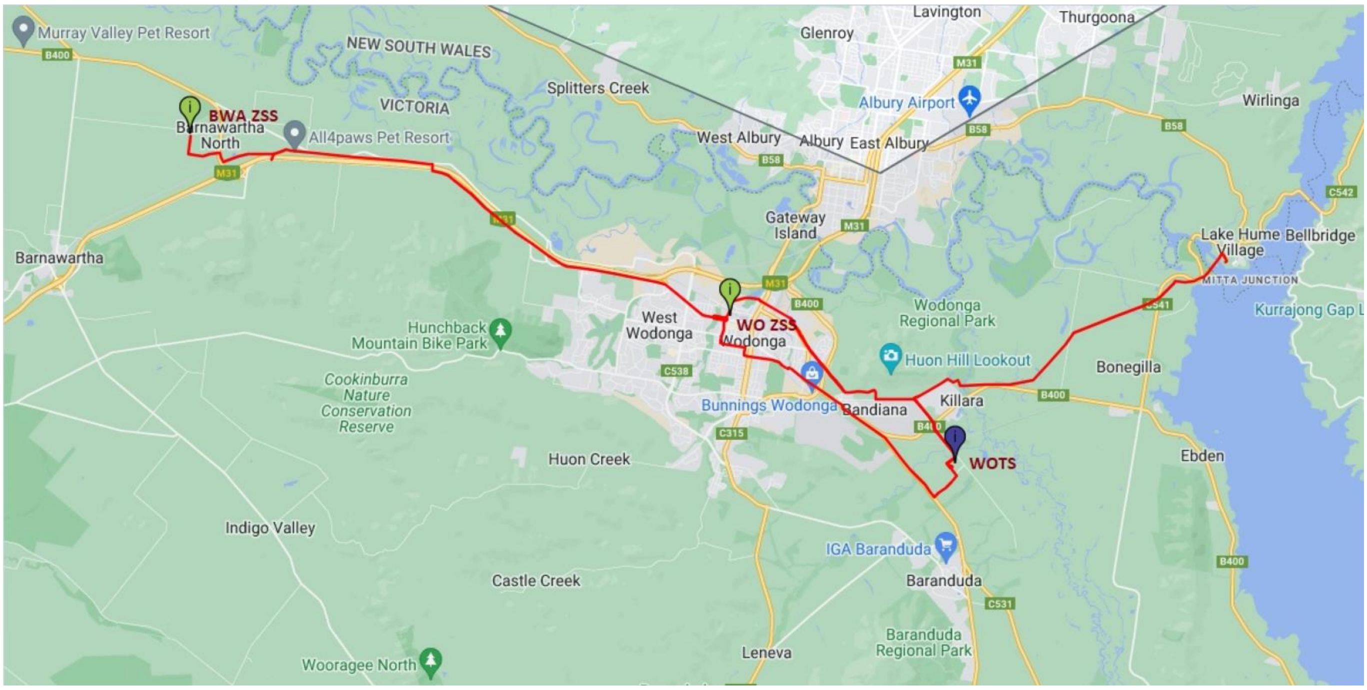

Figure 3: Map showing the Wodonga - Barnawartha sub-transmission network

As shown in the map above, the Barnawartha Zone Substation (BWA ZSS) is connected to WO ZSS 66 kV bus via a single 66 kV feeder (66 kV feeders are shown in red lines). The length of this feeder is 16.6 km.

The following diagram shows the 66 kV bus connection arrangement of WO ZSS with the 66 kV feeder connection to BWA ZSS (red boxes demonstrate 66 kV circuit breakers). The three WO ZSS transformers are 66/22 kV transformers.

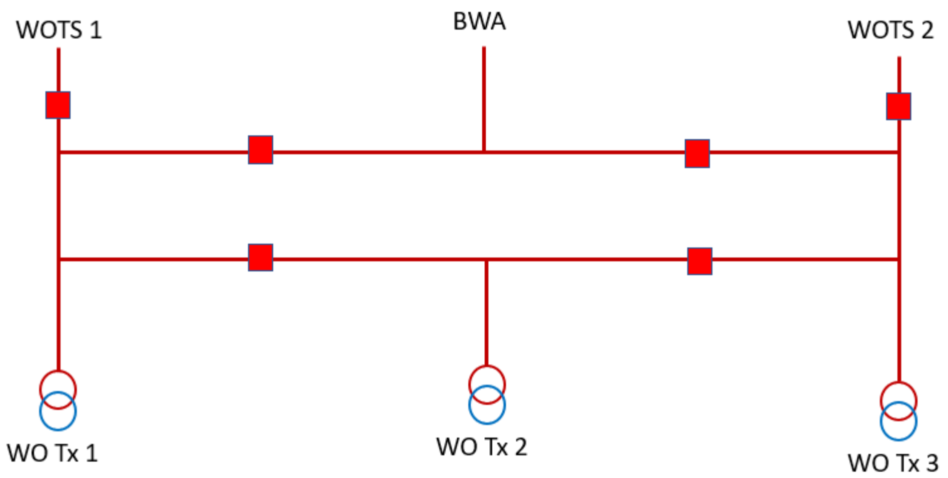

Figure 4: Wodonga Zone Substation 66kV bus arrangement

4. Identified need

4.1. Description

As mentioned above, there are already 60 MW of large-scale embedded generation connected to WOTS. As explained in the PSCR, AusNet has received a number of connection inquiries to connect a total of 390 MW of renewable generation to WOTS sub-transmission (66 kV) system. Of this, 370 MW is to connect into BWA ZSS.[2]

Through preliminary studies AusNet has found that only a portion of this proposed generation can be accommodated by the existing assets, and the output of the connected generation would have to be curtailed during peak generation due to the existing constraints of the network.

The limited available capacity reflects the fact that the WO – BWA 66 kV feeder was originally planned to supply the small rural load connected to BWA ZSS. The summer rating of the existing line is limited to 64.02 MVA and the existing line cannot accommodate the expected growth in renewable generation. In addition, WOTS would experience a significant reverse power flow with this proposed generation and the existing two transformers are not capable of handling this reverse power flow.

The identified need of this RIT-T is to address the existing constraints on the sub-transmission and distribution network in north-eastern Victoria (Wodonga - Barnawartha area) to enable more renewable generation to connect to this part of AusNet's network.

4.2. Assumptions

The identified need is underpinned by a number of assumptions, including the projected growth in renewable generation given the connection inquiries received; the risk of asset failure (determined by the condition of the assets); and the likelihood of the relevant consequences. In addition to these assumptions, AusNet adopted the assumptions detailed in the following subsections to quantify the risks associated with the identified need.

4.2.1. Market impact costs

Market models produce three key values for assessing net economic benefits:

- savings in total generation costs when new low-cost generation is introduced;
- curtailment of new low-cost generation; and
- savings in total generation costs when a transmission augmentation is introduced to reduce curtailment.

To determine whether enabling new generation connections is beneficial to electricity consumers as a whole, compared to the case without new generation:

- the sum of capital expenditure for the new generation and NEM-wide generation operating costs must be lower;
- curtailment of existing and new generation must be within bounds that are reasonably acceptable for generation proponents; and
- the capital cost of network augmentation must be lower than the savings developed by introducing the new generation.

Adhering to these three determinants leads to a future generation and transmission mix that reduces total costs to consumers. AusNet undertakes market modelling to assess hosting capacity, with and without the proposed augmentation. The assessment is performed using time-sequential modelling that takes account of:

[2] Up-to-date connection interest information is available at AusNet's Subtransmission Ratings and Connections Dashboard

- Projected changes in demand, with specific components that track potential growth in rooftop solar systems, electric vehicle penetration and charging habits, domestic and commercial battery installations, demand-side participation, and virtual power plant schemes utilizing aggregated batteries and vehicle-to-grid technologies.
- Addition of new transmission-connected generators and retirement of existing ageing generators according to AEMO's latest-available ISP projections.
- Addition of new interconnector projects according to AEMO's ISP projections.
- Projected changes in fuel costs for coal and gas-fired generators.
- Projected changes in fixed and variable generator operating costs, maintenance cycles and unplanned outages.
- National Electricity Market Dispatch Engine (NEMDE) constraint equations for regions outside Victoria.
- NEMDE constraint equations for electricity system stability in Victoria.
- Secure thermal operation under N-1 contingency conditions within Victoria, with reference to future changes in power flow.
- Multiple macroeconomic growth scenarios according to AEMO's latest-available Input Assumptions and Scenarios Report (IASR).
- Federal and State-based targets for renewable energy and emissions reduction.

Modelling is performed using hourly time intervals over multiple years to develop a long-term view that aligns with the operational lifetime of generation and transmission assets.

4.2.2. Emission reduction costs

Greenhouse gas emissions would be reduced by replacing fossil fuel powered generation with renewable generation. AusNet quantified the benefits from reductions in carbon emissions using the cost of carbon as given in the draft guidance published by the AER[3].

4.2.3. Supply risk costs

In calculating the supply risk costs, AusNet estimated the expected unserved energy based on the most recent demand forecasts and valued this expected unserved energy with the latest AER Value of Customer Reliability (VCR)[4]. The VCR value applied is based on the sector values published by the AER and the composition of load, by sector, supplied from WOTS. The resulting estimate of the weighted VCR for affected customers is $48,000/MWh for WOTS 66 kV.

4.2.4. Safety risk costs

The Electricity Safety Act 1998[5] requires AusNet to design, construct, operate, maintain, and decommission its network to minimise hazards and risks to the safety of any person as far as reasonably practicable or until the costs become disproportionate to the benefits from managing those risks. By implementing this principle for assessing safety risks from asset failures, AusNet uses:

- a value of statistical life[6] to estimate the benefits of reducing the risk of death;
- a value of lost time injury[7]; and
- a disproportionality factor[8].

AusNet's approach, including the use of a disproportionality factor, is consistent with the guidance provided by the AER.

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[3] https://www.aer.gov.au/documents/aer-valuing-emissions-reduction-draft-guidance-march-2024

[4] In dollar terms, the Value of Customer Reliability (VCR) represents a customer's willingness to pay for the reliable supply of electricity. The values produced are used as a proxy, and can be applied for use in revenue regulation, planning, and operational purposes in the National Electricity Market (NEM).

[5] Victorian State Government, Victorian Legislation and Parliamentary Documents, *"Electricity Safety Act 1998,"* available at Electricity Safety Act 1998 (legislation.vic.gov.au)

[6] Department of the Prime Minister and Cabinet, Australian Government, *"Best Practice Regulation Guidance Note: Value of statistical life,"* available at https://www.pmc.gov.au/resource-centre/regulation/best-practice-regulation-guidance-note-value-statistical-life

[7] Safe Work Australia, "The Cost of Work-related Injury and Illness for Australian Employers, Workers and the Community: 2012-13," available at https://www.safeworkaustralia.gov.au/system/files/documents/1702/cost-of-work-related-injury-and-disease-2012-13.docx.pdf

[8] Health and Safety Executive's submission to the1987 Sizewell B Inquiry suggesting that a factor of up to 3 (i.e. costs three times larger than benefits) would apply for risks to workers; for low risks to members of the public a factor of 2, for high risks a factor of 10. The Sizewell B Inquiry was public inquiry conducted between January 1983 and March 1985 into a proposal to construct a nuclear power station in the UK.

4.2.5. Financial risk costs

In the event of an asset failure, costs will be incurred in replacing the failed assets (and any consequential damage to other assets). The risk of this financial impact may vary for different credible options and, therefore, should be factored into the cost-benefit assessment.

5. Credible Options

This section describes the credible options that have been considered to address the identified need, including:

- the technical characteristics of each option;
- the estimated construction timetable and commissioning date; and
- the total indicative capital and operating and maintenance costs.

The purpose of the RIT-T is to identify the credible option for addressing the identified need that maximises the net market benefit. An important aspect of this task is to consider non-network and network options on an equal footing, so that the optimal solution can be identified, evaluated and determined.

None of the options considered are expected to have an inter-regional impact. Each credible option is discussed below, commencing with the Do Nothing/BAU option. The network option costs have been updated to reflect our latest cost estimates.

5.1. Option 0: Do Nothing/BAU

The Do Nothing/BAU option assumes that AusNet would not undertake any investment, outside of the normal operational and maintenance processes. The Do Nothing/BAU (Business as Usual) option establishes the base level of risk (base case) and provides a basis for comparing other credible options.

5.2. Option 1: Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 19/4.75 conductor

This option involves installation and commissioning of the WOTS spare transformer (330/66/22 kV 75 MVA) as the third in-service transformer at WOTS and augment the existing WO-BWA 66 kV line with 19/4.75 AAC (All Aluminium Conductor) conductor to increase the summer rating to 105 MVA. The existing WO-BWA 66 kV line is constructed with 19/3.25 AAC conductor with a 64 MVA summer rating. As there will be only one line between WO-BWA, even after the augmentation, this option does not provide a solution to the supply risk due to an unplanned outage of this line (e.g., due to a vehicle colliding with a pole, or tree branches falling onto the line in heavy winds etc).

The construction would commence in September 2024, with project completion expected by December 2026. The estimated capital cost of this option is $54.7 million.

In relation to operation and maintenance (O&M) expenditure, AusNet does not expect this option to have a material impact on future O&M costs i.e., routine maintenance expenditure would be substantially unchanged.

5.3. Option 2: Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 37/3.75 conductor

This option is very similar to option 1 above, the only difference being augmenting the existing WO-BWA 66 kV line with 37/3.75 AAC conductor to increase the summer rating to 118 MVA. Similar to Option 1, as there will be only one line between WO-BWA after the augmentation this option does not provide a solution to the supply risk due to an unplanned outage of the line.

The construction would commence in September 2024, with project completion expected by December 2026. The estimated capital cost of this option is $55.1 million.

In relation to O&M expenditure, AusNet does not expect this option to have a material impact on future O&M costs i.e., routine maintenance expenditure would be substantially unchanged.

5.4. Option 3: Commission the WOTS spare transformer and add a second circuit to the existing WO-BWA 66 kV line

This option is also similar to Option 1 above, the only difference being the addition of a second circuit to the existing WO-BWA 66 kV line with similar conductor to increase the summer rating to 128 MVA (two 64 MVA circuits in parallel). Similar to Options 1 and 2, as there will be only one line between WO-BWA after the augmentation, this option does not provide a solution to the supply risk due to an unplanned outage of the line.

The construction would commence in September 2024, with project completion expected by December 2026. The estimated capital cost of this option is $63.0 million.

In relation to O&M expenditure, AusNet does not expect this option to have a material impact on future O&M costs.

5.5. Option 4: Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line

This option includes installation and commissioning of the WOTS spare transformer (330/66/22 kV 75 MVA) as the third in-service transformer at WOTS and adding a new line in parallel with the existing WO-BWA 66 kV line with 37/3.75 AAC conductor.

In the PSCR, AusNet noted that a conductor of higher capacity than 19/3.25 AAC for the new line will not increase the overall summer rating above 128MVA (double the rating of the existing 19/3.25 AAC conductor), due to paralleling, and hence 19/3.25 conductor was selected. However, in practice, the load sharing of parallel lines is in proportion to the ratio of the conductor impedances and use of a lower impedance conductor (such as 37/3.75 AAC) can result in overall ratings increase. Network modelling has revealed that a 37/3.75 AAC conductor in parallel with a 19/3.25AAC conductor would increase the overall capacity between WO-BWA to 143 MVA. Selection of a higher rated conductor also offers the ability to enable future connection interest or load growth in this area. As such, Option 4 has been amended to include 37/3.75 AAC conductor due to the significant ratings increase in exchange for a marginal cost increase over 19/3.25 AAC conductor.

A new easement would be required as this is a new line. Unlike other three options above, Option 4 would provide a solution to the supply risk due to an unplanned outage of a single line, as the probability of losing both lines at the same time is negligibly small.

The construction would commence in September 2024, with project completion expected by December 2026. The estimated capital cost of this option is $56.2 million.

In relation to O&M expenditure, AusNet does not expect this option to have a material impact on future O&M costs.

5.6. Non-network options

In the PSCR, AusNet sought submissions from non-network proponents that could contribute to addressing the identified need. The PSCR included a table which set out the curtailment reductions that a non-network option placed preferably at Barnawartha connecting to Barnawartha Zone Substation would be required to deliver. We explained that the non-network option would need to mitigate the risks associated with the curtailed renewable generation from existing generators in the Wodonga – Barnawartha area and from new generation connecting into this area due to the constraints between WO – BWA sub-transmission section. The information presented provided an indication of the required operating profile, noting that prospective non-network service providers may not be able to exactly match these requirements.

AusNet received no non-network options or submissions in response to the PSCR. On that basis, we have concluded that there are no credible non-network options that could address the identified need.

5.7. Options considered and not progressed

AusNet considered a fifth network option, as presented in the PSCR, involving the addition of a new 66kV line connecting Wodonga Terminal Station (WOTS) to BWA using 37/3.75 AAC conductor to increase the overall summer rating to BWA in addition to the installation and commissioning of the WOTS spare transformer (330/66/22 kV 75 MVA) as the third in-service transformer at WOTS. In this network arrangement the new 37/3.75 AAC line between WOTS-BWA would be operated in parallel with existing WOTS-WO two lines and WO-BWA line. Similar to Option 4, this option would provide a solution to the supply risk due to an unplanned outage of a single line to BWA, as the probability of losing both lines at the same time is negligibly small. Network modelling revealed that the overall capacity between WOTS-BWA would be limited to 123 MVA due to WO-BWA existing line being constrained well before the new line reaching its capacity. A new easement would also be required as this is a new line. The overall capacity gain of this option is lower than either Option 3 or Option 4 while the cost is much higher than either of the options. Hence this option is not progressed further.

Minor line rating improvements of the existing WO-BWA line can be obtained through Dynamic Line Raring (DLR) technology which has the capability to monitor ambient temperature, wind condition, line loading and conductor behaviour (sag/shape) and use that information to "calibrate" the line rating in real time. However, the existing line rating improvement through DLR technology is limited and not sufficient to meet the identified need. Therefore, this option has not been progressed.

5.8. Material inter-regional network impact

The proposed augmentations at WOTS and WO-BWA will not change the transmission network configuration and none of the network options considered are likely to have a material inter-regional network impact. A 'material inter-regional network impact' is defined in the NER as:

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

6. Economic assessment of the credible options

6.1. Assessment approach

Consistent with the RIT-T requirements and RIT-T Application guidelines[9], AusNet undertook a cost-benefit analysis to evaluate and rank the net economic benefits of the credible options over a 45-year period.

All options considered has been assessed against a business-as-usual case or base case where no proactive capital investment to address the identified need is made.

6.2. Material classes of market benefits

Clause 5.16.4 (b)(6)(iii) of the NER requires the RIT-T proponent to consider whether each credible option provides the classes of market benefits described in clause 5.15A.2(b)(4). To address this requirement, the table below discusses our approach to each of the market benefits listed in that clause for each credible option.

Table 2: Analysis of Market Benefits

Class of Market Benefit	Analysis
(i) changes in fuel consumption arising through different patterns of generation dispatch;	The credible options may affect the costs of dispatch by avoiding network constraints that result in curtailment of renewable generation. Our approach to estimating this market benefit is explained in section 4.2.1.
(ii) changes in voluntary load curtailment;	Any changes in voluntary load curtailment will be valued in accordance with any applicable network support agreements that may be in place.
(iii) changes in involuntary load shedding with the market benefit to be considered using a reasonable forecast of the value of electricity to consumers;	The credible options may reduce involuntary load shedding, by increasing network capacity. Our approach to estimating this market benefit is explained in section 4.2.3.
(iv) changes in costs for parties, other than the RIT-T proponent, due to differences in: *(A) the timing of new plant;* *(B) capital costs; and* *(C) the operating and maintenance costs;*	There is not expected to be any difference between the credible options.
(v) differences in the timing of expenditure;	There is not expected to be any difference between the credible options.
(vi) changes in network losses;	The credible options are not expected to result in material changes to electrical energy losses.
(vii) changes in ancillary services costs	The credible options will not have any impact on ancillary service costs.
(viii) competition benefits	The credible options will not provide any competition benefits.

[9] Australian Energy Regulator, "*Application guidelines – Regulatory investment test for transmission*" available at https://www.aer.gov.au/documents/aer-rit-t-guidelines-final-amendments-clean-6-october-2023

(ix) any additional option value (where this value has not already been included in the other classes of market benefits) gained or foregone from implementing the credible option with respect to the likely future investment needs of the National Electricity Market;	There will be no impact on the option value in respect of the likely future investment needs of the NEM.
(x) any other class of market benefit determined to be relevant by the AER.	There are no other classes of market benefit that are relevant to the credible options.

6.3. Methodology

The purpose of this section is to provide a high-level explanation of our methodology for identifying the preferred option. As a general principle, it is important that the methodology takes account of the identified need and the factors that are likely to influence the choice of the preferred option. As such, the methodology is not a 'one size fits all' approach, but one that is tailored to the particular circumstances under consideration.

In general, the identified need for a project can be described in terms of two types of risk:

- supply risk, where an asset failure may lead to a loss of supply to customers; and
- non-supply risk, which captures the potential consequences of an asset failure, which may include safety and bushfire risk, in addition to damage to adjacent assets or property.

In relation to supply risk, we typically adopt a probabilistic planning methodology which considers the likelihood and severity of critical network conditions and outages. The expected annual cost to customers associated with supply risk is calculated by multiplying the expected unserved energy (the expected energy not supplied based on the probability of the supply constraint occurring in a year) by the value of customer reliability (VCR).

In relation to non-supply risks, our approach monetises this risk by multiplying the following parameter estimates:

- the probability of asset failure;
- the cost of consequence of the asset failure;
- the likelihood of the consequence given the failure has occurred; and
- the number of assets to which the analysis relates.

For this project, in addition to the supply risks and non-supply risks, there is also a significant market benefit component, which is addressed the market modelling, as described in 4.2.1. Specifically, the reduction in wholesale energy costs that arise from the augmentation is a key factor in the cost benefit analysis.

The preferred option is the one that delivers the lowest total cost to customers, which is the sum of the cost of implementing that option and any residual risk-cost. The identification of the preferred option is complicated by the fact that the future is uncertain and that various input parameters are 'best estimates' rather than known values. Therefore, the RIT-T analysis must be conducted in the face of uncertainty.

To address uncertainty in our assessment of the credible options, we use sensitivity analysis and scenario analysis in our cost benefit assessment. As recommended by the AER's application guidelines, we use sensitivity analysis to assist in determining a set of reasonable scenarios.[10] The relationship between sensitivity analysis and scenarios is best explained by the AER's practice note:[11]

> *Scenarios should be constructed to express a reasonable set of internally consistent possible future states of the world. Each scenario enables consideration of the prudent and efficient investment option (or set of options) that deliver the service levels required in that scenario at the most efficient long run service cost consistent with the National Electricity Objective (NEO).*
>
> *Sensitivity analysis enables understanding of which input values (variables) are the most determinant in selecting the preferred option (or set of options). By understanding the sensitivity of the options model to the input values a greater focus can be placed on refining and evidencing the key input values. Generally the more sensitive the model output is to a key input value, the more value there is in refining and evidencing the associated assumptions and choice of value.*
>
> *Scenario and sensitivity analyses should be used to demonstrate that the proposed solution is robust for a reasonable range of futures and for a reasonable range of positive and negative variations in*

10 AER, Application guidelines, Regulatory investment test for transmission, August 2020, page 43.
11 AER, Asset replacement planning, January 2019, page 36.

key input assumptions. NSPs should explain the rationale for the selection of the key input assumptions and the variations applied to the analysis.

In applying sensitivities and scenarios to our cost benefit assessment, we have regard to the different circumstances that may eventuate that would affect the choice of the preferred option. Where our analysis shows that an option is clearly preferred, we will not undertake further testing. This approach is consistent with clause 5.15A.2(b)(2) of the Rules, which states that the RIT–T must not require a level of analysis that is disproportionate to the scale and likely impact of each credible option considered.

In preparing the RIT-T, we have also had regard to AEMO's 2023 Inputs, Assumptions and Scenarios Report (IASR) and its 2024 Integrated System Plan (ISP). We note that the current IASR scenarios are Progressive Change, Step Change and Green Energy Exports, which are expressed in terms of their respective contributions to Australia's possible decarbonisation future, as depicted in the figure below.

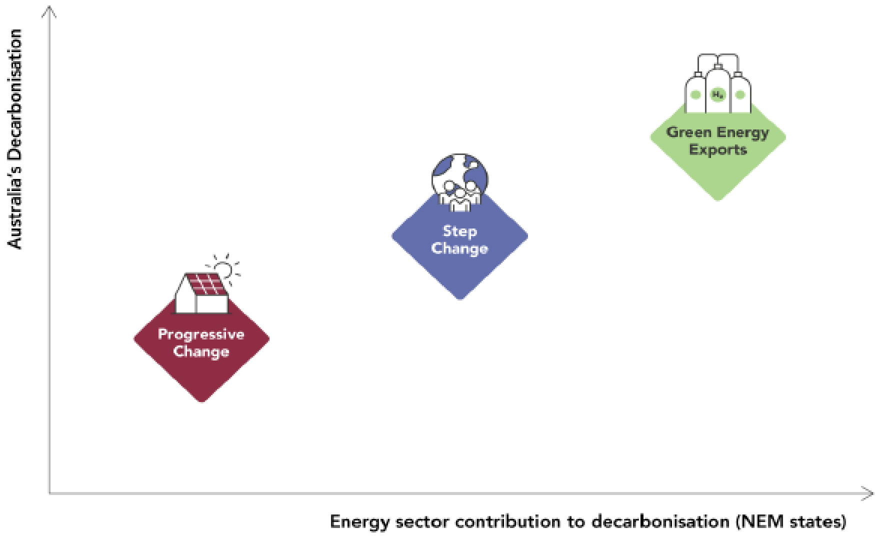

Figure 5: AEMO's scenarios for its 2023 IASR[12]

We note that the scenarios adopted by AEMO in its 2023 IASR are focused principally on the matters that are relevant to major transmission investments, rather than smaller transmission investments of the type considered in this report. Furthermore, we are also conscious that the identified need arises from the connection inquiries that we have already received, rather than projected changes in renewable generation connecting to this portion of our network.

In conducting the net economic benefit analysis, we focused our initial analysis on the step change and progressive change scenarios, to determine whether we were obtaining a consistent decision signal in relation to one of the options. Depending on the outcome of this initial analysis, our methodology is to assess at that stage whether further market modelling for the Green Energy Exports scenario is warranted. In our view, we regard this two-step approach as a pragmatic way of balancing the costs of undertaking further market modelling against the benefits that it would provide in relation to the investment decision. We discuss our findings and scenario selection in section 6.5.

6.4. Key variables and assumptions

Table 3 below lists the key variables and assumptions applied in the economic assessment, which are essential inputs to our methodology for the purpose of this PADR. The table also sets out the upper and lower bounds of the range of forecasts adopted for each of these variables. The lower bound and upper bound estimates are used to undertake sensitivity testing and scenario analysis. The detailed results of this modelling are provided in the next section.

In relation to the discount rate, we have adopted central, upper and lower bound estimates that are consistent with AEMO's IASR in July 2023. We note that discount rates are subject to change, particularly in the current economic climate. As such, the rates employed in this PADR are considered reasonable in exploring the impact of different rates on the cost-benefit assessment of the competing options to address the identified need.

12 AEMO, Inputs, Assumptions and Scenario Report 2023, July 2023, page 4.

Table 3: Input assumptions used for sensitivity studies

Parameter	Lower Bound	Central (Base) Case	Higher Bound
Project Cost	AusNet estimate - 25%	AusNet estimate	AusNet estimate + 25%
Cost of Carbon[13]	AER estimate - 25%	AER estimate	AER estimate +25%
Value of Customer Reliability (VCR)[14]	AER estimate - 25%	AER estimate	AER estimate +25%
Asset Failure Rate	AusNet assessment - 15%	AusNet assessment	AusNet Assessment +15%
Discount Rate	3.9%	7.0%	10.5%
Generation Connected	90% of the generation modelled	100% of Generation Modelled	110% Of Generation Modelled

6.5. Cost benefit analysis

The economic analysis allows comparison of the economic cost and benefits of each option to rank the options and to determine the optimal timing of the preferred option. It quantifies the capital costs and the cost of the residual risk for each option, to determine a total cost for each option. The net economic benefit for each credible option is the total cost associated with that option minus the costs of the Do Nothing/BAU option.

AusNet considered following 4 network options in the evaluation to find the preferred option to address the identified need.

1. Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 19/4.75 conductor
2. Commission the WOTS spare transformer and augment the existing WO-BWA 66 kV line with 37/3.75 conductor
3. Commission the WOTS spare transformer and add a second circuit to the existing WO-BWA 66 kV line
4. Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line

As already explained, each of these options will provide additional network capacity to enable more renewable generation to connect, deliver positive market benefits and reduce carbon emissions, in accordance with the National Electricity Objective.

Table 4 presents the costs and benefits for the Step Change and Progressive Change scenarios. As explained in section 6.3, the results from this initial assessment will determine whether it is necessary to undertake market modelling for the Green Energy Exports scenario. The data presented is expressed in present value terms and in $m real 2024 prices. The assessment period is 48 years covering the period from 2024/25 to 2071/72.

The presentation of the data in Table 4 shows the costs of each option, which are the same for both scenarios. This is followed by data on the total benefits and net economic benefits for each option under the Step Change and Progressive Change scenarios.

13 AER, Valuing emissions reduction - AER guidance and explanatory statement, May 2024.
14 AER, 2023 Values of Customer Reliability Annual Adjustment, December 2023.

Table 4: Cost benefit analysis and net economic benefits for each option in present value terms ($M, real 2024)

	Option 0	Option 1	Option 2	Option 3	Option 4
Costs					
Capital Expenditure	-	-$44.65M	-$44.97M	-$51.41M	-$45.04M
Operating Expenditure	-$1.54M	-$1.67M	-$1.70M	-$1.67M	-$1.67M
Safety, Collateral, Environmental Risk Costs	-$0.08M	-$0.08M	-$0.08M	-$0.08M	-$0.08M
Supply Risk Costs	-$22.74M	-$6.69M	-$6.69M	-$6.69M	-$1.92M
Total costs	**-$24.37M**	**-$53.09M**	**-$53.44M**	**-$59.86M**	**-$48.71M**
Step Change scenario: Total benefits and net economic benefits					
Generation Redispatch + Unserved Energy + Demand-side Participation	-	$21.97M	$26.57M	$38.14M	$38.14M
Emissions Reductions	-	$26.53M	$31.94M	$46.22M	$46.22M
Total Benefits	**-**	**$48.50M**	**$58.51M**	**$84.37M**	**$84.37M**
Total Option Benefit	**-$24.37M**	**-$4.59M**	**$5.07M**	**$24.51M**	**$35.66M**
Net benefit Compared to BAU	**-**	**$19.78M**	**$29.44M**	**$48.88M**	**$60.02M**
Progressive Change scenario: Total benefits and net economic benefits					
Generation Redispatch + Unserved Energy + Demand-side Participation	-	$14.90M	$15.84M	$20.27M	$20.27M
Emissions Reductions	-	$20.19M	$31.28M	$28.59M	$28.59M
Total Benefits	**-**	$35.10M	$47.11M	$48.85M	$48.85M
Total Option Benefit	**-$24.37M**	**-$18.00M**	**-$6.32M**	**-$11.01M**	**$0.14M**
Net Benefit Compared to BAU	**-**	**$6.37M**	**$18.04M**	**$13.36M**	**$24.50M**

The above table shows the net economic benefit for each of the four options compared to the 'do nothing/BAU' option for the Step Change and Progressive Change scenarios. Both options show that Option 4 is preferred, delivering a net economic benefit of $60.02 million and $24.50 million in present value terms for the Step Change and Progressive Change scenarios. The weighting of the options has no bearing on the selection of the preferred option.

In our view, given the consistent results for both scenarios, we do not consider it necessary to undertake modelling for the Green Energy Exports Scenario. In making this judgment, we note that the market benefits for Options 3 and 4 are the same for each scenario. The advantage of Option 4 compared to Option 3 is that the former option has lower risks of unserved energy, which will also be the case under the Green Energy Exports Scenario.

6.6. Sensitivity analysis

AusNet has tested the robustness of the investment decision by varying six inputs for the Step Change scenario, as shown in Figure 6: Sensitivity analysis of the six shown inputs on the net present value of each option ($M, real 2024) below. The sensitivity study results show that all the credible options considered would continue to provide positive net economic benefits for each sensitivity, while the Option 4 "Commission the WOTS spare transformer and add a new WO-BWA 66 kV line in parallel with the existing line with 37/3.75 conductor" continues to provide the highest net economic benefits in all cases.

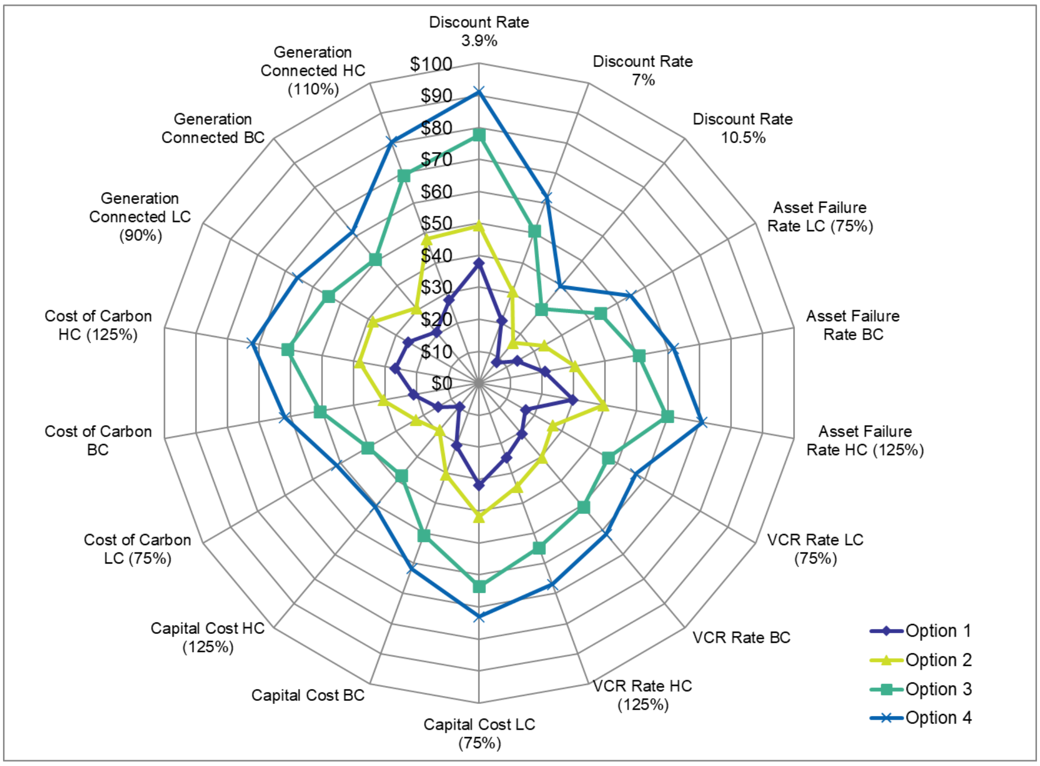

Figure 6: Sensitivity analysis of the six shown inputs on the net present value of each option ($M, real 2024)

6.7. Preferred option

The preferred option (Option 4) is to:

- Install and commission the WOTS spare transformer (330/66/22 kV 75 MVA) as the third in-service transformer at WOTS. The scope would involve a double switching of the third transformer on the 330kV side and connections into the WOTS 66kV and 22kV buses.
- Add a new line in parallel with the existing WO-BWA 66 kV line with 37/3.75 conductor to increase the overall summer rating of WO-BWA to 143 MVA, including the installation of conductor poles and associated equipment. A new easement would be required as this is a new line.

The construction would commence in September 2024, with project completion expected by December 2026. The estimated capital cost of this option is $56.2 million (nominal).

In accordance with the RIT-T, this option is expected to maximise the present value of the net economic benefit to all those who produce, consume and transport electricity in the NEM.

6.8. Capital and operating costs of the preferred option

The direct capital expenditure of the preferred option (Option 4) is $49.9 million ($, nominal). The principal direct capital expenditure elements, expressed in nominal terms, are:

- Design and internal labour, $7 million;
- Materials, plant and equipment, $11.4 million;
- Contracts, $27.4 million; and
- Other, $4 million.

7. Next steps

7.1. Request for submissions

AusNet invites written submissions, on the matters set out in this report, from Registered Participants, AEMO, interested parties, non-network service providers and those registered on our demand-side engagement register.

All submissions and enquiries should be directed to:

Email: rittconsultations@ausnetservices.com.au

Submissions are due on or before Friday 16 August 2024.

Submissions will be published on AusNet's and AEMO's websites. If you do not wish to have your submission published, please clearly stipulate this at the time of lodging your submission.

7.2. Next stage of RIT-T process

Following the conclusion of the consultation period on this report, AusNet will consider any submissions received and publish the Project Assessment Conclusions Report (**PACR**) which will explain:

- A summary of, and commentary on, any submissions received; and
- The preferred option to address the identified need.

AusNet expects to publish the PACR in September 2024.

8. Satisfaction of the RIT-T

In accordance with clause 5.17.4(j)(11)(iv) of the Rules, we certify that the proposed option satisfies the regulatory investment test for transmission. The table below shows how each of these requirements have been met by the relevant section of this report.

Table 5: Compliance with regulatory requirements

Requirement			Section
5.16.4(v) The project assessment draft report must set out the matters detailed in the project assessment draft report as required under paragraph (k) (below).			Noted. See details below.
(1)		a description of each credible option assessed;	Section 5.
(2)		a summary of, and commentary on, the submissions to the project specification consultation report	No submissions were received.
(3)		a quantification of the costs, including a breakdown of operating and capital expenditure, and classes of material market benefit for each credible option;	Section 5 and 6.8.
(4)		a detailed description of the methodologies used in quantifying each class of material market benefit and cost;	Sections 6.1 and 6.2.
(5)		reasons why the RIT-T proponent has determined that a class or classes of market benefit are not material;	Section 6.1
(6)		the identification of any class of market benefit estimated to arise outside the region of the Transmission Network Service Provider affected by the RIT-T project, and quantification of the value of such market benefits (in aggregate across all regions);	Not applicable.
(7)		the results of a net present value analysis of each credible option and accompanying explanatory statements regarding the results);	Section 6.4.
(8)		the identification of the proposed preferred option;	Section 6.5.
(9)		For the proposed preferred option identified under subparagraph (8), the RIT-T proponent must provide:	
	(i)	details of the technical characteristics;	Section 2 and 4.2.
	(ii)	the estimated construction timetable and commissioning date;	Section 4.2.
	(iii)	if the proposed preferred option is likely to have a material inter-network impact and if the Transmission Network Service Provider affected by the RIT-T project has received an augmentation technical report, that report; and	Not applicable.
	(iv)	a statement and the accompanying detailed analysis that the preferred option satisfies the regulatory investment test for transmission	Section 6.5.

Appendix – RIT-T assessment and consultation process

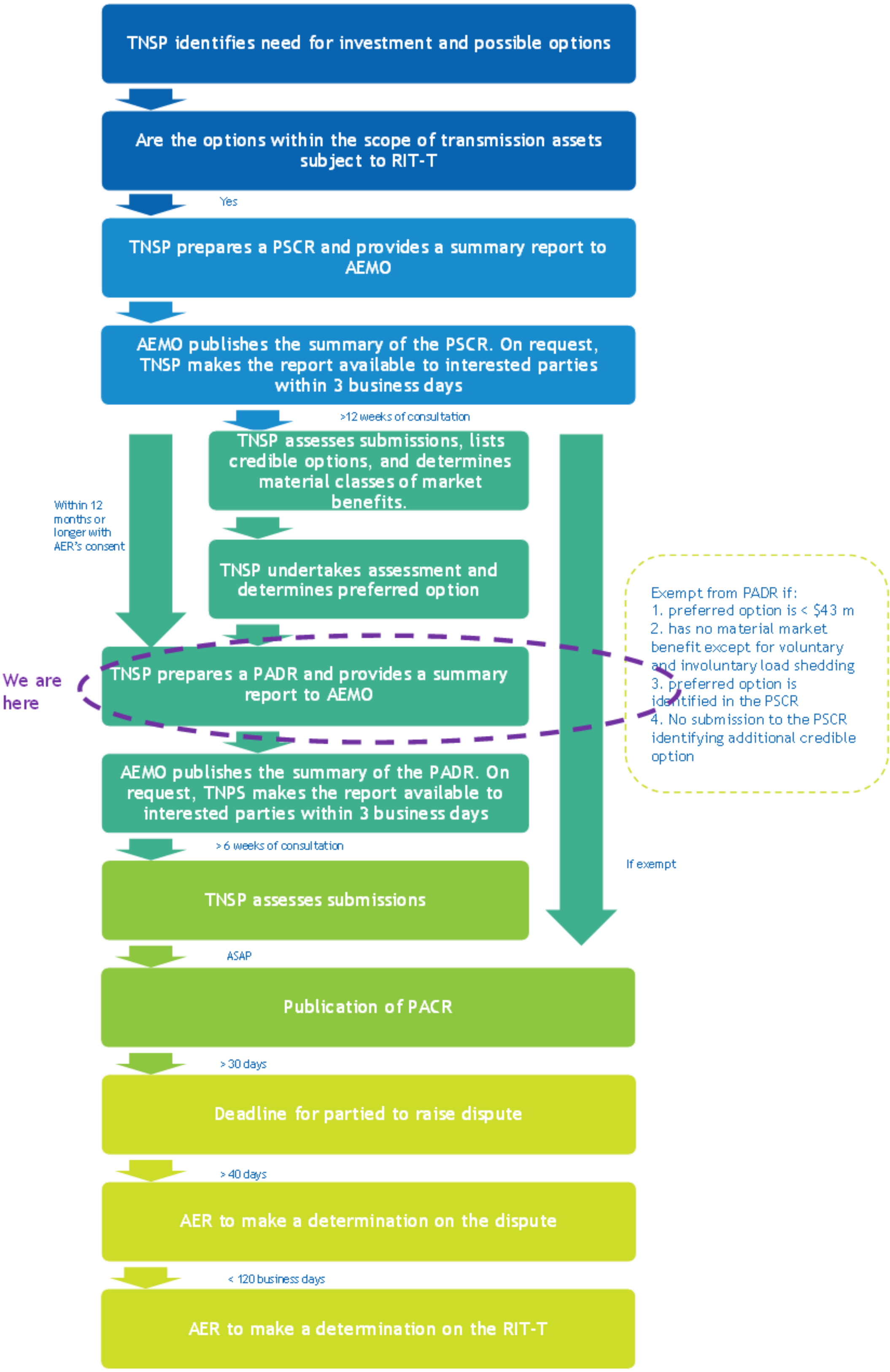

Figure 7: RIT-T assessment and consultation process

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