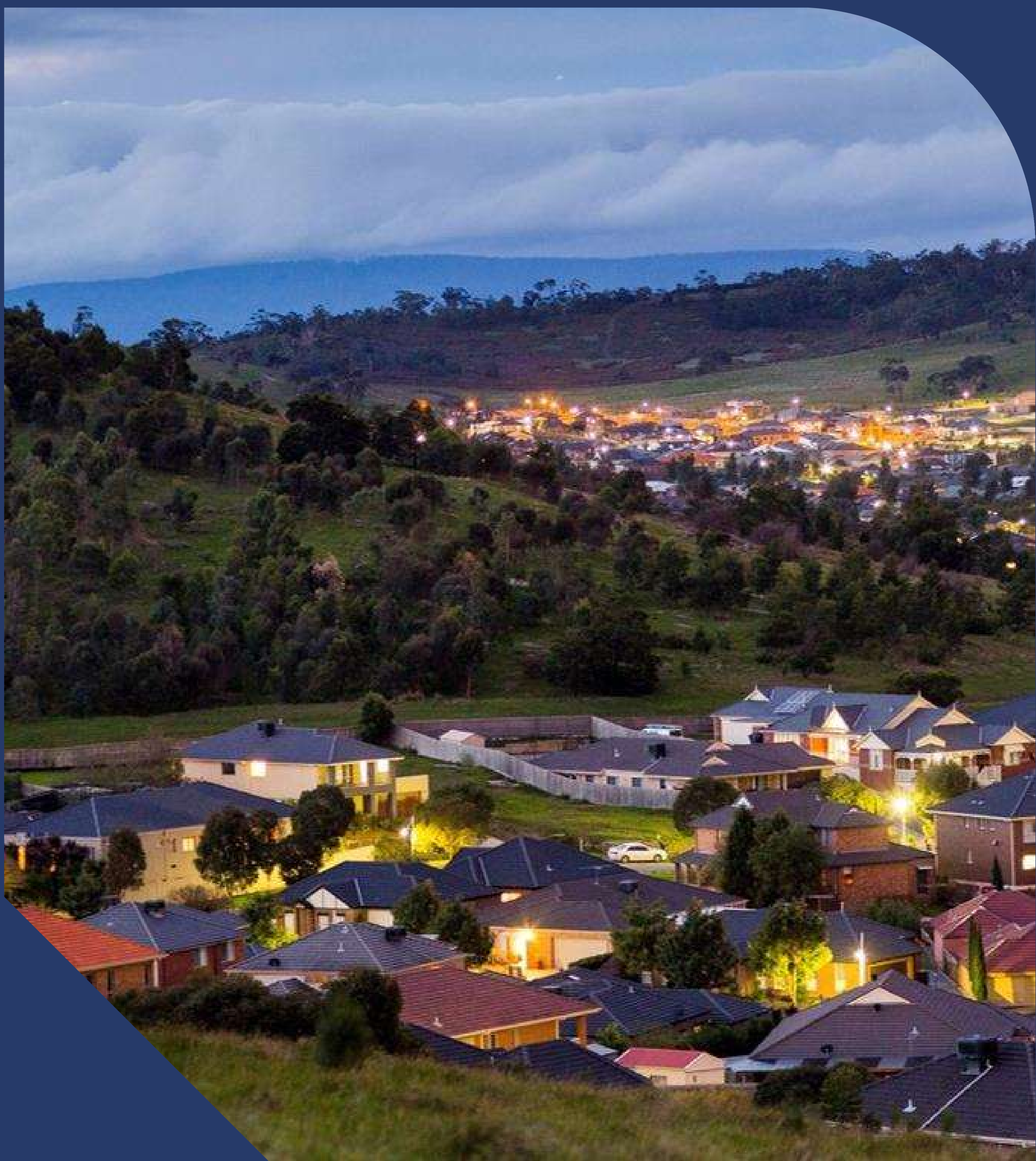
Tower Strengthening: Murray Switching Station to Dederang Terminal Station

Regulatory Investment Test for Transmission

Project Assessment Conclusions Report

Friday, 27 October 2023



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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.

The towers along the Murray Switching Station (MSS) to Dederang Terminal Station (DDTS) circuit were design and constructed from 1959 to 1965 using the State Electricity Commission of Victoria's design codes that applied at that time. This design is no longer applied because it does not address the risks associated with high intensity winds.

Our assessment is that the existing towers present significant potential risks and consequences for electricity customers, our employees and the general public in the event of an asset failure. In addition to the need for remedial action to mitigate these risks and consequences, AusNet must also ensure that it complies with its regulatory obligations, which include the Electricity Safety Act 1998. This Act requires AusNet to minimise hazards and risks to the safety of any person as far as reasonably practicable. In summary, there is an 'identified need' for remedial action to mitigate the risks associated with these towers.

The Regulatory Investment Test for transmission (RIT-T) is an economic cost-benefit test used to assess and rank potential investments capable of meeting the identified need. The purpose of the RIT-T is to identify the credible option that 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).

This Project Assessment Conclusions Report (PACR) follows the publication of our Project Specification Consultation Report (PSCR) which was the first step in the RIT-T process. As explained in the PSCR, this tower strengthening project can proceed to the final stage of the RIT-T process, being the PACR, in accordance with clause 5.16.4(z1) of the Rules, for the following reasons:

- the preferred option, has a capital cost of less than $46 million, which is below the threshold amount;
- the PSCR identified the preferred option and explained our reasons for selecting it; and
- the credible options will not have a material class of market benefits except for those specified in clause 5.15A(b)(4)(ii).

We did not receive any submissions in response to the PSCR.

The analysis presented in this PACR explains that the preferred option is to reinforce the towers (Option 1) as this option delivers the highest net market benefit. This option also involves lower capital costs ($32.7 million), than the alternative credible option of replacing the highest risk towers ($38.3 million). This preferred option is expected to provide a net benefit of approximately $27 million compared to the 'Do Nothing' or Business As Usual (BAU) option. The alternative option is also superior to the Do nothing/BAU option, but it is inferior to Option 1 by approximately $10 million. Our sensitivity testing and scenario analysis confirm that Option 1 is superior to Option 2 and the BAU option.

The costs of the preferred option have increased markedly from those estimated in the PSCR. The increase in costs reflect the outcome of more detailed studies of the towers, which revealed that additional work was required compared to the original scope. Despite this increase in the scope of work, reinforcing the 56 Towers remains the preferred option.

We propose to commence construction on the tower reinforcements in January 2024. Project completion is expected by June 2026.

If you have any questions about this PACR or the proposed project, please send your queries to ritdconsultations@ausnetservices.com.au or contact Francis Lirios on (03) 9695 6000.

2. Background

Steel lattice structures make up approximately 97 per cent of the towers on our transmission network. Lattice structures consist of angled galvanised steel members connected with bolts. These structures generally support either single-circuit or double-circuit lines, including three different phase conductors per circuit. The phase conductors are protected from lightning strikes by single or multiple ground wires situated on the peaks of the structures.

The earliest constructed towers are single circuit towers which transport electricity from one terminal station to another. Later towers were designed to carry two circuits, which improved reliability of supply whilst marginally increasing the cost.

There are generally four types of towers on our network, i.e., light suspension, heavy suspension, light strain and heavy strain, with an expected service life of approximately 70 years, depending on the environmental conditions of the site. Strain structures carry a combination of vertical and horizontal loads from conductors and its ancillary hardware. These structures allow conductors to be terminated or strained off with the structures in line with the conductor axis.

The figure below shows the 330 kV strain tower on the Murray Switching Station (MSS) to Dederang Terminal Station (DDTS) circuit.

Figure 1: DDTS-SMTS No. 1 330 kV strain tower

The towers along the MSS-DDTS circuit were design and constructed from 1959 to 1965 using the State Electricity Commission of Victoria's design codes that applied at that time. As explained below, this design is no longer applied because it does not address the risks associated with high intensity winds.

In 1981, there was a major tower failure on the MSS-DDTS No 2, 330kV line due to windstorms. There have been two subsequent failures in 1999 and 2009, which resulted in failures of four tower structures that were similar in design to the towers on MSS-DDTS. The 1999 failure event was due to high intensity winds, while the 2009 was caused by a windstorm exacerbated by the convection effects of the fires which burnt along the Strathewen area during the 2009 Black Saturday Bushfires.

The Bendigo to Kerang 220kV line, which was constructed during the same period as MSS-DDTS, has also experienced similar tower collapse events due to structural design inadequacy. A total of 18 towers have failed on that line from four separate events in 1979, 1993, 2010 and 2014. These tower failures provide further evidence that the original tower design applied along the MSS-DDTS circuit is inadequate.

In 2010, a new line design code, AS/NZS7000-2010, was published which addresses high intensity wind loading from thunderstorms and downburst winds. This design code, which was subsequently updated in 2016, also considers the risk of cascade failures (i.e., multiple tower collapses during a single event). The design code uses reliability-based principles to achieve a tower strength that is consistent with the target design life or expected remaining asset life of the relevant structure.

The towers along the MSS-DDTS circuit are non-compliant to current overhead line design standards (AS/NZS7000-2016). Consequently, the towers are at risk of failure during an extreme weather event, which would lead to a significant loss of supply and safety risks. A number of these towers are located adjacent to road crossings, which exposes road users to the risk of serious injury or death in the event of a tower collapse. The level of health and safety risk posed by a potential tower failure or conductor drop event near road crossings is not acceptable to AusNet.

3. Identified need

3.1. Description

The towers along the MSS-DDTS circuit are non-compliant to current overhead line design standards. The current design standard, AS/NZS7000-2016, accounts for the risks associated with high intensity wind loading from thunderstorms and downburst winds, and the risk of cascade failures (i.e.,multiple tower collapse during a single event). The development of the new standard is a response to the experience of tower failures on our network, including on the MSS-DDTS circuit.

The design of the existing towers on the MSS-DDTS circuit drives a need to mitigate the risks and potential consequences of tower failure. These risks and consequences are:

- adverse safety outcomes for our employees, contractors and the general public; and
- loss of electricity supply to customers.

In addition to the need for remedial action to mitigate these risks and consequences, AusNet must also ensure that it complies with its regulatory obligations, which include the Electricity Safety Act 1998. This Act requires AusNet to minimise hazards and risks to the safety of any person as far as reasonably practicable. In relation to the towers along the MSS-DDTS circuit, compliance with this Act (and other regulations) contribute to the identified need.

3.2. Assumptions

In assessing the identified need, AusNet must consider the risk of asset failure and the likelihood of potential adverse consequences eventuating. In addition to estimating these risk and consequences eventuating, AusNet has adopted the following further assumptions to quantify the potential costs of tower failure.

3.2.1. Supply risk costs

In the event of a tower failure along the MSS-DDTS circuit, customers will experience a loss of supply event. The supply risk cost is the probability of an event occurring multiplied by the unserved energy that would result from that event. The cost of unserved energy is determined by the Value of Customer Reliability (VCR), which is estimated by the AER and depends on the composition of customers supplied by the MSS-DDTS circuit.

3.2.2. Safety risk costs

The Electricity Safety Act 1998 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 to estimate the benefits of reducing the risk of death;
- a value of lost time injury; and
- a disproportionality factor.

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

3.2.3. Financial risk costs

In the event of a tower 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.

4. Potential 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 an 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.

As the identified need in this case arises from the design of towers along the MSS-DDTS circuit, which do not comply with the current overhead line design standard, there are no credible non-network options that could address this identified need. In effect, the nature of the risks is asset-related and cannot be mitigated by a non-network option given the significant costs of retiring the assets.

The credible options are therefore:

- Reinforcement of the transmission towers to achieve the current design standard; and
- Pre-emptive full replacement of the highest risk towers.

Neither option is expected to have an inter-regional impact. Each credible option is discussed below. We also describe the Do Nothing/BAU option, although this is not credible in this instance because it would not address the safety risks associated with the existing assets.

4.1. 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 option therefore establishes the base level of risk and provides a basis for comparing other credible options.

Whilst the direct capital costs of this option are zero, the continued exposure to residual risks means that this option has significant risk costs associated with it. In relation to this project, 'do nothing' is not a credible option.

4.2. Option 1: Reinforcement of transmission towers to current design standards

This option would involve upgrading 56 towers on MSS-DDTS Nos. 1 and 2 circuits to meet the current design standard. The works would be prioritised to minimise the safety risk of tower failure to road users and the general public. The construction would commence in January 2024, with project completion expected by June 2026. The estimated capital cost of this option is $32.7 million in nominal terms.

The scope of work for this option would include:

- perform site inspection to validate data, verify site conditions including geotechnical investigation;
- perform climb inspection of selected towers to validate the drawing accuracies;
- undertake site inspection to establish traffic management requirements, site access requirements for plant machinery and suitability of live line preparation to minimise outage requirements;
- identify the required loading and undertake structural analysis of the existing towers using site specific conditions to confirm the need for upgrade or the extent of reinforcement;
- identify the required loading on foundations and undertake structural analysis of the existing foundations using site specific loading to confirm the need for upgrade and the extent of reinforcement;
- design the required reinforcement using AS/NZS7000 - 2016 and AS 3995 – 1994;

- procure all required materials including steel members and other hardware, including arrest systems;
- undertake a field audit to confirm all work has been completed to AusNet's standards; and
- update SAP with new insulator and structure data, and PLS-CADD model following completion of site works.

Following detailed site inspections, the scope of work required to deliver Option 1 was found to be significantly greater than first estimated in the PSCR. Specifically, following site inspections it was concluded that substantial work would be required to strengthen the tower foundations to address the safety risks. This work was additional to the original scope and has led to a significant upward revision to the cost estimates presented in the PSCR.

In relation to operating expenditure, we do not expect this option to have a material impact on our future costs i.e. routine maintenance expenditure would be substantially unchanged.

4.3. Option 2: Pre-emptive full replacement of towers

Under this option the 15 highest risk towers that are in close proximity to road users would be retired and replaced with AS/NZS7000-2016 compliant towers. To keep the line energised, a by-pass system would be constructed using the Emergency Restoration System masts. As new towers, the new assets would obtain a Condition Score 1 (which would be superior to Option 1).

The estimated cost of this option is approximately $38.3 million compared to $32.7 million for Option 1. As noted in relation to Option 1, we do not expect this option to have a material impact on our future operating expenditure. The construction timeframes for this option would be similar to Option 1.

5. Economic assessment of the credible options

5.1. Market benefit

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 both credible options.

Table 1: Analysis of Market Benefits

Class of Market Benefit	Analysis
(i) changes in fuel consumption arising through different patterns of generation dispatch;	The credible options will not have any impact on fuel consumption.
(ii) changes in voluntary load curtailment;	The credible options are not expected to lead to changes in voluntary load curtailment.
(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 are expected to have an impact on involuntary load shedding, by affecting the risk of asset failure. The cost benefit analysis will therefore consider the impact of each option on load shedding. AusNet applies probabilistic planning techniques to assess the expected cost of unserved energy for each option.
(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 are not expected to be any such impacts on other parties if a credible option proceeds.
(v) differences in the timing of expenditure;	The credible options will not result in changes in the timing of other expenditure.
(vi) changes in network losses;	The credible options will not result in 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.
(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.

As explained in the above table, the only market benefit that is relevant to the identified need is the change in involuntary load shedding, which is calculated as follows:

- **Energy at risk**: This is the amount of energy, weighted by the demand conditions considered (10% POE and 50% POE), that would not be supplied as a result of a tower failure. This statistic provides an indication of the magnitude of energy that would not be supplied in the unlikely event of a tower failure.

- **Expected unserved energy**: This is the energy at risk weighted by the probability of a tower failure. This statistic provides an indication of the amount of energy, on average, that will not be supplied in a year considering the low probability that a tower failure occurs.

In relation to the identified need, however, the most significant driver of the required works is the need to address the safety risks to road users and the general public associated with tower failure. Each credible option (including the BAU option) will have different costs associated with safety risks and financial risks that will play a role in determining the preferred option.

5.2. 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 for the particular circumstances under consideration.

The identified need for this 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, bushfire risk and environmental costs, in addition to damage to adjacent assets or property.

In relation to supply risk, we 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.

The purpose of the cost benefit analysis that underpins the RIT-T assessment is to determine whether there is a cost-effective option to mitigate the supply and non-supply risks (the aggregate 'risk-cost'). To be cost-effective, the reduction in the aggregate risk-cost that an option is expected to provide must exceed the cost of implementing that option. The preferred option provides greatest expected net benefit, expressed in present value terms.

In the absence of remedial action,

Figure 2 shows how the aggregate risk-cost will typically increase as the risk of asset failure and energy at risk increase over time. The optimal timing of the preferred option occurs when the annualised capital cost of that option (or the operating cost for a non-network option) is equal to the aggregate risk-cost.

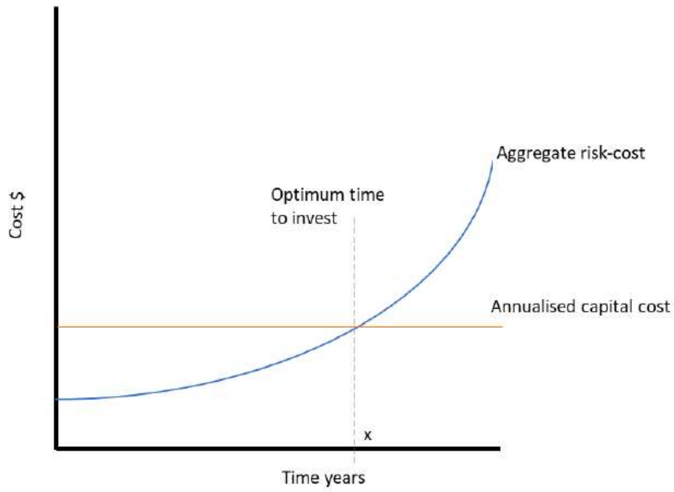

Figure 2: Increasing risk-cost over time and optimal project timing[1]

In effect, the preferred option 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 testing and scenario analysis in our cost benefit assessment. As recommended by the AER's application guidelines, we use sensitivity testing to assist in determining an appropriate set of reasonable scenarios.[2] The relationship between sensitivity analysis and scenarios is best explained by the AER's practice note:[3]

> *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 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 particular circumstances to ensure that the approach is appropriate. 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 and its 2022 Integrated System Plan (ISP). We note that the scenarios adopted by AEMO are focused particularly on the matters that are relevant to major transmission investments, rather than smaller transmission investments of the type considered in this report. Accordingly, we have adopted an approach that is appropriate to the specific circumstances described in this report relating to the identified need and the credible options.

5.3. Key variables and assumptions

Table 2 below lists the key variables and assumptions applied in our economic assessment, which are essential inputs to our methodology described above. The table also sets out the upper and lower bounds of the range of forecasts adopted for each of these variables. As already explained, 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 section 5.4.

Table 2: Key variables and assumptions

Variable / assumption	Lower bound	Central estimate	Upper bound
Demand forecasts	In this analysis demand will affect unserved energy. Our approach, however, is to vary the expected costs of unserved energy by +/-25% through a combination of upper and lower estimates of demand; the probability of asset failure and VCR.		
Cost of involuntary supply interruption	25% reduction - refer to demand forecasts	VCR estimate[4]	25% increase - refer to demand forecasts
Safety cost	-25% reduction in the central case	Value of statistical life of $4.5 million[5]	25% increase in the central case
Safety cost Disproportionate Factor	Central estimate	Factor of 3	Central estimate

1 This figure is reproduced from the AER's Industry practice application note, Asset replacement planning, January 2019, figure 8. This figure assumes that the option eliminates the aggregate risk-cost in full, which may not be the case.
2 AER, Application guidelines, Regulatory investment test for transmission, August 2020, page 43.
3 AER, Asset replacement planning, January 2019, page 36.
4 Calculated using the latest VCR estimates for each sector.
5 Best Practice Regulation Guidance Note Value of statistical life, December 2014, escalated.

Variable / assumption	Lower bound	Central estimate	Upper bound
Option cost	15% reduction in central estimate	In-house cost estimates using detailed and high-level project scopes	15% increase in central estimate
Real discount rates[6]	3.0%	7%	10.5%
Probability of asset failure	25% reduction - refer to demand forecasts	Historical asset performance data, plus forecasts based on condition monitoring and CBRM modelling	25% increase - refer to demand forecasts

As explained in the above table, the expected cost of unserved energy is affected by three variables: demand forecasts; the cost of involuntary supply interruption; and the probability of asset failure. Rather than conducting sensitivities on each parameter, we have considered the upper and lower bounds for the expected cost of unserved energy as the central estimate +/-25%. This approach recognises that each parameter is uncertain and may contribute to a higher or lower expected cost of unserved energy.

5.4. Cost benefit analysis

Our 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.

As each of the credible options involves the replacement of existing assets, we have assumed that the operating cost for each option is unchanged from the 'Business as Usual' option. We consider this approach to be a reasonable working assumption for the purposes of this RIT-T.

We present our analysis as follows:

- Section 5.4.1 presents the NPV analysis using central estimates; and
- Section 5.4.2 presents the sensitivity testing and scenario analysis.

5.4.1. Net present value analysis

The table below presents the annualised net economic benefit of each credible option.

Table 3: Costs and net economic benefit for each option ($m nominal, in present value terms)

	Option 0 – Do Nothing/BAU	Option 1 – reinforcement	Option 2 – replacement
Capital expenditure	N/A	26.47	35.32
Operating expenditure	N/A	-	-
Safety risks	56.09	18.62	19.43
Unserved energy	23.30	7.36	8.07
Total costs	**79.39**	**52.44**	**62.82**
Net benefit	–	26.94	16.57

5.4.2. Sensitivity testing and scenario analysis

The table below shows the net economic benefit for each credible option applying sensitivity analysis. As explained in section 5.3, the high and low unserved energy sensitivity reflects the combined effect of upper and lower estimates of demand, the VCR and the probability of asset failure.

[6] The discount rates are consistent with AEMO's 2023 Inputs, Assumptions and Scenarios Report.

Table 4: Net present values for each option ($m nominal)

	Central Case	Higher Capex	Lower Capex	High unserved energy	Low unserved energy	High discount rate	Low discount rate	High safety risks	Low safety risks
Option 1	26.94	22.97	30.91	30.93	22.96	26.94	42.58	36.31	17.58
Option 2	16.57	11.27	21.87	20.38	12.76	16.57	33.16	25.74	7.41

Source: AusNet

The sensitivity analysis in the above table shows that Option 1 is preferred by a significant margin for each sensitivity. The above analysis provides comfort that Option 1 is preferred.

For completeness, we have also conducted scenario analysis to further test this proposition. The current IASR scenarios – which relate principally to changes in the wholesale generation market – are not relevant to this investment decision. Specifically, the IASR scenarios – progressive change, step change and green energy exports – are expressed in terms of their respective contributions to Australia's possible decarbonisation future, as depicted in the figure below. While critical to ISP projects, these dimensions have no practical bearing on the asset replacement decision that is being considered in this RIT-T.

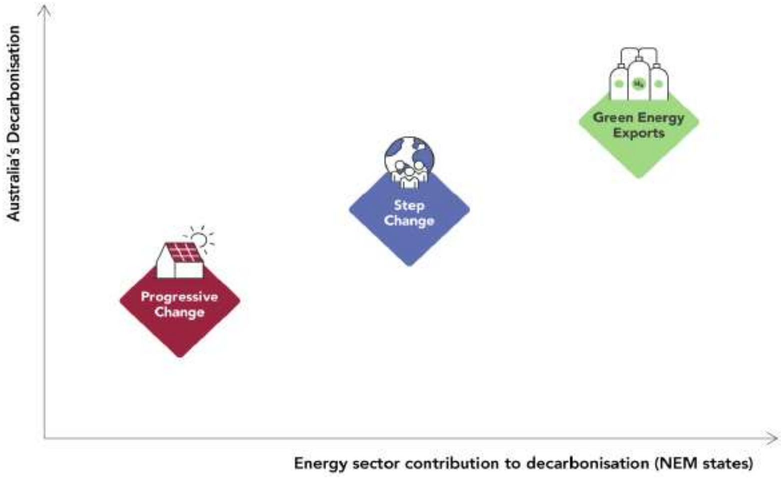

Figure 3: AEMO's scenarios for its 2023 IASR[7]

In our view, the scenarios developed below comply with the requirements of the RIT-T application guidelines, noting that they describe different sets of states of the world that are relevant to the investment decision that is being addressed in this PACR. In reaching this conclusion and in establishing the scenarios for this PACR, we note that the AER's RIT-T Application Guidelines explains:[8]

> "Under the RIT–T instrument, the number and choice of reasonable scenarios must be appropriate to the credible options under consideration. Specifically, the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect:
>
> – the ranking of the credible options, where the identified need is for reliability corrective action, inertia network services or system strength services. In these cases, only the ranking (as opposed to the sign) of credible options' net economic benefits is important; and
>
> – the ranking or sign of the net economic benefit of any credible option where the identified need is not for reliability corrective action, inertia network services or system strength services. In these cases, the preferred option must have a positive net economic benefit.
>
> The appropriate number and choice of reasonable scenarios could vary depending on the credible options under consideration. This recognises that NER clause 5.15A.2(b)(2) requires RIT–T proponents to apply the RIT–T to a level of analysis that is proportionate to the scale and likely impact of each credible option."

In each scenario, we have adopted a central estimate for the safety risks, as our view is that there is no scenario that warrants a higher or lower estimate to be adopted.

7 AEMO, Inputs, Assumptions and Scenario Report 2023, July 2023, page 4.
8 Australian Energy Regulator, Application guidelines – Regulatory investment test for transmission, August 2020, page 41.

Table 5: Definition of reasonable scenarios

Scenario	Option Cost	Unserved Energy	Safety risks	Discount rate
Central Case	Central estimate	Central estimate	Central estimate	Central estimate
Weak economic growth	Lower bound	Lower bound	Central estimate	Lower bound
Supply side constraints	Upper bound	Upper bound	Central estimate	Upper bound

Table 6 below provides a brief description of each scenario.

Table 6: Guide to scenarios

Scenario	Description
Central Case	This scenario adopts the central estimate for each variable in the economic assessment. It represents the most likely outcome.
Weak economic growth	This scenario reflects weak economic growth. It has lower costs of delivering the option, lower demand and a lower discount rate. It should be noted that the safety risks are unaffected by weak economic growth and, therefore, a central estimate is adopted.
Supply side constraints	This scenario represents an economic rebound and continuing supply side issues. It is characterised by higher costs of delivering the option, higher demand and an upper bound discount rate.

The table below shows the results of our scenario analysis. For each case, Option 1 is preferred to Option 2.

Table 7: Net benefit for each scenario ($M)

	Central case	Weak economic growth	Supply side constraints
Option 1	26.94	41.64	26.96
Option 2	16.57	33.65	15.08

Source: AusNet

5.5. Preferred option

Based on the results of our economic analysis, our preferred option is to upgrade 56 towers on MSS-DDTS Nos. 1 and 2 circuits to meet the current design standard. The works would be prioritised to minimise the safety risk of tower failure to road users and the general public. The construction would commence in January 2024, with project completion expected by June 2026. The estimated capital cost of this option is $32.7 million.

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.

5.6. Capital and operating costs of the preferred option

The direct capital expenditure is $32.7 million (nominal). The principal capital expenditure elements, expressed in real terms, are:

- Design and internal labour, $1.81 million;
- Materials, $0.23 million;
- Plant and equipment, $0.85 million; and
- Contracts, $23.8 million.

The remaining costs include an allowance for management reserve and overheads.

In relation to the timetable for completing the works, as already noted we expect the work to commence in January 2024 and the project In-service date is expected to be June 2026.

6. 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 8: Compliance with regulatory requirements

Requirement			Section
5.16.4(v) The project assessment conclusions 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 4.
(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 4 and 5.6
(4)		a detailed description of the methodologies used in quantifying each class of material market benefit and cost;	Sections 5.1 and 5.2
(5)		reasons why the RIT-T proponent has determined that a class or classes of market benefit are not material;	Section 5.1
(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 5.4
(8)		the identification of the proposed preferred option;	Section 5.5
(9)		For the proposed preferred option identified under subparagraph (8), the RIT-T proponent must provide:	
	(i)	details of the technical characteristics;	Section 4.2 and Appendix
	(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 5.5

Appendix – Technical characteristics

The scope involves upgrading 56 towers on Murray Switching Station to Dederang Terminal Station (MSS-DDTS) Nos. 1 and 2 circuits to meet the current design standard, and would include the following activities:

- perform site inspection to validate data, verify site conditions including geotechnical investigation;
- perform climb inspection of selected towers to validate the drawing accuracies;
- undertake site inspection to establish traffic management requirements, site access requirements for plant machinery and suitability of live line preparation to minimise outage requirements;
- identify the required loading and undertake structural analysis of the existing towers using site specific conditions to confirm the need for upgrade or the extent of reinforcement;
- identify the required loading on foundations and undertake structural analysis of the existing foundations using site specific loading to confirm the need for upgrade and the extent of reinforcement;
- design the required reinforcement using AS/NZS7000 - 2016 and AS 3995 – 1994;
- procure all required materials including steel members and other hardware, including arrest systems;
- undertake a field audit to confirm all work has been completed to AusNet' standards; and
- update SAP with new insulator and structure data, and PLS-CADD model following completion of site works.

The table below details the 56 Towers that will be reinforced as a result of this program.

Table 9: Compliance with regulatory requirements

Tower Road Crossings	Tower No	MSS-DDTS C1	MSS-DDTS C2	Grand Total
Murray Valley 1 Highway	T076	1	1	2
	T078	1	1	2
	T079	1	1	2
	T080	1	1	2
	T081	1	1	2
Murray Valley 1 Highway Total		**5**	**5**	**10**
Murray Valley 2 Highway	T019	1	1	2
	T020	1	1	2
	T021	1	1	2
	T022	1	1	2
	T023	1	1	2
	T024	1	1	2
Murray Valley 2 Highway Total		**6**	**6**	**12**
Murray Valley 3 Highway	T009		1	1
	T010	1	1	2
	T011	1	1	2
	T012		1	1
	T013	1	1	2
	T014	1	1	2
	T015	1		1
Murray Valley 3 Highway Total		**5**	**6**	**11**
Omeo Highway	T171	1	1	2
	T172	1	1	2
	T173	1	1	2

Tower Road Crossings	Tower No	MSS-DDTS C1	MSS-DDTS C2	Grand Total
	T174	1	1	2
	T175	1	1	2
	T176	1	1	2
Omeo Highway Total		**6**	**6**	**12**
Kiewa Valley Highway	T212	1		1
	T213	1	1	2
	T214	1	1	2
	T215	1		1
	T216	1	1	2
	T217	1	1	2
	T218		1	1
Kiewa Valley Highway Total		**6**	**5**	**11**
Grand Total		**28**	**28**	**56**

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