Managing the risk of pole failure

Final Project Assessment Report

Date: 22 March 2024

TasNetworks | Powering a Bright Future

Disclaimer

This document is the responsibility of Regulation, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

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Executive Summary

Climate change is increasing the frequency and severity of bushfires, which in turn increase the risk to customer safety and reliability.

Concurrently, a shortage of quality wood poles both locally and nationally make it increasingly challenging for TasNetworks to source wood poles that can continue to manage affordability, while also meeting safety and customer service performance needs.

In recognition of this changing environment, TasNetworks is applying the Regulatory Investment Test for Distribution (**RIT-D**) to assess whether alternative technologies or approaches to our pole replacement program could result in greater net benefits for customers compared to our current approach.

This Final Project Assessment Report (**FPAR**) is the final step in the RIT-D process. TasNetworks previously published a Draft Project Assessment Report (**DPAR**) on 1 December 2023 that detailed our assessment of the various options that could meet the identified need. The FPAR includes a less detailed analysis of the matters included in the DPAR.

Two options were identified as being credible and were assessed in the DPAR against a 'business-as-usual' base case. The base case is also considered a credible option (i.e. continuing current pole replacement program). The credible options are:

- **Base Case -** replacing poles on condition deterioration with the best available grade of wooden pole (service life of 44 years).
- **Option 1** – Hybrid replacement strategy on condition deterioration with either a Fibreglass Reinforced Polymer (**FRP**) spun concrete composite (Titan) pole or best available grade wooden pole.
- **Option 2** – Replace on condition deterioration with lowest suitable grade of wooden pole (service life of 25 years).

The economic assessment of the options against the base case is shown in Table 1. Option 1 provides the greatest net present value (**NPV**) of the market benefits considered in the 20-year assessment period. Given the longer service life of Titan poles, terminal value is the key driver of market benefits.

Table 1 Net present value of assessed credible options

Option	Total Cost[1] (20 years, nominal)	Benefits (PV compared to base case)	Costs (PV compared to base case)	NPV
1	$493,466,742	$11,265,623	$7,165,189	$4,100,434
2	$475,699,154	-$37,547,980	$0	-$37,547,980

TasNetworks sought written submissions from interested parties in relation to the preferred option outlined in the DPAR. No submissions were received.

[1] Capital and operating expenditure

Contents

Glossary

AER	Australian Energy Regulator
BAU	Business as Usual
CCA	Copper-Chrome-Arsenate
DPAR	Draft Project Assessment Report
ENA	Energy Networks Australia
FPAR	Final Project Assessment Report
FRC	Fibreglass Reinforced Composite
FRP	Fibreglass Reinforced Polymer
HBLCA	High Bushfire Loss Consequence Area
IASR	Inputs, Assumptions and Scenarios Report
NER	National Electricity Rules (Version 200 referenced throughout this document)
NEM	National Electricity Market
RIT-D	Regulatory Investment Test for Distribution
NPV	Net Present Value
USE	Unserved Energy
VCR	Value of Customer Reliability

1 Identified Need

"The identified need for this RIT-D is to increase overall net market benefits in the National Electricity Market by improving the resilience and service life of our pole population."

TasNetworks' distribution network relies on 235,000 poles to support assets and equipment that facilitate the distribution of electricity to more than 295,000 customers.

TasNetworks historically replaced poles with the highest available grade of suitable wood pole as they generally represented the least cost whole-of-life option for restoration and continuity of grid supply. However, bushfires significantly reduce the supply and average service life of wood poles making any fire resistant non-wood alternatives increasingly viable.

TasNetworks has previously replaced wood poles with non-wood alternatives in circumstances where wood poles do not represent the best whole-of-life option or there has been a shortage of suitable replacements.

Recently, the following factors have emerged leading to a re-evaluation of TasNetworks' pole replacement strategy:

- Increasing bushfire risk;
- Diminishing availability of suitable wood poles; and
- Emergence of new technologies

In response, TasNetworks has assessed if amending our current pole management strategy is warranted. The purpose of this RIT-D is to identify the investment option that meets the identified need outlined in this section while maximising net economic benefits and meeting reliability standards.

TasNetworks currently proactively replaces deteriorated poles where possible. Investment is required in future years to sustain the performance of TasNetworks' pole population and to ensure the number of poles at, or exceeding their service life remains manageable. In particular, there will be a need to progressively increase the number of staked pole replacements as they reach the end of their service life.

In assessing its pole management strategy, TasNetworks has considered the costs and benefits of various pole materials to ensure the optimal, whole-of-life solution is identified. This analysis demonstrated Titan poles are the preferred material.

Further information on TasNetworks' asset management approach to poles is included in Section 2 of the DPAR.

2 Credible Options

In the DPAR, two options were identified as being credible in addition to a 'business-as-usual' base case. These are:

- **Base case** - Replacing poles on condition deterioration with the best available grade of wooden pole (S3).
- **Option 1** – Hybrid replacement strategy on condition deterioration with either a Titan pole or highest suitable grade (S3) wood pole.
- **Option 2** – Replace on condition deterioration with the lowest suitable grade (S4) wood pole.

TasNetworks considered two other network options that were ultimately not included in the NPV analysis for the reasons outlined in Section 3.4 of the DPAR.

TasNetworks also determined that there is unlikely to be a non-network option that could form a potential credible option on a standalone basis, or that could form a significant part of a potential credible option for this RIT-D. TasNetworks described the reasons for this conclusion in a Notice of Determination published on 1 December 2023.

Note that in all cases, TasNetworks considers staking before replacing wood poles. Poles are replaced when there is too much wood rot at the groundline to stake the pole, or where it is not prudent to stake given whole-of-life cost.

2.1 The Base Case

For this RIT-D, the base case is where TasNetworks continues with our current pole condition inspection and replacement program. This involves replacement of all poles with S3 wood poles in condition based planned works replacement.

This option reflects TasNetworks' current business practice. However, as explained in Section 2 of the DPAR, the availability of suitably durable wood poles is decreasing, resulting in a reduction in the serviceable life (there has been a decrease in the average service life of S3 poles from 48 years to 44 years since 2014). There are currently a limited numbers of pole suppliers, resulting in diversity and competition constraints in the market. This has led to a reliance on locally grown S4 wood poles, imported poles or, in certain circumstances, wood pole alternatives. For simplicity, this option assumes continued availability of S3 poles.

As with all other wood species, these poles are prone to fire damage leading to poor resilience outcomes.

The vast majority of these poles are also treated with CCA that pose significant disposal costs if burnt/carbonised. There are increasingly limited dump sites for toxic CCA waste disposal, which must now be exported for disposal in Victoria.

The average unit rate for purchasing and installing S3 wood poles is $9,000 per pole.

2.2 Option 1

Under Option 1, TasNetworks replaces deteriorated poles with Titan poles (if available), then by default with S3 wood poles in condition based planned works where appropriate. This is a hybrid replacement strategy where poles are replaced with both S3 wood poles and Titan poles.

This option is equivalent to the base case but poles are replaced with Titan poles (rather than S3 wood poles) in the highest technically feasible volumes. As described in Section 2.1.2 of the

DPAR, TasNetworks has considered a range of different materials for alternative poles and identified Titan as the preferred option. A total transition to Titan is limited by TasNetworks' change management, contractual obligations, and supply constraints as described in Section 3.4.2 of the DPAR.

Given these constraints, installation will be prioritised to locations where the technology provides the best value. This will begin with those circumstances deemed appropriate for replacement with alternative poles in Section 2.1.2 of the DPAR. The replacement volumes of Titan and S3 wood poles over the next 20 years under this option are shown in Figure 1[2].

This option is consistent with Standards Australia's Overhead Line Design Handbook released in response to the 2019-2020 Australian and 2020 United States' bushfire seasons.

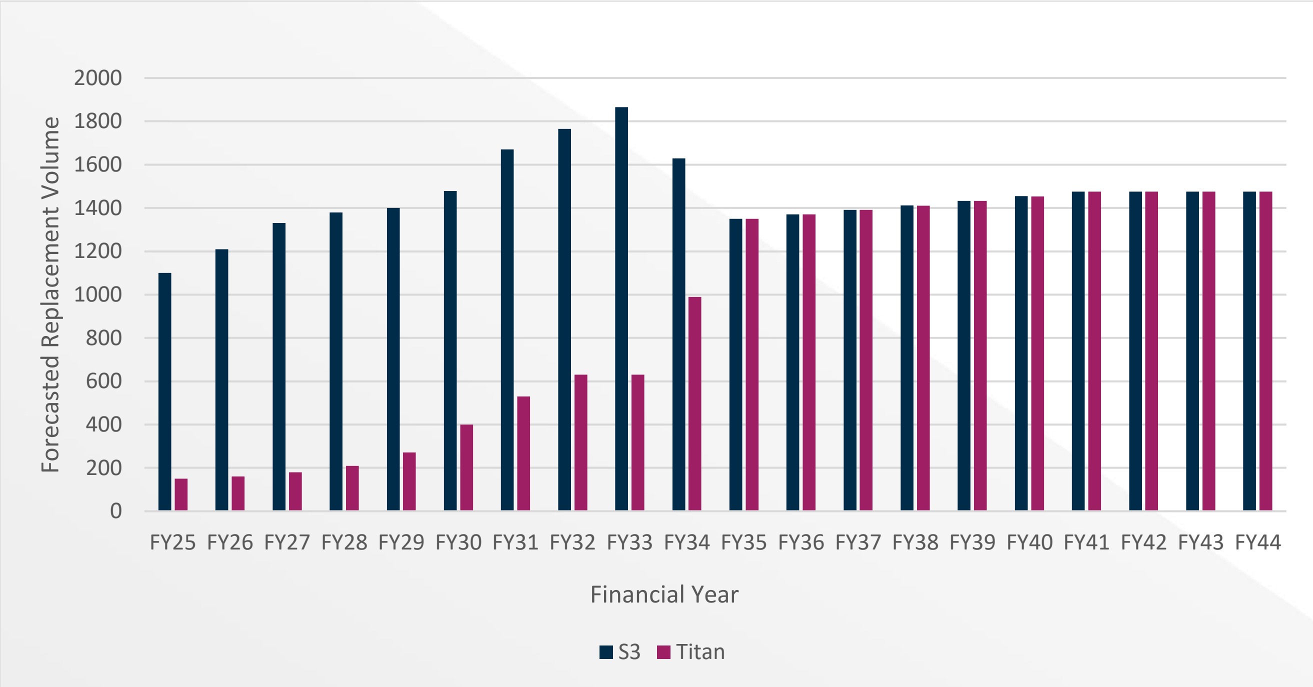

Figure 1 Replacement volumes of Titan and S3 wood poles over the next 20 years under Option 1

The average unit rate for purchasing and installing S3 wood poles is $9,000 per pole.

The expected average unit rate for purchasing and installing a Titan pole is $10,000 per pole.

2.3 **Option 2**

Under Option 2, TasNetworks continues with the current pole condition inspection and replacement program and uses S4 wood poles in condition based planned works replacement.

Option 2 is equivalent to the base case but poles are replaced with a lower grade timber (S4 compared to S3).

Similar to the base case, S4 timber poles are prone to fire damage and are mostly CCA treated.

The unit rate for purchasing and installing S4 wood poles is $9,000 per pole.

[2] As described in Section 2.1.3 of the DPAR, annual replacement volumes are rising consistent with the bow wave in TasNetworks pole fleet

3 Modelling and Assumptions

3.1 Assumptions

TasNetworks has made several key assumptions for this RIT-D to improve the assessment of options. In particular, TasNetworks has assumed the base case is a continuation of our business as usual approach to pole replacement. This differs from a base case where TasNetworks operates the network element to failure. Under a run to failure base case, the majority of benefit can be attributed to a reduction in risk costs from replacing the network element proactively. Given all the credible options for this RIT-D involve the proactive replacement of assets, TasNetworks do not expect the usual classes of market benefit to be material.

To adequately capture the resilience difference between poles types TasNetworks have also made assumptions regarding the number of poles lost to bushfire per year. This is based on historical trends.

3.2 Benefits

The NER requires that all categories of market benefit identified in relation to the RIT-D are included in the RIT-D assessment, unless TasNetworks can demonstrate that a specific category (or categories) is unlikely to be material. The FPAR is required to set out the classes of market benefit that TasNetworks considers are not likely to be material for a particular RIT-D assessment[3].

TasNetworks does not consider any of the relevant market benefit categories to be material for the purposes of this RIT-D analysis. That is, TasNetworks do not expect quantifying any of the relevant benefits will impact the ranking or sign of the preferred option.

The AER has recognised that if the credible options considered will not have an impact on the wholesale market, then a number of classes of market benefits will not be material in the RIT-D assessment, and so do not need to be estimated[4]. No credible option is expected to result in any change in dispatch outcomes and wholesale market prices.

We therefore consider that the following classes of market benefits are not material for this RIT-D assessment:

- changes in voluntary load curtailment (since there is no impact on pool price);
- changes in costs for parties, other than for TasNetworks (since there will be no deferral of generation investment);

Table 2 includes reasons why the remaining classes of market benefit are not material for this RIT-D assessment.

Table 2 Immaterial market benefits

Market benefit category	Reason why it is not considered material
Changes in involuntary load shedding	All of the assessed options including the base case are proactive replacement of assets. As a consequence, there is a minimal unplanned pole failure resulting in unserved energy across all options.
Differences in the timing of expenditure	None of the credible options affect the timing of expenditure within the 20-year assessment period.

[3] Clause 5.17.4(j)(8)
[4] AER, RIT-D Application Guidelines, p.29

Changes in load transfer capacity and the capacity of embedded generators to take up load	None of the credible options allow end users to gain access to a back-up power supply or improve the capacity for embedded generators to take up load.
Option value	Option value is likely to arise where there is uncertainty regarding future outcomes. In this instance there may be benefit in TasNetworks adopting a flexible investment strategy that can adapt to future conditions. TasNetworks do not consider option value is relevant for this this RIT-D assessment as the need for and timing of the investment is being driven by asset age.
Changes in electrical energy losses	We do not expect any material changes in network losses between options.
Changes in Australia's greenhouse gas emission	We do not expect any changes in greenhouse gas emissions from implementing any of the credible options.

3.2.1 Terminal value

As explained in Section 3.1, TasNetworks has assumed the base case is a continuation of our business as usual approach to pole replacements. As a result, the key driver of benefits between credible options is the service age of the pole types.

Most pole types have asset lives greater than 20 years. This means they are not fully depreciated and continue to retain value beyond the 20-year modelling period. In these instances, TasNetworks have taken a terminal value approach to incorporating capital costs in the assessment, which ensures that the capital cost of the replacement program is appropriately captured in the 20-year assessment period.

Terminal value has been calculated using the remaining undepreciated cost of the assets at the end of the assessment period, using straight-line depreciation. Given the key driver of benefits between options is related to the service life of the poles (65 years for Titan compared to 44 for S3 wood poles), terminal value is expected to have a larger impact on the preferred option compared to other RIT-D assessments.

Although a longer assessment period may capture additional costs and benefits not accounted for in terminal value, TasNetworks does not expect this would materially impact the outcome of the analysis in Section 4. This is due to the key source of benefit of using Titan poles being the longer service life, which is largely captured in terminal value.

3.3 Description of the modelling methodologies applied

This section outlines the methodologies and assumptions TasNetworks have applied to undertake this RIT-D assessment. We have applied an asset ‘risk cost’ evaluation framework to quantify the risk cost reductions associated with replacing the identified poles. Although avoided risk costs are not material for the purposes of this RIT-D assessment it is still relevant to understand the driver behind the overall replacement program. The risk cost modelling framework is described in Section 4 of the DPAR.

3.3.1 Analysis period and discount rate

The RIT-D analysis has been undertaken over a 20-year period from 2023 to 2042, which considers the size, complexity and expected life of each option to provide a reasonable indication of its cost. Although poles typically last well beyond 20 years, TasNetworks do not expect extending the analysis beyond 20 years will materially impact the outcome. This is explained in more detail in Sections 3.2.1 and 4.1.

The NER states[5] that present value calculations in the RIT-D must use a commercial discount rate appropriate for the analysis of a private enterprise investment in the electricity sector. Consequently, TasNetworks has used a pre-tax real discount rate of 7% reflecting the assumptions of the 2023 Inputs, Assumptions and Scenarios Report (**IASR**).

3.3.2 Description of reasonable scenarios

We have developed three scenarios for this RIT-D assessment:

1. a 'low benefits' scenario – reflecting a conservative set of assumptions, which represents a lower bound on reasonably expected potential market benefits that could be realised; and
2. a 'central' scenario reflecting our base set of key assumptions;
3. a 'high benefits' scenario – reflecting an optimistic set of assumptions, which represents an upper bound on reasonably expected potential market benefits.

TasNetworks have developed these scenarios by applying sensitivity analysis to key input variables that will likely affect the performance of credible options. Table 3 below summarises the key assumptions making up each scenario.

Given that the low and high benefits scenarios are less likely to occur, the scenarios have been weighted accordingly; 25% – low benefits scenario, 50% – central benefits scenario, and 25% – high benefits scenario.

Table 3 Summary of reasonable scenarios

Key variable	Scenario 1 - Low Benefits	Scenario 2 - Central	Scenario 3 - High Benefits
Capital costs	120% of central	Same as base analysis	80% of central
Discount Rate[6]	10.5%	7.0%	3.3%
Value of Customer Reliability	80% of central	18.87 $/kWh	120% of central
Risk costs	80% of central	Same as base analysis	120% of central

[5] Clause 5.17.1(c)(9)(iii)
[6] Consistent with the AER RIT-D Guidelines, TasNetworks has adopted the discount rates from the 2023 IASR for the central and high scenarios. Pre-tax real weighted average cost of capital is used as the lower bound.

4 Assessment of credible options

This section outlines the assessment TasNetworks have undertaken of the credible options. The assessment compares the options against a base case BAU option.

4.1 Gross benefits of each credible option

Table 4 shows the gross market benefits of each credible option across the three modelled scenarios on a present value basis compared to the base case to enable sensitivity.

Table 4 Gross market benefits for each credible option compared to base case, PV $

Option	Scenario 1 - Low Benefits	Scenario 2 - Central	Scenario 3 - High Benefits
1	$5,946,371	$11,265,623	$22,861,976
2	-$19,175,256	-$37,547,980	-$78,299,082

As demonstrated in Figure 2, the majority (approximately 88%) of the positive benefits associated with Option 1 are driven by greater terminal values than the base case due to Titan poles being considerably longer lived than wood poles. Terminal value is described in Section 3.2.1 and accounts for the value retained by the poles beyond the 20 year assessment period. Although a longer modelling period may capture additional costs and benefits not in terminal value, TasNetworks expects this would only improve the value of Option 1 against the base case and not impact the outcome of the assessment. This is because a longer modelling period would capture additional replacements of wood poles under the base case and Option 2 that would not occur under Option 1.

Similarly, Option 2 has a significantly lower terminal value compared to the base case reflecting the lower service life of S4 compared to S3 wood poles. Given S3 wood poles last beyond 20 years, the base case also has terminal value, however it is not shown in Figure 2 as this is relative to the base case.

As described in Section 3.3 of the DPAR, avoided annualised risk costs is the driver for asset replacement, however it is not a key source of benefit for this RIT-D given all options, including the base case, avoid similar risk costs by proactively replacing assets prior to failure.

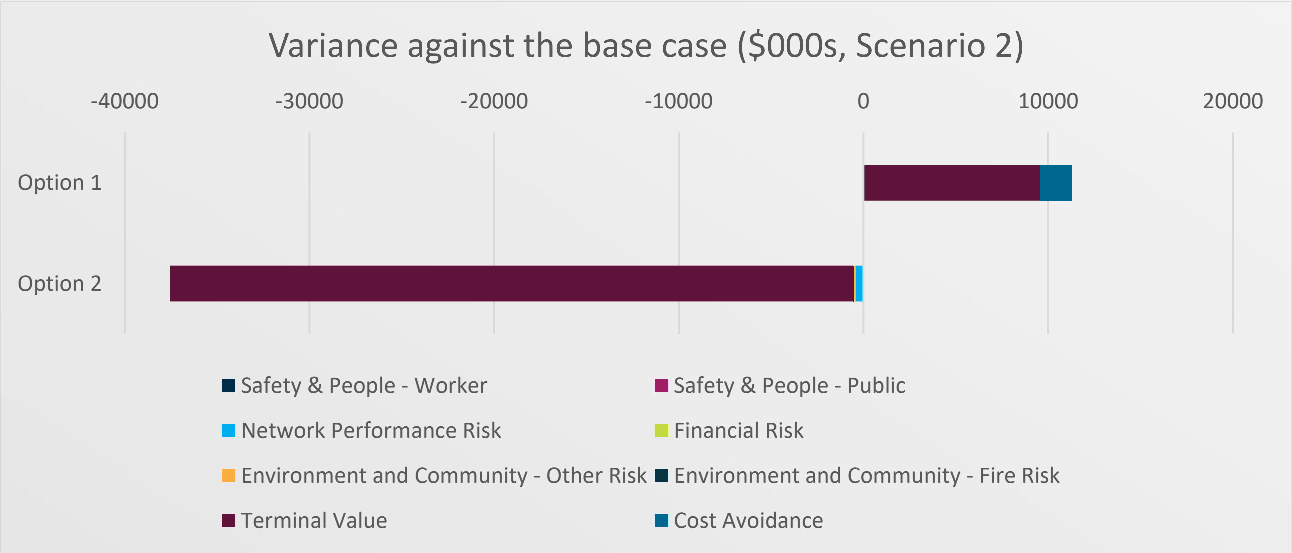

Figure 2 Benefits compared to base case.

Option 1 also results in a 'cost avoidance' benefit compared to the base case. This represents avoided capex associated with fewer replacements in Option 1 following bushfire. Under the base case and Option 2, some poles replaced within the 20 year assessment period will be replaced again as a consequence of bushfire. This is avoided in Option 1 as these poles are replaced with Titan.

Estimated costs for each credible option approximations reflect the similar installation unit costs of the various pole types.

Table 5 shows the estimated present value costs of each credible option in each of the three scenarios compared to the base case. It also shows the total cost of the replacement programs over 20 years. These costs are sum of both capital and operating expenditure[7]. The relatively similar approximations reflect the similar installation unit costs of the various pole types.

Table 5 Estimated costs of each credible option compared to base case, PV $2023-24

Option	Scenario 1 - Low Benefits	Scenario 2 - Central	Scenario 3 - High Benefits	Total Nominal Cost (20 years – Scenario 2)
Base Case	n/a	n/a	n/a	$475,699,154
1	$4,825,266	$7,165,189	$11,348,893	$493,466,742
2	$0	$0	$0	$475,699,154

Option 1 is higher cost than the base case and Option 2 over 20 years as Titans are more expensive than wood poles. The differences in costs between the various scenarios are largely driven by the competing impact of capex and discount rate sensitivities. Although nominal capex is higher in Scenario 1, this is offset by the capex being discounted at higher rate. As a result, the cost is the lowest in Scenario 1 on present value terms and highest in Scenario 3.

Option 2 is the same cost as the base case reflecting the same installation cost for wood poles regardless of durability.

4.2 Net present value assessment outcomes

Table 6 shows the outcome of the net present value assessment. It includes the net benefits (gross benefits minus estimated costs) of each credible option in each of the scenarios. It includes the net benefits of each option weighted against the probability of each scenario. A positive outcome indicates the option has higher net benefits than the base case and is preferred. A negative outcome indicates the base case is preferred.

Table 6 Net benefits each credible option

Option	Scenario 1 - Low Benefits		Scenario 2 - Central		Scenario 3 - High Benefits		Weighted	
	Net Benefits	Rank	Net Benefits	Rank	Net Benefits	Rank	Net Benefits	Rank
1	$1,121,104	**1**	$4,100,434	**1**	$11,513,083	**1**	$5,208,764	**1**
2	-$19,175,256	2	-$37,547,980	2	-$78,299,082	2	-$43,142,575	2

As demonstrated in Table 6, Option 1 is the preferred option across all scenarios and on a weighted basis. The base case remains preferable to Option 2.

[7] Capex accounts for approximately 90% of the total cost across all options

4.3 Sensitivity testing

TasNetworks has undertaken sensitivity testing to understand the robustness of the RIT-D assessment to underlying assumptions about key variables. In particular, TasNetworks have tested the optimal timing of the project under each of the modelled scenarios. TasNetworks has then tested the sensitivity of the total net market benefit to variations in the key factors underlying the assessment.

4.3.1 Sensitivity testing of the assumed optimal timing for the preferred option

TasNetworks has calculated the optimum timing of the preferred option for each of the modelled scenarios.

As demonstrated in Figure 3, the expected annual benefit from the proposed option currently exceeds its annualised cost of replacement in each scenario, justifying commencing the project immediately.

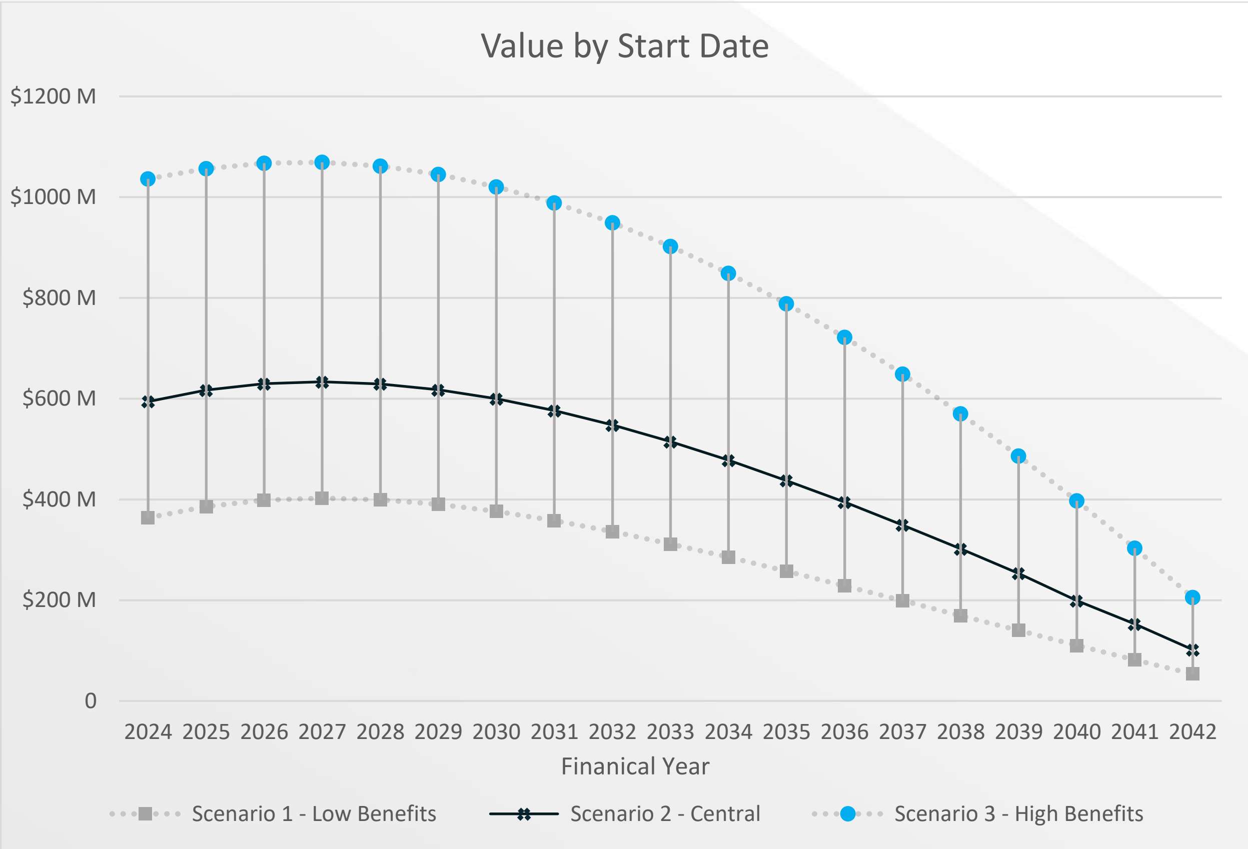

Figure 3 Timing sensitivity on value.

4.3.2 Sensitivity of the overall net market benefit

Consistent with the AER's RIT-D Guidelines, TasNetworks has also applied sensitivity analysis to the overall net market benefit of the preferred option to identify 'boundary values' for specific input assumptions at which the preferred option changes. Given the majority of benefit from this investment is from terminal value, TasNetworks considers the preferred option is only sensitive to:

- Capital expenditure
- Discount rate

These boundary values are shown in Table 7.

Table 7: Boundary values

Capital costs	Discount rate
208% of central scenario	13.5%

TasNetworks does not consider that any of these threshold values can be reasonably expected and, thus, considers that the expected net market benefits have been demonstrated to be robust to a range of alternate assumptions. In particular, due to diminishing supply of suitable wood poles, we do not expect the cost of Titan poles to increase compared to wood poles.

5 Statement of satisfaction

TasNetworks has identified a potential change to its pole replacement program to ensure the ongoing reliability of the Tasmanian distribution network. The triggers for a potential change are increasing bushfire risks and decreasing availability of wood poles.

Detailed analysis has shown that replacing wood poles with Titan poles (if available) results in better outcomes for customers than the current replacement practices.

The proposed preferred option, Option 1, satisfies the RIT-D. This statement is made based on the detailed analysis set out in this report. The proposed preferred option is the credible option that has the highest net economic benefit under the most likely reasonable scenarios.

This FPAR concludes the RIT-D process.

For further information, please contact:

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Appendix 1 – Final Project Assessment Report Checklist

The following table demonstrates compliance of this FPAR with the requirements of clause 5.17.4(j) of the NER.

NER Requirement	Section
(1) a description of the identified need for the investment.	Section 1
(2) the assumptions used in identifying the identified need.	Sections 1, 2 & 3
(3) if applicable, a summary of, and commentary on, the submissions on the options screening report.	N/A
(4) a description of each credible option assessed.	Section 2
(5) where TasNetworks has quantified market benefits, a quantification of each applicable market benefit for each credible option.	Section 4.1
(6) a quantification of each applicable cost for each credible option, including a breakdown of operating and capital expenditure.	Section 4.1
(7) a detailed description of the methodologies used in quantifying each class of cost and market benefit.	Section 3.3
(8) where relevant, the reasons why the RIT-D proponent has determined that a class or classes of market benefits or costs do not apply to a credible option.	Section 3.1
(9) the results of a net present value analysis of each credible option and accompanying explanatory statements regarding the results.	Section 4.2
(10) the identification of the proposed preferred option.	Section 4.2
(11) for the proposed preferred option, the RIT-D proponent must provide: (i) details of the technical characteristics; (ii) the estimated construction timetable and commissioning date (where relevant); (iii) the indicative capital and operating cost (where relevant); (iv) a statement and accompanying detailed analysis that the proposed preferred option satisfies the regulatory investment test for distribution; and (v) if the proposed preferred option is for reliability corrective action and that option has a proponent, the name of the proponent.	(i) Section 2 (ii) N/A (iii) Section 4.1 (iv) Section 5 (v) N/A
(12) contact details for a suitably qualified staff member of the RIT-D proponent to whom queries on the draft report may be directed.	Section 5
(13) a summary of any submissions received on the draft project assessment report and the RIT-D proponent's response to each such submission.	N/A – no submissions received

Appendix 2 –RIT-D Process