Managing the risk of pole failure

Draft Project Assessment Report

Date: 1 December 2023

TasNetworks | Powering a Bright Future

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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 deems it prudent to apply 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 Draft Project Assessment Report (**DPAR**) is the second step in the RIT-D process. TasNetworks have published this report concurrently with our notice of determination concluding that no non-network options could meet the identified need.

Two options were identified as being credible and have been assessed 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 seeks written submissions from interested parties in relation to the preferred option outlined in this document. Submissions are due on or before 12 January 2024. All submissions and enquiries should be directed to TasNetworks' Regulation Team at **regulation@tasnetworks.com.au**.

[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
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."

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.

To maintain affordability for our customers, asset investments are only made by TasNetworks when they address clearly identified customer and/or business needs. As described in Section 2.3, TasNetworks pole replacement program is facing increasing pressure from bushfire risk and the availability of high-quality wood poles. As a consequence, TasNetworks have assessed whether amending our current pole management strategy is warranted. The deterioration of distribution poles eventually results in failure of the network element. The impact or consequences of a pole failure may include:

- Network outages
- Injury or fatalities
- Damage to other TasNetworks' plant and equipment
- Damage to third party assets
- Fire ignition
- Financial impacts for outage penalties
- Emergency replacements
- Toxic waste disposal and environmental remediation costs

TasNetworks currently mitigates this risk by proactively replacing 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.

As wood poles age, cracks, splits and holes increase the availability of moisture in the wood and accelerate the rate of decay. As described in Section 2.2.1, wood decay is the major driver of wood pole degradation and condemnation in Tasmania.

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.

2 Background

2.1 TasNetworks' pole population

TasNetworks' distribution network relies on 233,471 poles to support assets and equipment that facilitate the distribution of electricity to more than 295,000 customers. Poles provide support, insulation and adequate air gap clearances between overhead conductors, overhead switchgear, pole mounted transformers, vegetation and building infrastructure. The various pole structure types and quantities in our network are shown in Table 2.

Table 2 Overhead line support structures installed in TasNetworks' distribution system (at end of FY2022/23)

Support structure type	Count
Wood pole (CCA TN and untreated)	209,509
Steel reinforced concrete pole	159
Steel lattice tower (ex-Transmission)	176
Steel structure (incl. steel lattice poles)	16,690
Steel A-frame concrete infill (Stobie) pole	6,154
FRP reinforced concrete composite (Titan) pole*	783
Total	**233,471**

2.1.1 Wood poles

Wood poles make up approximately 90% of TasNetworks' distribution pole fleet. These poles are graded from S1 to S4 for strength and durability in line with Australian Standards[2]. Approximately, 80 % of wood poles in TasNetworks' network are locally grown S3 strength durability, and 20 % are locally grown S4 strength durability. S1 and S2 class timber is not grown in Tasmania, however some have been imported from the mainland for special design needs or post bushfire resupply. Historically, the average service life of wood poles in our network has been:

- 44 years for S3
- 25 years for S4

Wood poles are used extensively within the distribution network because they have historically represented the least cost whole-of-life option for restoration and continuity of grid supply.

The vast majority of TasNetworks' wood pole population (approximately 90%) is treated with Copper-Chrome-Arsenate (**CCA**). CCA treatment protects the wood from insect and fungal attack, extending its useful life in comparison to untreated wood poles. Copper also limits wood rot.

2.1.2 Non-wood (alternative) poles

TasNetworks has historically replaced poles with the highest available grade of suitable wood pole. 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 wood poles. This has included situations where the pole:

[2] AS5604 Timber – Natural Strength Durability Ratings

- Supports critical equipment[3];
- Is in a high bushfire loss consequence area (**HBLCA**); and/or
- Supports a large load (e.g in high wind areas or supporting a long span).

TasNetworks Network Standard Specification for alternative poles requires a mandatory Energy Networks Australia (**ENA**) Bushfire Pole Type Test[4]. TasNetworks has previously conducted analysis to determine the optimal technology and material type for our alternative poles. This considered criteria including:

- Strength/resilience
- Fire resistance
- Life-cycle
- Earthing integrity
- Handling and installation
- Environmental consideration
- Design

The analysis compared poles made from:

- Wood poles (of various durability)
- Steel
- Composite
    - Fibreglass Reinforced Composite (**FRC**)
- Concrete
    - Fibreglass Reinforced Polymer (**FRP**) spun concrete composite (Titan)
    - FRP spun concrete
    - Open spun concrete
    - Cast concrete

The analysis demonstrated that FRP reinforced composite spun concrete poles (Titan) is the most cost effective option compared to other non-wood poles in higher bushfire risk prone locations. However, S3 CCA wood poles would remain cost effective in other locations.

Titan poles:

- are lighter than wood and concrete equivalents;
- require less maintenance over a longer service life;
- are easy to handle, ship and install ;
- have an expected service life of 65 years;
- are Type Tested as electrically insulated to 16kV for improved safety;
- are more resistant to fire than alternatives (steel and wood); and

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[3] Equipment that would result in significant costs if the pole were to fail in service including large transformers, reclosers and voltage regulators.

[4] Forest & Wood Products Australia, *Assessing the ability of a large-scale fire test to predict the performance of wood poles exposed to severe bushfires and the ability of fire retardant treatments to reduce the loss of wood poles exposed to severe bushfires*, April 2009

- are cheaper than other concrete alternatives (e.g. Stobie poles)

2.1.3 Pole Asset Life Cycle Sustainability

TasNetworks has identified two factors relating to poles resulting in an imminent, increased need for annual pole replacements, compared with replacing a constant number of poles per year ad infinitum. This forecast increase is commonly referred to as an asset replacement ‘bow wave’, and is being driven by:

- **Historical bushfires** - Historically, bushfires result in many, if not all wood poles in a specific region being sufficiently damaged so as to require immediate replacement. This creates the effect of a pole replacement ‘bow wave’, where all these poles with a similar installation date reach their end-of-life at the same time, requiring replacement.

- **Historical asset construction** – Historical construction and replacement projects have resulted in many poles being installed across Tasmania at around the same time. As those poles approach end-of-life their condition is observed to deteriorate, and replacement is required. For these reasons, TasNetworks’ pole data shows that in the next decade the wood pole fleet will experience a condemnation rate that increases year-on-year (as opposed to a constant condemnation rate that would be observed for a wood pole population with an even distribution of asset ages).

2.2 Asset management

2.2.1 Pole inspections

TasNetworks undertakes both planned replacement works on condemned poles and unplanned replacement work on failed poles. Planned replacement is generally cheaper than unplanned replacement and avoids safety and bushfire risks, and outage penalty costs.

On installation, wood poles are assigned a safety factor of 4.5. As the pole degrades its condition is assessed and TasNetworks determines if:

- It remains in service - considered to be in adequate condition to safely remain in service until the next inspection (safety factor greater than 3);

- Is classified as impaired - not considered to be in adequate condition but suitable to be considered for staking (safety factor between 2.6 and 3); or

- Is classified as condemned - not considered to be in adequate condition to safely remain in service until the next inspection and not suitable for staking (safety factor of 2.5 or less).

In Tasmania, detectable wood soft rot represents 54% of wood pole condemning.

Due to the critical and extensive nature of these assets, pole management activities are proactively planned to mitigate the risk of in-service failure. All treated wood poles are inspected on a 5 year cycle while the safety factor remains above 3. If the safety factor falls between 2.6 and 3, the inspection cycle is reduced to 2.5 years and the pole is considered for staking. Wood pole staking commenced in 2002 and the current staked wood pole population is approximately 30,000 poles. Wood poles are generally staked at 30-45 years of age with the staked pole typically lasting 10-15 years after staking. Upon staking, a pole’s safety factor reverts to that of a new pole.

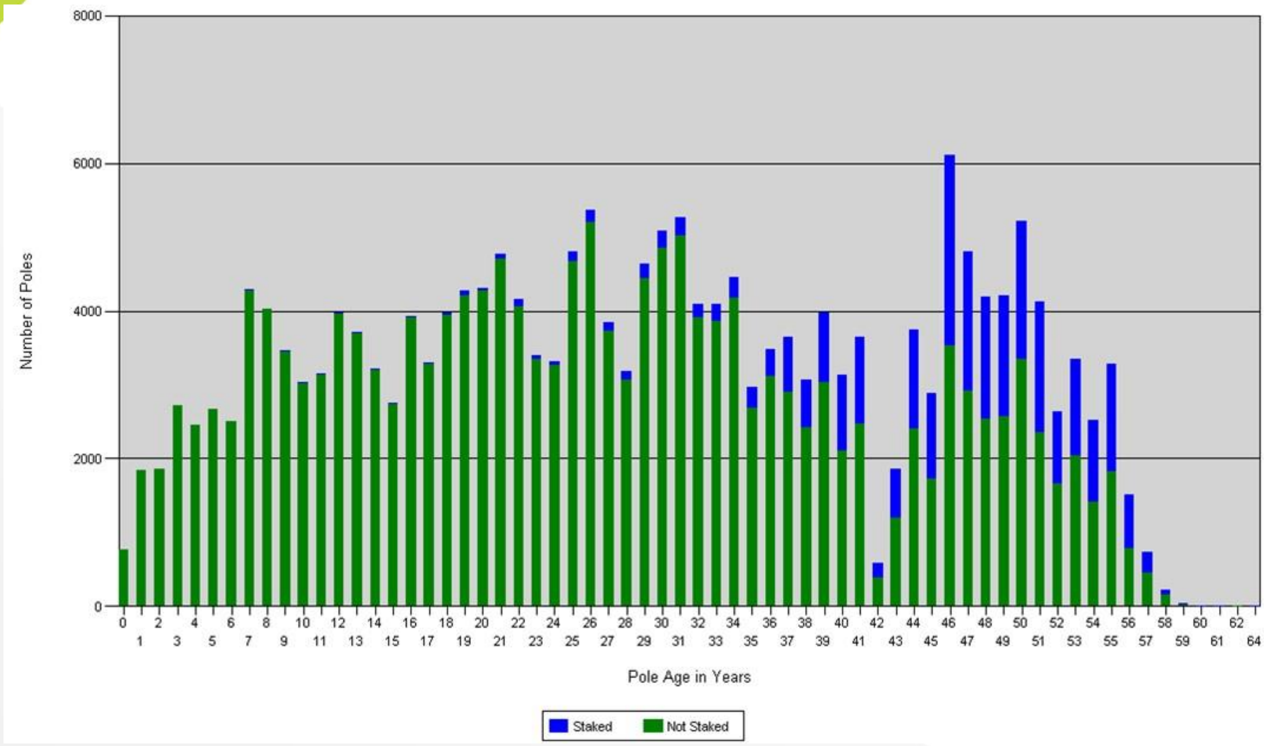

Figure 1 Age of poles in TasNetworks' network

Figure 1 shows that a large number of staked poles have now reached or are approaching end of life. On this basis it is anticipated that the number of staked poles needing to be replaced will increase in forthcoming years.

2.2.2 Design considerations

New overhead line pole design choices must comply with the current Australian Standard for overhead line design[5]. These standards allow TasNetworks to apply local knowledge in the design and construction of distribution poles, in particular where alternative materials provide safety and reliability levels equal or greater to that prescribed by the Standard.

Standards Australia's Overhead Line Design Handbook[6] provides guidance in relation to the application of the relevant Standards. Following the severe 2019-2020 bushfire season in Australia and the United States, the Handbook was updated to provide recommendations in relation to overhead line design for poles installed in bushfire prone areas. This includes:

a) Poles used in bushfire areas should be fire resisting. Dressed durable and creosote treated poles are suitable.

b) Poles of alternative materials should be tested in accordance with the ENA Pole Fire Test Method to determine their level of fire resistance.

c) Non-fire resisting poles should be impregnated or coated with a fire retardant that has been successfully tested in accordance with the ENA Pole Fire Test Method.

d) Poles in bushfire prone areas should be selected and managed in accordance with:

- ENA Guideline for the Management of Burning and Fire-damaged CCA Impregnated Poles and Cross arms
- ENA Technical Report - Guide for the Selection and Management of Poles to Reduce Damage and Loss when They are Exposed to Bushfires

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[5] AS/NZS 7000:2016 Overhead Line Design

[6] SA/SNZ HB 331:2020 Overhead Line Design Handbook

In addition to the design features required under the relevant Standards, TasNetworks considers the following factors when replacing poles:

- Availability of suitable poles;
- Environmental impact;
- Complexity of the existing site, either due to the loading forces at that location, restrictions around the footprint of the replacement or other assets located on the pole;
- Climate change asset resilience and adaptation[7];
- Criticality of the asset (or co-located assets) and site to network security and reliability;
- Frequency of exposure to public and workers[8]; and
- Accessibility of pole location for timely pole replacement[9].

2.3 Drivers of change

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

These drivers are discussed more in the following sections.

2.3.1 Bushfire Risk

Wood poles are vulnerable to ground fire, pole top pollution fires and bushfires. Under the existing replacement program, bushfire resistant support structures and bushfire damaged wood poles are replaced by CCA treated S3 wood poles. However, CCA treated timber is prone to continuously smoulder if exposed to fire. As described in Section 2.1.2 and 2.2.2, TasNetworks has increasingly needed to consider bushfire risk in our design considerations for pole replacement. TasNetworks consider alternative pole materials should be considered in higher bushfire risk impact sites (weighed up against the increased material costs).

Pole loss due to bushfires can be significant. The number of poles lost in significant[10] previous events include:

- 118 poles in 2018-19
- 100 poles in 2016
- 400 poles in 2013
- 5,000 poles in 1967

Bushfire risk is expected to increase in the future as a result of changing climatic conditions.

2.3.2 Availability of suitable wood poles

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[7] TasNetworks expects poles to face increasing wind speeds, more frequent and severe droughts and bushfires and more frequent dry lightning ignition and fuel reduction burns.
[8] Including cost of traffic control on higher traffic frequented locations
[9] Ground access to poles can be limited by snow, ice, flooding, and bushfire destabilization.
[10] There are multiple smaller events which occur annually not listed. There are approximately 100 assets lost on average due to fire.

As described in Section 2.1.1, the majority of TasNetworks' pole population is comprised of S3 and S4 wood poles. These are sourced from locally grown timber species that have been proven suitable for use as an overhead line support structure. However following bushfires in S3 and S4 plantation forests, the supply of suitable species has diminished. TasNetworks has previously imported poles from the mainland states of Australia to resupply following bushfires but, due to higher cost, imported poles are not a prudent whole-of-life option compared to other alternative poles.

There are several field trials underway both in Tasmania and the Australian mainland to identify new species suitable for use as power poles. If the trials are successful TasNetworks will consider whether they could be used to fill supply shortages, however this is not expected to occur in the near future.

Hence the lack of suitable S3 and S4 wood poles or proven wood alternatives means non-wood alternatives are used in certain replacements and could be the default replacement if no other option is available.

2.3.3 New technologies

The majority of the non-wood poles in Tasmania today were installed prior to TasNetworks taking over responsibility for the distribution network in 2014. Since then, locally grown S3 wood poles have been considered the best whole-of-life option and, when available, used in the vast majority of pole replacements. However, in recent years, new technologies and materials have emerged that are a viable alternative to previous non-wood options, especially in bushfire prone areas. This includes FRP spun concrete composite poles that are generally cheaper, more fire resistant and longer lived than other alternative materials used historically in Tasmania. Steel reinforced concrete poles were not considered due to their excessive weight (which effects transport costs) and that they are an electrically non-insulated pole.

As described in Section 2.2.2, new Australian Standards have also been introduced encouraging the consideration and use of alternative materials in bushfire prone areas and as a contingency supply.

3 Credible Options

A credible option is an option that:

- addresses the identified need;
- is commercially and technically feasible; and
- can be implemented in sufficient time to meet the identified need.

TasNetworks must consider all options that it could reasonably classify as credible for meeting the identified need, without bias to energy source, technology, ownership and whether it is a network or non-network option.

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 has 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. Specifically, TasNetworks does not consider any non-network option would meet the criteria of being commercially and technically feasible.

TasNetworks has determined that the cost of non-network options that enable poles to be decommissioned rather than replaced to be excessively expensive with minimal additional benefits compared to the proposed network option.

Furthermore, given poles are integral to ensuring the conveyance of electricity to customers in our distribution network, TasNetworks does not consider any non-network option capable of avoiding the need to undertake replacement expenditure.

TasNetworks has outlined the above in a Notice of Determination published alongside this DPAR.

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.

3.1 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 2.3, 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 $9000 per pole.

3.2 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, 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.

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. The replacement volumes of Titan and S3 wood poles over the next 20 years under this option are shown in Figure 2[11].

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.

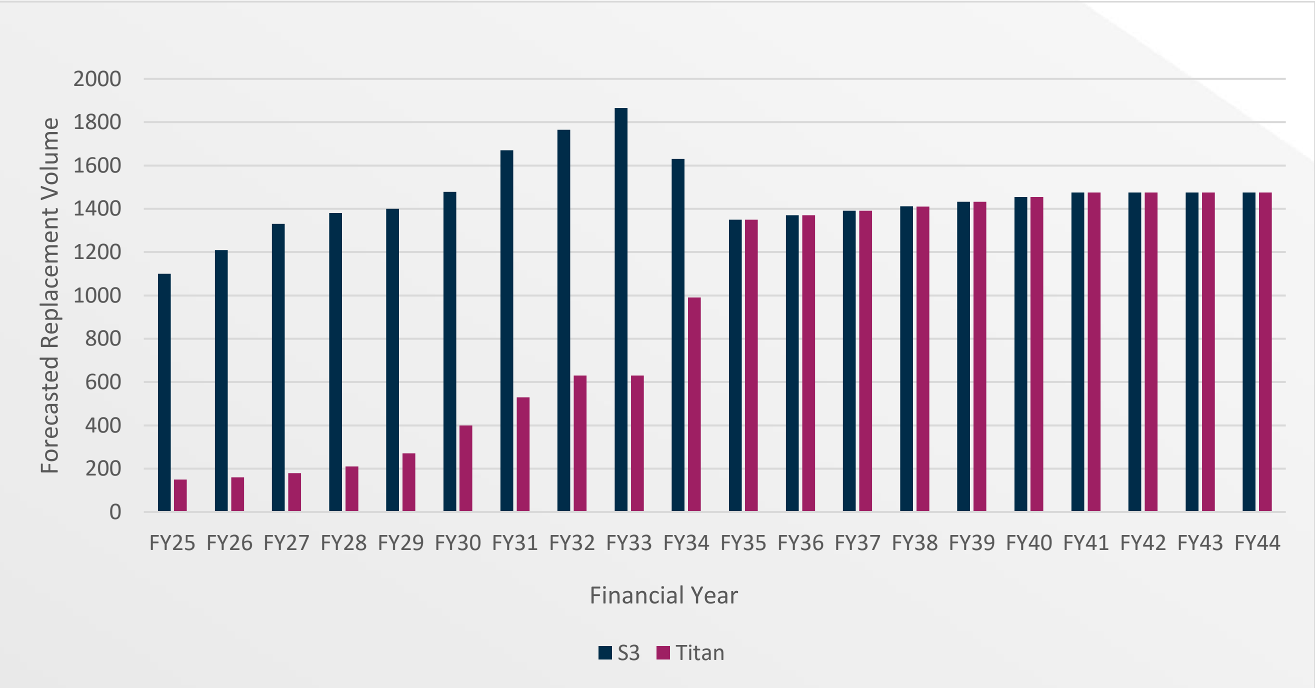

Figure 2 Replacement volumes of Titan and S3 wood poles over the next 20 years under Option 1

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.

3.3 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.

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

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.

3.4 Options considered but not progressed

3.4.1 Replace poles upon failure

This is equivalent to all other options but poles are replaced upon failure rather than proactively on condition deterioration.

Reactive replacement is not a credible option for a high volume replacement program as it does not align with TasNetworks' regulatory and legislative obligations. The benefit of slightly longer functional life from reactive replacement of poles is likely to be significantly outweighed by high levels of unserved energy and outage costs from allowing poles to run to failure. This option is not shown in the options analysis as it is not considered a credible option.

3.4.2 Replace poles exclusively with Titans

This option is equivalent to other options but TasNetworks uses exclusively Titan poles in condition based planned works replacement.

As described in Section 2.1, Titan poles have a number of advantages over wood poles including a longer service life (65+ years) and higher fire resilience. TasNetworks considers this option would likely result in the highest net benefits given the relatively similar installation cost to wood poles but significantly longer service life.

However, it is not technically feasible for TasNetworks to install Titan's at a greater rate than under Option 1. TasNetworks is limited by our change management, contractual obligations, and supply constraints. For this reason, this option is not considered credible for this RIT-D. Figure 2 shows increasing volumes of titan replacements as supply chain constraints are expected to be ease.

4 Modelling and Assumptions

4.1 Assumptions

TasNetworks has made several key assumptions for this RIT-D to improve the assessment of options. In particular, TasNetworks have 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.

4.2 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 DPAR 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[12].

The market benefits that must be considered under the NER are:

- changes in voluntary load curtailment (considered a negative benefit);
- changes in involuntary load shedding and customer interruptions caused by network outages;
- changes in costs to other parties (timing of new plant, capital costs, operating and maintenance costs) [13];
- differences in timing of expenditure;
- changes in load transfer capacity and the capacity of embedded generators to take up load;
- option value;
- changes in electrical energy losses;
- changes in Australia's greenhouse gas emissions; and
- any other class of market benefit determined to be relevant by the AER.

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 above 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[14]. 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);

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[12] Clause 5.17.4(j)(8)

[13] Note: OPEX inspection cost is similar for all options except for a 25% reduction in groundline inspection and rot treatment for Titan poles.

[14] AER, RIT-D Application Guidelines, p.29

- changes in costs for parties, other than for TasNetworks (since there will be no deferral of generation investment);

The remaining classes of market benefit include:

- changes in involuntary load shedding;
- differences in the timing of expenditure;
- changes in load transfer capacity and the capacity of embedded generators to take up load;
- option value; and
- changes in electrical energy losses.

TasNetworks consider that none of the five classes of market benefits listed above are material for this RIT-D assessment for the reasons set out below in Table 3.

Table 3 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.
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.

4.2.1 Terminal value

As explained in Section 4.1, 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.

As explained in Sections 2 and 3, 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 do not expect this would materially impact the outcome of the analysis in Section 5. 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.

4.3 Description of the modelling methodologies applied

This section outlines the methodologies and assumptions TasNetworks have applied to undertake this RIT-D assessment.

4.3.1 Overview of the risk cost modelling framework

We have applied an asset 'risk cost' evaluation framework to quantify the risk cost reductions associated with replacing the identified poles. Risks are assessed against TasNetworks' risk framework using the AER's risk-cost assessment methodology outlined in their Industry Practice Application Note: Asset Replacement Planning 2019. TasNetworks notes that despite avoided risk costs being a key a driver for most asset replacement programs it is not material for the purposes of this RIT-D assessment given proactive replacement already reflects our current business practice. As such, all options in Section 3 avoid similar annualised risk over the modelling period. The risk cost modelling framework is still relevant to understand the driver behind the overall replacement program, despite not influencing the ranking of options assessed in this RIT-D.

The 'risk cost reductions' have been calculated with reference to the following formula:

$$TQR = \sum_{n=0}^{n} (PoF \times No) \times (LoC \times CoC)$$

Where,

- TQR = total quantified risk/risk cost per year of the event happening
- PoF = annual asset probability of failure. Probability of failure values are obtained from our asset performance records. The values are also benchmarked where applicable nationally and internationally.
- No = number of assets
- CoC = cost of consequence of the failure event. These values are provided by an external insurance broker and aligned to TasNetworks' risk management framework
- LoC = likelihood of consequence of failure event. This value is determined using both actual (as observed by both TasNetworks and peers) and estimated data.

The TQR value, or risk cost avoided, is included as a benefit in the overall economic options analysis. Avoided risk cost values are the difference between risk costs incurred under the base case and each credible option.

Key risks considered in the TQR assessment for this RIT-D are:

- Safety;
    - injury to workers (employees and contractors); and
    - members of public;

- Network performance – i.e. avoided involuntary load shedding described in Section 4.1;
- Direct financial costs;
- Environmental impacts;
    - fire start; and
    - oil spills.

Where possible, TasNetworks uses real or benchmarked data to quantify the TQR.

By applying the above framework, TasNetworks can quantify the costs associated with pole failure for the purposes of valuing the benefits of each credible option.

4.3.2 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 4.2.1 and 5.1.

The NER states[15] 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**).

4.3.3 Description of reasonable scenarios

The RIT-D analysis is required to incorporate a number of different reasonable scenarios, which are used to estimate expected net market benefits. The number and choice of reasonable scenarios must be appropriate to the credible options under consideration. For a market benefits driven RIT-D such as this, the choice of reasonable scenarios must reflect any variables or parameters that are likely to affect the ranking of the credible options, or the sign of the net economic benefits of any of the credible options.

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.

[15] Clause 5.17.1(c)(9)(iii)

Table 4 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 4 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[16]	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

[16] 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.

5 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.

5.1 Gross benefits of each credible option

Table 5 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 5 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 3, 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 4.2.1 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 3 as this is relative to the base case.

As described in Section 4.3, 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.

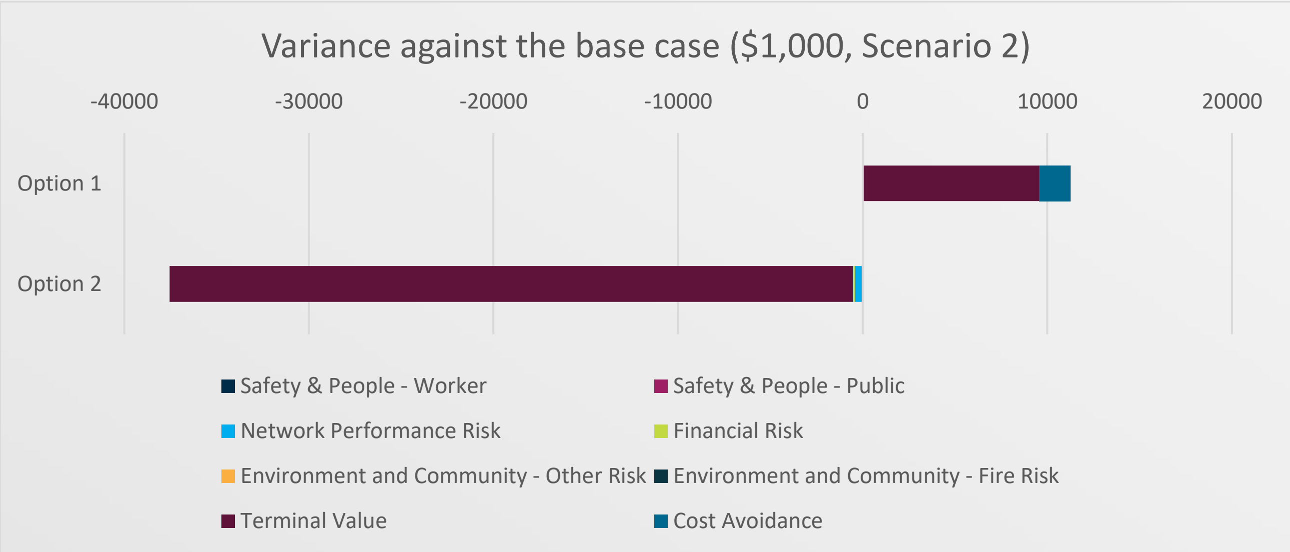

Figure 3 Benefits compared to base case

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 6 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[17]. The relatively similar approximations reflect the similar installation unit costs of the various pole types.

Table 6 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	$0

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. For example, although 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 2.

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

5.2 Net present value assessment outcomes

Table 7 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 7 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 7, Option 1 is the preferred option across all scenarios and on a weighted basis. The base case remains preferable to Option 2.

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17 Capex accounts for approximately 90% of the total cost across all options

5.3 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.

5.3.1 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. The optimum timing of the solution is the year the NPV of the expenditure is maximised. It is worth noting that currently the expected annual benefit from the proposed option exceeds its annualised cost of replacement, further justifying commencing the project immediately.

As demonstrated in Figure 4, the NPV of Option 1 is maximised when commenced immediately across all scenarios.

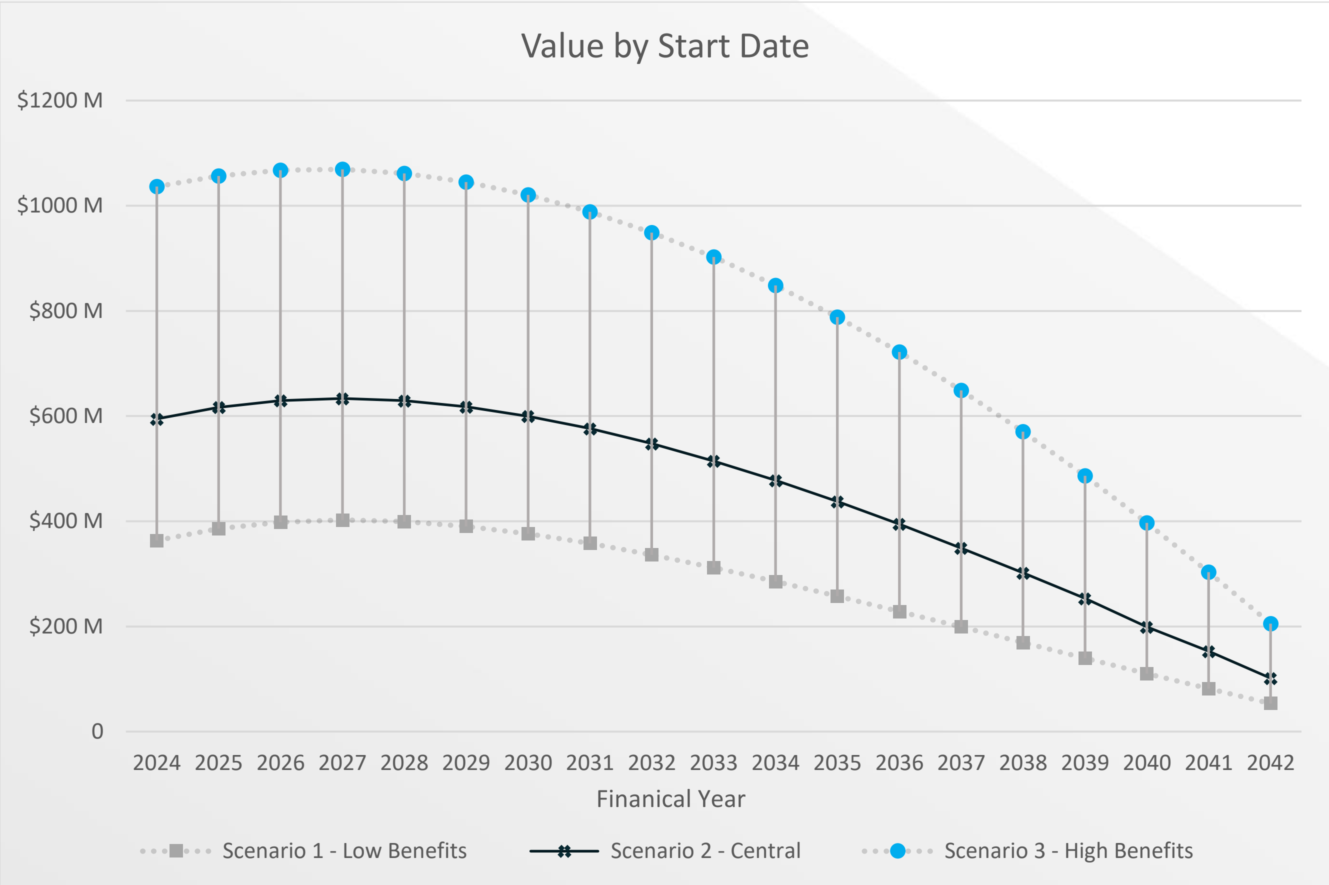

Figure 4 Timing sensitivity on value.

5.3.2 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 8.

Table 8: 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.

6 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 that are currently used.

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.

7 Next Steps

As detailed in Section 5.2 and described in Section 3, the preferred option to address the identified need is Option 1.

TasNetworks is seeking written submissions to this DPAR over a six-week period ending at 12 January 2024.

Stakeholders should be aware that submissions may be published by TasNetworks. Stakeholders should mark submissions confidential if they do not want them published. In the case of confidential submissions, TasNetworks may explore with the submitting party if it can make a redacted or non-confidential version public.

TasNetworks intends to publish a final project assessment report as soon as practical after the DPAR consultation period. The final project assessment report will include a summary and commentary on submissions received.

For further information, please contact:

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Submissions or enquiries in relation to this DPAR can be sent directly to: regulation@tasnetworks.com.au.

Appendix 1 – Draft Project Assessment Report Checklist

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

(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 & 4
(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 3
(5) where TasNetworks has quantified market benefits, a quantification of each applicable market benefit for each credible option.	Section 5.1
(6) a quantification of each applicable cost for each credible option, including a breakdown of operating and capital expenditure.	Section 5.1
(7) a detailed description of the methodologies used in quantifying each class of cost and market benefit.	Section 4.3
(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 4.1
(9) the results of a net present value analysis of each credible option and accompanying explanatory statements regarding the results.	Section 5.2
(10) the identification of the proposed preferred option.	Section 5.2
(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 3.3 (ii) N/A (iii) Section 5.1 (iv) Section 6 (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 7

Appendix 2 –RIT-D Process