Powerlink Queensland

Asset Reinvestment Review

Working Group Report

June 2023

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Executive Summary

During the revenue determination process for our 2023-27 regulatory period, the Australian Energy Regulator (AER) raised, in its Draft Decision[1], the potential for improvements in Powerlink's transmission lines asset management and replacement practices. Powerlink is committed to seeking continuous improvement across all of our business operations and recognises that affordability is a key concern for our customers. In line with this commitment, and in response to the potential opportunities identified by the AER, we undertook to review our approach to network asset reinvestment, particularly for overhead transmission lines.

A Working Group was established with members from Powerlink, Powerlink's Customer Panel, members of the AER Consumer Challenge Panel subgroup that had been involved in Powerlink's 2023-27 revenue determination process and the AER to guide its direction and considerations. The review considered our risk cost modelling approach, the impact of risk on economic decisions, the role of deterministic criteria in an economic assessment framework and the balance or trade-off between capital and operating expenditure.

Our current approach, which consists of refit work that is expected to achieve a life extension of a nominal 15 years across an entire asset, bundled in a single up-front intervention, was reviewed and explored by the Working Group. Typically such works consist of a combination of condition driven works and compliance driven works, and adopts a hybrid risk/deterministic approach.

The review considered whether there is an alternative approach to transmission line refit that drives a materially better outcome for customers. To this end, the Working Group considered the outcomes (net present value comparisons and trade-offs between capital expenditure and operating expenditure) of alternative asset definitions and work-bundling approaches.

Four project case studies were assessed as part of the review. Each of the four projects had been included in our revenue proposal, and had sufficient condition information, project scopes and estimates available to inform the assessment of alternative asset definitions and work-bundling approaches. The different bundling approaches resulted in various life extension outcomes, so any subsequent condition intervention was specifically modelled in the assessment.

This report presents the following recommendations of the Working Group derived from the assessment of these case studies:

1. no change be implemented to Powerlink's asset definition for transmission lines (i.e. built section)
2. compliance works are only undertaken on structures where condition based work is to be performed
3. both Powerlink's current approach and the alternative bundling approach be modelled for future transmission line refit investment decisions, and the most cost effective solution progressed based upon detailed condition and cost information, while allowing for the developing network needs to support the energy transformation.

These recommendations should be introduced as soon as practicable, as they are not expected to result in any material change in risk. The Working Group also noted that the alternative bundling approach could also enable a more flexible delivery and resourcing model through better staging of projects based on risk, ensuring that reinvestment decisions are made in a way that efficiently accommodates potential future scenarios.

[1] AER, Draft Decision, Powerlink Queensland Transmission Determination 2022 to 2027, Attachment 5 Capital Expenditure, September 2021, page 7.

Powerlink anticipates that these recommendations will be implemented in 2023/24, while we will report back to our Customer Panel on the progress made in embedding the recommendations from this review into our business as usual processes one year after finalisation of the review.

Powerlink would like to acknowledge the time and effort committed by all of those members of the Working Group external to Powerlink, and thank all of those members for their constructive engagement throughout the process and invaluable insights provided that have resulted in a thorough review of our processes.

1 Background

Powerlink lodged its Revenue Proposal for its 2023-27 regulatory period with the Australian Energy Regulator (AER) in January 2021. The proposal set out Powerlink's revenue requirements for prescribed transmission services over the period from 1 July 2022 to 30 June 2027.

Our overarching goal was to deliver a Revenue Proposal that was capable of acceptance by our customers, the AER and Powerlink. In preparing our Revenue Proposal, we undertook extensive engagement with our customers, stakeholders, the AER and the AER's Consumer Challenge Panel (CCP23) on all key elements of our Revenue Proposal during its development. Our engagement built on the strong foundations we undertake in the normal course of business.

Origins for the Asset Reinvestment Review

In its Draft Decision[2], the AER accepted our total forecast capital expenditure. The AER found our capital expenditure forecasting methodology to be a significant improvement on the methodology used in our previous 2018-22 Revenue Proposal and that our risk-cost based analysis and supporting economic modelling are a significant step forward. The AER also identified potential opportunities for a more targeted economic risk based approach, particularly for overhead transmission lines reinvestment, and raised concerns with our use of the Repex Model (replacement expenditure model) for forecasting purposes.

In light of this feedback, and consistent with our drive for continuous improvement, we committed to a review of our approach to network asset reinvestment. In our letter to the AER[3], we identified a number of matters that we considered would be relevant to the review and noted that the review would need to have regard to what is reasonably required to deliver network reinvestment works in the Queensland operating environment. In addition, we flagged our intention to publish the outcomes of the review and adopt improvements over the remainder of the 2023-27 regulatory period.

Scope of the Asset Reinvestment Review

From the matters raised in our letter to the AER, Powerlink developed criteria for the Working Group to consider while developing the scope of the review. We identified that the review should focus on both the prudency and efficiency elements of reinvestment capital expenditure.

Through discussion with the Working Group, it was agreed that the scope of the review should consider:

- social licence to operate over the asset life
- built section definition and its impact on the intervention timing and scale of works
- how to better capture the benefits, including financial, of 'bundling' condition and compliance driven works within transmission line projects
- how to better capture the challenges and costs, of access for Powerlink assets, both from a remote geographic and network outage perspective
- what is optimal at both a project and portfolio level

[2] AER, Draft Decision, Powerlink Queensland Transmission Determination 2022 to 2027, Attachment 5 Capital Expenditure, September 2021, page 8

[3] Powerlink, Letter to Justin Oliver, September 2021, Powerlink - Review of Powerlink's Approach to Network Asset Reinvestments - September 2021_Redacted.pdf (aer.gov.au).

- the AER Industry practice application note asset replacement planning[4]
- how to incorporate best practice approaches used by other networks
- future-proofing – given the rapidly changing environment, there is a need to ensure improvements to asset reinvestments are sustainable of the longer-term
- how to ensure predictable and repeatable outcomes.

However, the scope of the review excluded consideration of use of the Repex Model for future revenue proposals, as this is not used to determine reinvestment requirements in the normal course of business. Powerlink will consider how to forecast its reinvestment expenditure ahead of commencing our 2028-32 Revenue Proposal process. The capital expenditure forecast approach to be undertaken at that time will be developed with engagement with our Customer Panel.

[4] AER, Industry practice application note for asset replacement planning, January 2019

2 Engagement Process

Engagement objectives

To guide engagement throughout the review, Powerlink set the following objectives:

- enable in-depth and timely discussion on key elements of the asset reinvestment review, including its scope
- ensure customer, stakeholder and AER insights are heard and considered
- build an understanding of Powerlink's asset reinvestment requirements.

To achieve these objectives, we undertook the following engagement approach.

Asset Reinvestment Review Working Group

Powerlink commenced a review of its asset reinvestment approach and criteria in early 2022 to ensure consistency with sound asset management and risk-based decision frameworks.

To inform the direction of the review and ensure that customer, stakeholder and AER perspectives were appropriately considered, we established an Asset Reinvestment Review (ARR) Working Group as the primary engagement body for the review.

Membership was drawn from Powerlink's Customer Panel and members of the AER's Consumer Challenge Panel subgroup that had been involved in Powerlink's 2023-27 revenue determination process through an expression of interest process, while a representative from the AER was also invited to participate. The Working Group was advisory in nature, with members predominantly engaged at the *Involve* level of the IAP2 Spectrum.

A formal Terms of Reference was developed for the ARR Working Group outlining its purpose, membership and responsibilities. More detail can be found on Powerlink's website in the Asset Reinvestment Review Working Group Terms of Reference.

Membership

The ARR Working Group comprised the following standing members:

- Mark Henley, Uniting Communities
- Bev Hughson, Darach Energy Consulting Services
- Mark Grenning, Energy Users Association of Australia (EUAA)
- Chris Hazzard, St Vincent de Paul
- Andrew Broadbent, CS Energy
- Albert Tong, Australian Energy Regulator (AER)
- Paul Ascione, Powerlink, General Manager Asset Strategies and Planning
- Jenny Harris, Powerlink, General Manager Network Regulation
- Gerard Reilly, Powerlink, General Manager Communications, Customer and Engagement
- Roger Smith, Powerlink, Manager Network and Alternate Solutions
- David Gibbs, Powerlink, Manager Asset Strategies
- Nathaniel Dunnett, Powerlink, Manager Portfolio Planning & Optimisation
- Jules Taylor, Powerlink, Customer Strategist.

Process and focus areas

The ARR Working Group initially discussed and finalised the scope of the review. A glossary of terms was developed by Powerlink to assist in providing a common understanding of the terminology adopted within asset management, and for transmission lines assets in particular. The following table outlines a summary of ARR Working Group meetings and key focus areas progressed throughout the review process.

Month	Key focus area
March 2022	Discussed review scope.
April 2022	Glossary of terms, current approach overview, deep dive into Ross to Chalumbin Transmission Line Reinvestment case study.
May 2022	Confirmed scope of the review, built section definition.
June 2022	Site visit to Rocklea Tower Farm and Goodna tower site to view towers, climbing techniques and access tracks.
July 2022	Strawman outline of five options for the breakdown of built sections: 1. Powerlink current approach 2. Environment 3. Fixed length 4. Assets defined based on function (structure, insulator, conductor, etc.) 5. Accessibility.
October 2022	Use Ross to Chalumbin case study to compare three approaches: • Current approach • Each asset type with a built section is one asset – i.e. four assets per built section • Each individual asset component is one asset – every structure, conductor span, insulator, etc. (more than 3,000 assets in case study built section).
February 2023	Use of a graphic representation to review three approaches: • Review of the economic modelling of alternative options for built section of Ross to Chalumbin case study. • Results of economic modelling on a range of built sections • Preliminary recommendations • Next steps • Review of potential high level report structure.
April 2023	Presentation of Draft Asset Reinvestment Review Report for comment by Working Group members.
May 2023	Finalise report and complete review.

Table 1 Summary of meetings

A full list of meeting presentations and minutes can be found on Powerlink's website here.

Purpose of this report

The purpose of this report is to document the process undertaken to review Powerlink's asset reinvestment decision making, with respect to overhead transmission lines, and the resultant changes to asset management processes to be implemented. An overview of the process undertaken as part of this review is presented diagrammatically in Attachment A1.

Beyond the Asset Reinvestment Working Group, the audience is primarily internal Powerlink management and employees as it seeks to justify, and present the rationale for, the proposed changes to asset management processes. This report will be published on Powerlink's website.

3 Existing Asset Management Approach for Reinvestment

Reinvestment decision

Powerlink is committed to ensuring the sustainable long-term performance of its assets to deliver safe, reliable and cost-effective transmission services to customers, stakeholders and communities across Queensland. This is supported by adopting a proactive approach to asset management that optimises whole of life-cycle costs, benefits and risks, while ensuring compliance with applicable legislation, regulations, standards, statutory requirements, and other relevant instruments.

We examine assets from a whole of life perspective as part of our Asset Management System. The asset planning and reinvestment process is a key component of the asset management life cycle. We define the asset life cycle and main activities throughout nine stages shown in Figure 1 below.

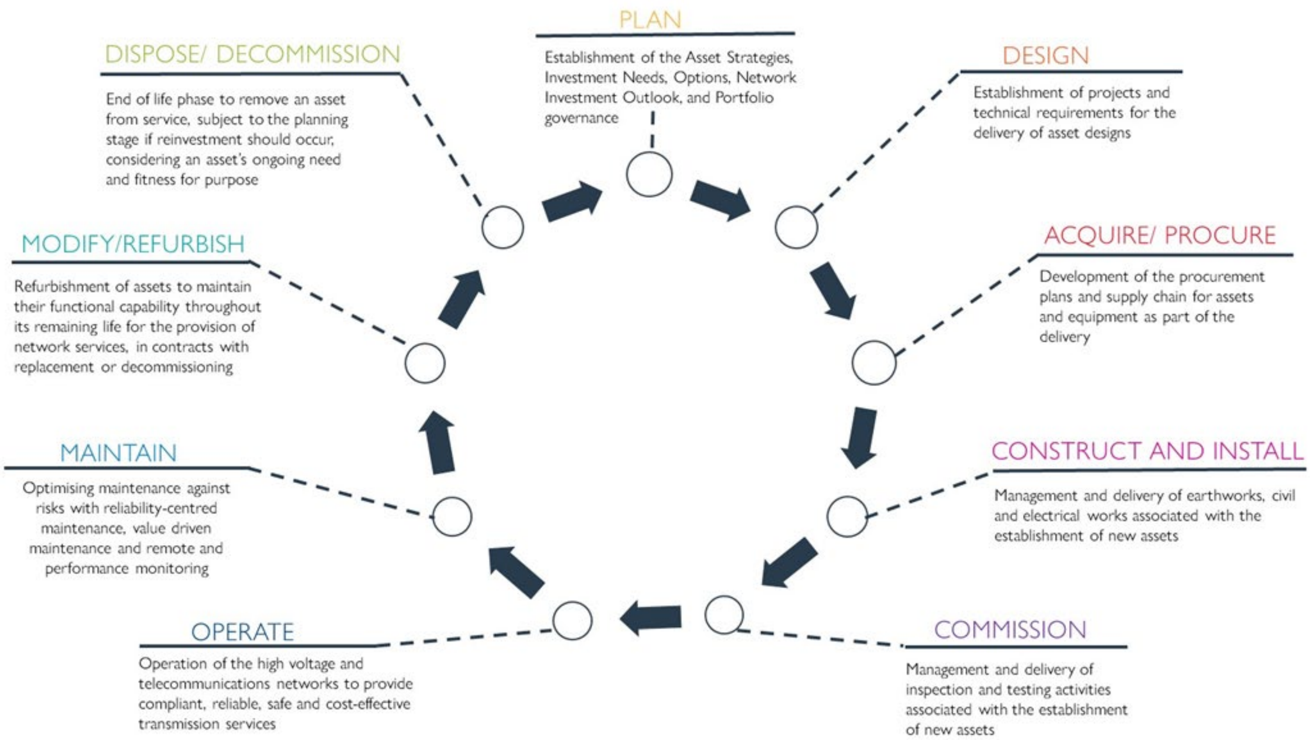

Figure 1 Asset management life cycle [source: Powerlink]

Monitoring and evaluating asset health, condition, and performance is a key component of a comprehensive asset management strategy, and is used by Powerlink across the network to enable a considered approach and prudent decision-making for future reinvestment needs.

The emerging operating environment

The transmission network plays a critical role in enabling the energy transformation to achieve a lower carbon future and Powerlink is taking an active role in strategic planning to guide and shape the power system.

As highlighted in the Integrated System Plan[5] (ISP) and Queensland Energy and Jobs Plan[6] (QEJP), Powerlink's network will require augmentation to enable the transfer of large amounts of energy between Renewable Energy Zones (REZ), storage facilities and load centres. As the transmission network expands, Powerlink is committed to proactive engagement in working with communities, industry and stakeholders to create and sustain long-term value for customers.

In line with principle 8[7] of the AER Industry practice application note for asset replacement planning, specifically principle, the future operational environment and service levels support greater emphasis on preserving optionality over time when considering large-scale reinvestments.

However, our current approach is more targeted at efficient utilisation of scarce specialist resources (both internal skilled labour and external contractors) and network access (outages) than preserving optionality, as efficiency of delivery was a key issue during a period of low growth. However, we recognise that optionality becomes increasingly important during the emerging energy transformation. Our current approach is described further in Section 4.

As part of the Asset Reinvestment Review, considerable emphasis was given to a flexible and integrated approach for future reinvestment needs and options, such as using a new approach to project bundling that enables flexibility in reinvestment planning amongst future network development activities.

Integrated planning approach

Powerlink takes a flexible and integrated planning approach to optimise network development based on the analysis of future network needs. Our approach aims to deliver positive outcomes for customers while ensuring the ongoing safe, secure and reliable supply of electricity.

We regularly assess the current and forecast performance of the transmission system to ensure that we make prudent and cost effective asset investment decisions in a timely manner. Asset planning decisions are linked to customer outcomes and may involve augmentation to the network, reinvestment into existing network assets, implementation of non-network alternatives, or responding to opportunities that provide cost efficiencies and/or additional value for our customers.

Our asset management and joint planning approaches ensure asset reinvestments are not considered on a like-for-like replacement basis, but rather the enduring need of network assets and optimisation of the network to meet current and future needs are assessed. We perform a detailed analysis of both asset condition and network capability prior to proposing a reinvestment in order to identify the optimal solutions.

Asset reinvestment

Assets reach their end of technical life when the assessed condition shows a reduction in the assets ongoing ability to maintain required service levels beyond typical operational maintenance. This triggers an assessment of options to address emerging condition and/or performance related issues for the network asset. These options may encompass a range of investment strategies including reinvestment, network reconfiguration, non-network solutions and/or asset retirement. It is important to assess asset condition and non-network solutions holistically with the enduring network need for the asset so that the optimal network solutions can be identified.

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[5] Australian Energy Market Operator, Integrated System Plan, June 2022

[6] Queensland Government, Queensland Energy and Jobs Plan, September 2022

[7] AER, Industry practice application note for asset replacement planning, January 2019, Page 9 - "*flexibility, small scale actions, and deferral have economic 'option' value*"

Transmission line reinvestment

The decision of what investment is appropriate for a regulated transmission line is complex, involving prediction of the changing condition of all aspects of the line over time, identification of environmental influences, as well as identification of possible safety and reliability consequences should any components deteriorate to the point of loss of strength. Structures are very secure and our current standards are designed to ensure that failures are highly unlikely to occur.

The grading of steel deterioration is through subjective visual assessment, while modelling of environment related deterioration (e.g. wear and corrosion) many years into the future can be highly variable between structures on the same line. Further, a transmission network is composed of many thousands of structures and each structure is composed of several components, each with many individual elements (as shown in Figure 2), which further compounds the complexity of accurate condition modelling.

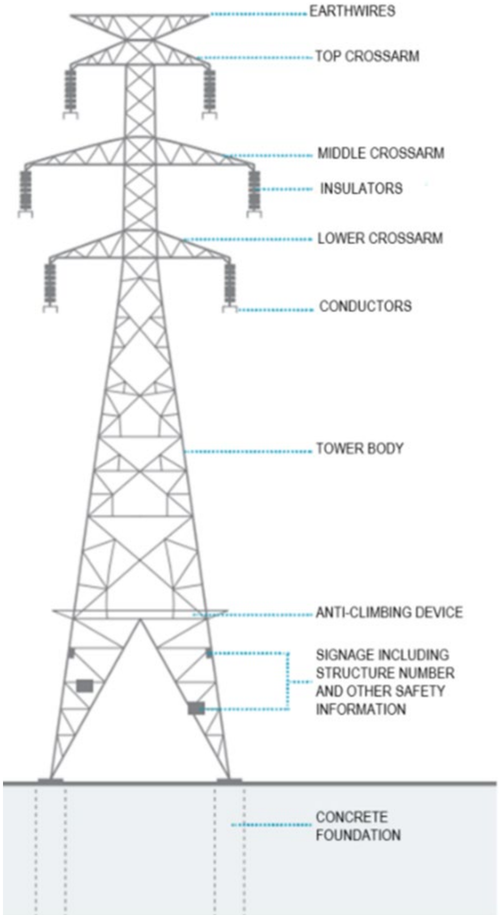

Figure 2 Typical transmission line asset components [source: Powerlink]

Consequently, asset management of transmission lines necessarily requires a fleet management approach. In practice, line condition is not easily reduced to a single value, but is a distribution of conditions representing every component condition (structure, foundation, conductor, insulator, etc.). The necessary timing of interventions, although usually referenced to a commissioning date, is a probability based decision reflecting what is known, and the possibility of more significant deterioration which has not been identified (due to the large number of components and the sampling nature of condition monitoring).

Condition triggers for investment

The primary criterion which we use to ensure compliance with legislation, and for determination of the optimum timing of line reinvestments, is asset condition. For steel transmission structures and foundations, this means the level of steel corrosion. This is monitored by an inspection regime which records the extent of corrosion on a sample of structures at a point in time and assigns a structure health index (HI) based on the accumulated level of corrosion of components. The system also uses regional corrosion rates in line with AS4312 (Atmospheric Corrosivity Zones in Australia) to predict structure corrosion levels and health into the future. This forms the basis of the Powerlink risk calculation model. Corrosion progression is modelled through a series of tables showing the average corrosion levels by age for each corrosion region.

Where risk costs and benefits do not provide a reinvestment trigger then the recommended reinvestment trigger timing is in the year in which a specific, predetermined corrosion threshold, based on percentages of bolts and members in different categories, is exceeded. The following corrosion grades for galvanised steel form the basis of Powerlink's system:

Grade 1 (G1) – good condition, galvanised surface intact.

Grade 2 (G2) – break down of corrosion protection has commenced - speckled rust appearing through galvanising layer.

Grade 3 (G3) – rapid corrosion has commenced, with rust patches evident (more than 50% of bolt surface affected).

Grade 4 (G4) – degraded to a point where galvanising no longer exists and structural integrity is becoming compromised, i.e. loss of shape has commenced and will accelerate.

Galvanised tower bolts and thin steel members (<5mm) have a small galvanising thickness and will start to show signs of corrosion in advance of the heavier galvanised steel members (>5mm). Bolt condition is therefore a good early indicator of the expected galvanising life of a tower and a good predictor of end-of-life timing. The point which is used by Powerlink (20% grade 3 bolts and 3.5% grade 4 bolts) reflects:

- that the point has been reached when a substantial level of condition based maintenance is required under Powerlink standards
- the level of maintenance to replace bolts will require a significant resource for medium and long length, and remote lines
- the time until a decline in structural integrity is close in comparison to the typical time required to undertake a transmission line reinvestment project (in the order of 3 years)
- that beyond this point, corrosion levels will increase exponentially as galvanising is completely lost on structure sections and components.

The threshold value of 3.5% grade 4 is a relatively small proportion of structure bolts (of the order of 50-60 bolts out of a typical total in excess of 1,500 per structure). However, this can be a large total quantity of bolts on long lines. Additionally, the investment needs to deal not only with the current level of corrosion but the expected levels of corrosion into the future, i.e. those bolts which will change from grade 3 to grade 4 during the period prior to investment.

These grades are applied to discrete items, e.g. a single bolt, member or component. To develop a model for lattice steel towers, which contain many hundred bolts and members, data and information from the Galvanisers Association of Australia and AS4312 is applied.

Transmission line health indices

Powerlink's health index (HI) methodology is used as a tool to compare assets and provide a guide to when intervention is expected to be necessary. The timing of intervention is determined by application of Powerlink's Reinvestment Criteria Framework[8], while the nature of the intervention, such as decommissioning, maintenance, refit or replacement, is determined by undertaking an economic assessment of all identified feasible options to address the condition risks.

The inputs used and the methodology applied to derive health indices for transmission lines are described below.

Inputs - data collection of structure corrosion levels

Data is obtained from a number of sources (direct data input by line-workers, ad hoc assessments, photographic evidence) and from different inspection types (climbing, aerial, ground and drone inspections) over a number of years.

Inspection and grading of corrosion levels are reported against standard measurement points and reference a consistent approach to the visual identification of corrosion, from grade 1 to grade 4, including the percentages of each grade for structure zones. Similar data collection and processing takes place for insulators and earth wires.

Data processing to calculate structure health index

Structure corrosion level data is automatically aggregated for each structure to determine a structure health index at a point in time (the inspection time). Structure health indices have a normal operating range from 0 (new) to 10, at which point structure strength is reduced below rated value and the probability of structure failure increases significantly.

Health indices are theoretically projected beyond 10 to predict significantly reduced strength due to extensive untreated corrosion, but Powerlink does not plan to operate in this region.

Structure health index projection in time

Structure health indices are individually projected forward to predict developing corrosion over time. Projection can be based on the performance to date of the asset, typically in condition assessment projections, or the corrosion region, typically for economic risk modelling.

Built section health index

A built section (BS) is a section of transmission line that was built/commissioned under a single project, and generally contains structures with identical or very similar characteristics. This effectively defines a single transmission line asset.

A built section health index is calculated as a percentile value of the distribution of known structure health indices. The percentile used varies depending on the number of structures in the built section. Very high percentile values (e.g. 95th percentile) are used for long lines, and lower percentile values (e.g. 65th percentile) are used for lines with a small number of structures.

This process is intended to ensure that the point in time when a significant number of structures will reach a highly degraded state, typically considered to be 10 to 20 structures based upon the criticality of the transmission line, is clearly identified. This allows time to identify options for intervention and carry out work before the rate of deterioration increases significantly such that deterioration of the built section is more significant and widespread.

Further description of our built section health index is included in the following table.

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[8] Powerlink, Reinvestment Criteria Framework, May 2020 (included with our 2023-27 Revenue Proposal)

Built Section Health Index Range	Description of Asset	Action
>10	Widespread extensive corrosion resulting in imminent risk of multiple failures in moderate to significant weather events	Modelling purposes only (well beyond normal operating range)
10	Widespread corrosion/strength reduction on a significant number of structures resulting in increased risk of failure in extreme weather event	Corrective work urgently required
9	Advanced corrosion, greater than 20% of components on a large number of structures, increasing risk of failure occurring during extreme weather event	Urgent planned works must be underway to address high risk components
8	Extensive corrosion of greater than 20% of components on a significant number of structures (a significant number of structures have HI≥8 with reduced strength)	Treatment to be completed to ensure built section HI8 not exceeded
5-7	Ageing condition, surface corrosion evident, but no significant strength reduction	Coordination of scheduled inspections to confirm expected timing to exceed built section HI8 (if untreated)
1-4	Good condition	Routine inspections from half expected life
0	New asset	No action

Table 2 Built section health index [source: Powerlink]

Risk cost

Risk Cost is a quantitative measure that monetises the risk of events, and is usually expressed on an annual basis for asset planning. Powerlink's risk cost methodology[9] follows guidance as set out in the AER Industry practice application note for asset replacement planning where asset failure and consequence are used as the driver for risk cost, as shown in Figure 2.

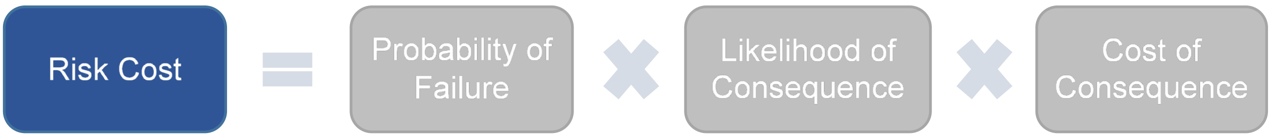

Figure 3 Risk cost definition [source: Powerlink]

In our methodology, the Probability of Failure (PoF) represents the irreparable failure of the network asset or component for a particular mode of failure. As the Health Index of an asset increases (i.e. the condition of the asset deteriorates), the likelihood that the asset will fail generally increases. For example, higher levels of corrosion indicate that the structure is less likely to withstand expected weather events.

[9] Powerlink, Overview of Asset Risk Cost Methodology, May 2019

When an asset does fail, there is a potential associated impact resulting from that failure. For example, there could be a loss of supply to customers, or an injury resulting from the failure. The Cost of Consequence (CoC) represents the financial (or monetised) equivalent of the risk consequence. The Likelihood of Consequence (LoC) represents the moderating factors used when assessing the consequences of failure (e.g. the likelihood of someone being in the proximity of the tower that fails). A combination of consequences may be modelled for any individual failure mode or event, and some consequences may only arise as a result of a combination of multiple failures.

The Risk Costs for network assets approaching end of life are calculated for each failure type and consequence category. Four main categories of risk are assessed within Powerlink's risk approach:

- Network risks – e.g. unserved energy due to a failed structure
- Safety risks – e.g. to the public or workers due to a tower collapse
- Financial risks – e.g. cost to replace a failed structure in an emergency manner
- Environmental risks – e.g. bushfire or contamination of insulating medium.

Risk cost modelling is used to quantify the risks associated with network assets approaching the end of their technical and economic life for the purposes of determining reinvestment decisions, refer Figure 4. The quantification of risk is one input to the economic comparison of options used within the Regulatory Investment Test for Transmission (RIT-T) economic cost benefit analysis of options.

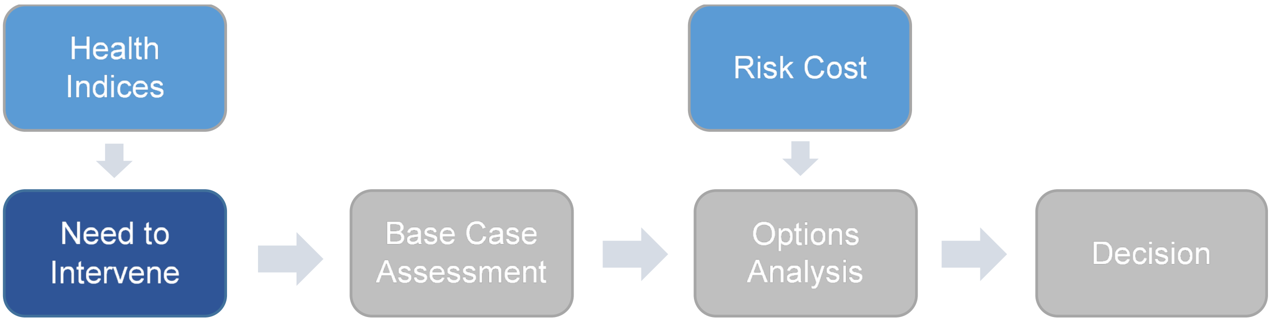

Figure 4 Asset Reinvestment Decision Process [source: Powerlink]

The AER Industry practice application note for asset replacement planning extends economic benefits to the mitigation of risk for assets approaching end of life. The RIT-T uses a cost-benefit economic analysis to assess the lowest cost recommended solution. That is, the risk cost avoided or not incurred by implementing an option can be expressed as a benefit within the economic assessment.

Not all options will equally reduce or fully eliminate the risk and this can vary with, and inform, the scope, timing and intervention for options considered. There may be other quantifiable benefits (including market benefits) or additional costs to be included to determine and compare the net economic benefit from implementing the option (or set of options including potential non-network solutions).

The health indices of assets are used to identify that some form of intervention is required. However, it is important to note that this is a trigger for additional investigation into the condition of the asset and potential actions to address the assessed condition. Once the need for intervention is established, various options to address this need will be considered and assessed in terms of cost to implement and the relative benefits that each option is expected to deliver (including the monetised reduction in risk). In this way, risk cost is factored into all reinvestment decisions.

4 Options Investigated

Current approach to reinvestment projects

Powerlink's transmission line assets are currently defined by built section, where all structures, conductors, insulators and overhead earth wire (OHEW) elements within a transmission line section are defined as a single asset. Despite this definition, in scoping reinvestment projects for a transmission line built section, only identified degraded components required to be replaced to achieve the enduring need of the life extension are included in the scope (not all components). A project is initiated to assess options to address the need when a maintenance solution is no longer sufficient.

Transmission line reinvestments are typically in the form of life extension (or refit) projects. These types of projects are generally a single up-front investment targeted to achieve a 10 to 20 year life extension (nominally 15 years). Components within the transmission line section can vary both in condition and life expectancy based on their type (e.g. conductor, structure, or insulator) and the environment. The project scope therefore only includes necessary work to address components reaching end of technical life in order to extend the life of the transmission line, for example components on structures that are expected to reach a health index of 8 and have an enduring need.

As such, the approach enables rectification of key condition issues which are likely to lead to failure within the life extension period. Ultimately, the range of network and non-network options are compared using a cost-benefit economic analysis to recommend the lowest cost solution, including potential non-network solutions, to meet the identified minimum need.

As the intent of the reinvestment under the current approach is to extend the useful life of the whole built section for a nominal 15 years, some compliance works were typically bundled with condition based works, such as signage replacement and replacement of climbing bolts. The bundling of compliance works are included for two reasons:

- to ensure the efficient use of resources through the single establishment to any given built section over a nominal 15 year period – this is to avoid consistent upgrade of access tracks and other recurrent costs
- to ensure the ongoing compliance of the whole asset (built section) with current requirements for the duration of the life extension.

As part of the review process, members of the Working Group were invited to attend Powerlink's Rocklea Tower Farm and a tower site in the region. Access to the tower site was via the typical access tracks that are maintained suitable for maintenance access only (i.e. 4-wheel drive all-weather access). The difficulty the group experienced traversing the access tracks illustrated the work necessary to upgrade access tracks following their degradation from weather and erosion to gain access for construction vehicles. This illustrated the benefits of bundling work to maximise utilisation of upgraded access tracks, before they are allowed to revert to normal condition suitable for maintenance access.

Notwithstanding this, as a result of this review, Powerlink has reviewed the range of compliance works typically bundled with the condition based works. Through engagement with the relevant business areas, we have reviewed the drivers of the compliance needs and have determined that these works can be delayed in line with condition triggers for any given structure. We are satisfied that this approach will not result in any additional material compliance risk, while emerging minor risks will be addressed under maintenance. This change to our approach was subsequently presented to the Working Group, who supported the proposed change in bundling works.

Alternative approaches investigated

The Working Group identified a range of alternative approaches to investigate, both in isolation and in combination. These considered alternative asset (built section) definitions and bundling approaches.

Asset definition

The initial approaches identified by the Working Group in respect of the asset definition were as follows:

- Powerlink's current approach of defining an asset by built section
- grouping adjacent structures based upon common environmental conditions
- establishing assets based upon a common, fixed length of transmission line
- defining assets based upon their function within the built section (structure, insulator, conductor, etc.)
- grouping adjacent structures based upon common accessibility.

Powerlink then assessed the proposed asset definitions, to ensure that the proposed approach was feasible and in line with improving outcomes for customers, by comparing them to a set of criteria to ensure that the asset definition:

- was able to be well defined at start of life and consistent throughout asset lifecycle
- was consistent with transmission industry practice
- provided additional customer benefits over the current classification
- was practical from a general business perspective, i.e. did not result in major and widespread process changes that would likely offset any benefit identified.

Following this analysis, it was agreed with the Working Group to model the following three asset definitions for a specific case study, being the current approach and two alternatives that disaggregated the asset into smaller components.

1. Powerlink's current approach of defining an asset by built section.
2. Grouping each asset type within a built section and valuing each group as one asset, i.e. four assets per built section.
3. Defining each individual asset component is one asset, i.e. every structure, conductor span, insulator, etc. (more than 3,000 assets in the case study built section).

Bundling of work

The Working Group identified four approaches to bundling work to inform the analysis and demonstrate potential benefits.

1. Powerlink's current approach of a single up-front bundled intervention (base case).
2. Two bundled interventions based upon specific observed structure condition information.
3. Three bundled interventions with a nominal 5 year separation between interventions.
4. Annual interventions based upon expected condition projections over time.

The different bundling approaches resulted in various life extension outcomes, so any subsequent condition intervention was specifically modelled in the assessment of the specific case study.

Case Study: Refit of Ross to Chalumbin 275kV transmission line

The Ross to Chalumbin refit project was used as a case study, as it is representative of the wider network, traversing a mixture of micro-environmental conditions, and there was extensive condition data available given it formed part of Powerlink's 2023-27 Revenue Proposal. The assessment was to consider cost outcomes in net present terms and trade-offs between capital expenditure (capex) and operating expenditure (opex).

In our 2023-27 Revenue Proposal, the refit work on the Ross to Chalumbin transmission line was proposed to be undertaken from 2026 and extend the useful life of the asset for 15 years. Costs that extend the useful life of an asset are capitalised.

Methodology of the modelling undertaken

The specific estimated costs for the project were assessed and allocated between fixed costs (such as contractor establishment) and variable costs (such as unit rates), and further allocated between components of asset (disaggregated assets). These costs were then collated to derive unit rates as required for the modelling input.

For option two of the bundling approaches, specific forecasts of when structures would reach HI8 were plotted to identify a logical bundling of structures, as shown in Figure 3 below. This also informed the timing of the subsequent intervention.

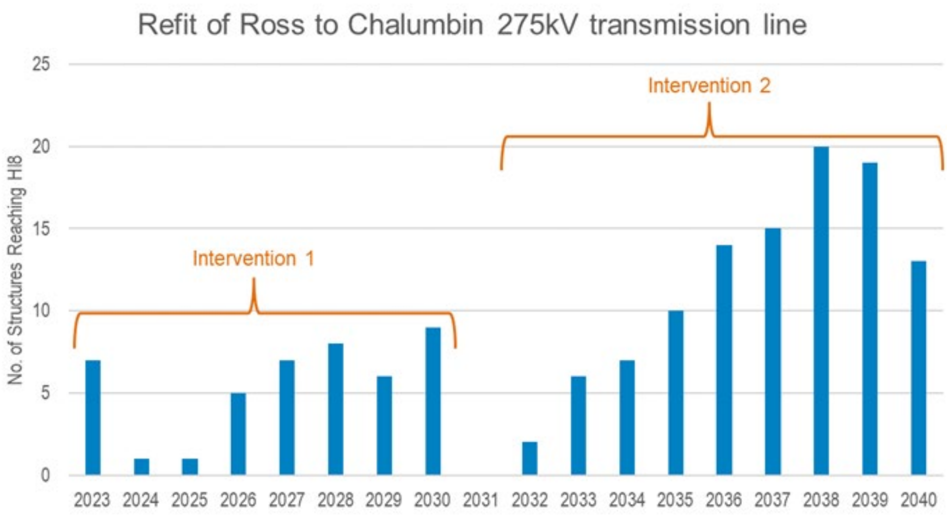

Figure 5 Bundling and timing of works for bundling option 2 [source: Powerlink]

For modelling purposes, returns were calculated over 30 years – based upon the current regulatory life for refit assets – and no allowance was included for update of business systems and processes to implement change in asset definition. The alternative approaches were then compared based on the net present cost of the total return, i.e. both capex and opex.

Quantitative and qualitative results of case study analysis

The following table presents the net present cost outcomes of the modelling undertaken for Ross to Chalumbin transmission line refit options.

	Built section [*base case]	Variance to base case	Asset types (4)	Variance to base case	Asset components (3000)	Variance to base case
Single intervention	$24.8m*	NA	$24.8m	-	$24.8m	-
Two bundled interventions	$23.4m	($1.4m)	$23.4m	($1.4m)	$23.4m	($1.4m)
Three bundled interventions	$23.2m	($1.6m)	$23.0m	($1.8m)	$23.0m	($1.8m)
Annual interventions	$36.4m	$11.6m	$34.6m	$9.8m	$31.7m	$6.9m

Table 3 Net present cost outcomes [source: Powerlink]

The following table collates quantitative and qualitative considerations of each option and ranks them based upon this combined assessment.

Description	Value Proposition	Ranking
Single intervention (base case)	Only address the minimum work required for each asset component to achieve the required enduring need in a single mobilisation. x Higher net present cost due to bundling up-front ✓ Lowest total cost due to bundling efficiency and reduced scope (mix of items that have reached worsened state of condition) ✓ Risk Mitigation – carries slightly decreased risk compared to other options due to up-front investment	3
Two bundled interventions (observed structure condition)	Only address the minimum work required for each asset component grouped by frequency distribution of condition state triggers. Balanced approach between up-front investment and just in time approach. ✓ Lowest net present cost due to trade-off between timing and mobilisation, note: timing tailored to specific investment needs which would vary for other investments x Slightly higher total cost due to additional mobilisation but retaining bundling efficiency ✓ Risk Mitigation – no material difference	2
Three bundled interventions (nominal 5 years)	Only address the minimum work required for each asset component grouped by 5-yearly based on condition state triggers in that period. Balanced approach. ✓ Lowest net present cost due to trade-off between timing and mobilisation, note: timing is repeatable for similar investments, and number of mobilisations depend on need and length of life extension x Slightly higher total cost due to additional mobilisation but retaining bundling efficiency, and reserves ability to reassess condition nearer to trigger compared to forecast ✓ Risk Mitigation – no material difference	1

Description	Value Proposition	Ranking
Annual interventions	Only address the minimum work required for each asset component at the time (year) each reaches the worsened condition state trigger. x Highest net present cost x Higher total cost due to additional mobilisation and works establishment costs ✓ Risk Mitigation – no material difference	4

Table 4 Quantitative and qualitative considerations [source: Powerlink]

Preliminary results

It was evident from the results of the modelling that there are significant disadvantages in unbundling the works completely and implementing annual interventions. Therefore, we excluded this approach from any further consideration.

The economic outcomes for two interventions or three interventions were very similar, and it was deduced that these are effectively the same scenario, as the practicalities of project delivery, such as resources and access to network outages, would effectively determine the actual timing of such interventions. We therefore determined to model two interventions only for additional projects.

This resulted in two bundling scenarios remaining, which would be applied to additional projects to validate the results from the initial case study.

5 Further Analysis and Modelling

Three additional transmission line refit projects were selected from those presented in our 2023-27 Revenue Proposal, as these had the most complete data on cost and condition available. In combination, the four projects selected as case studies accounted for almost 75% of our forecast transmission line refit capital expenditure in the 2023-27 regulatory period.

- Calliope River to Wurdong Tee (project 2644)
- Davies Creek to Bayview Heights (project 2754)
- Greenbank to Mudgeeraba (project 2415).

Cost information for each of the projects was developed from existing cost estimates, in the same way as the allocation undertaken for Ross to Chalumbin (project 2750). As discussed in the previous section, only two bundling scenarios were modelled for the projects – our current approach based on a single intervention and an alternative approach with timing notionally 5-7 years apart.

To ensure that asset definitions were sufficiently tested, all three options for asset definition were retained for modelling against the additional projects

Common modelling parameters were applied throughout the assessments undertaken. The modelling period was set at 30 years, in line with the current regulatory life for refit assets, while the commercial discount rate applied was 5.08%. Annual inflation was assumed to be a consistent 2.65%.

The economic results, net present cost, of the analysis are presented below.

	Built section [*base case]	Variance to base case	Asset types (4)	Variance to base case	Asset components (3000)	Variance to base case
Project 2750 – current	$24.8m*	NA	$24.8m	-	$24.8m	-
Project 2750 – alternative	$23.2m	($1.6m)	$23.0m	($1.8m)	$23.0m	($1.8m)
Project 2644 – current	$4.7m*	NA	$4.7m	-	$4.7m	-
Project 2644 – alternative	$4.8m	$0.1m	$4.8m	$0.1m	$4.8m	$0.1m
Project 2754 – current	$37.7m*	NA	$37.7m	-	$37.7m	-
Project 2754 – alternative	$37.9m	$0.2m	$37.9m	$0.2m	$37.9m	$0.2m
Project 2415 – current	$30.5m*	NA	$30.5m	-	$30.5m	-
Project 2415 – alternative	$31.8m	$1.3m	$31.8m	$1.3m	$31.8m	$1.3m

Table 5 Net present cost outcomes [source: Powerlink]

Sensitivities and scenarios modelled

To test the validity of the results derived from the economic modelling, a number of sensitivities and scenarios were modelled.

The initial economic analysis utilised project specific inputs for each built section. Therefore a sensitivity was undertaken whereby all project costs were derived from the Ross to Chalumbin transmission line refit project – effectively applying standard unit rates to all projects. This was selected as the cost information is the most mature, based upon the condition information available on the transmission line.

This sensitivity did not result in any change in the relative results of the analysis undertaken.

A second sensitivity was undertaken to assess how long the second intervention had to be deferred for there to be no variance between bundling approaches. This was undertaken through a trial and error approach and found that results of the economic analysis consistently converged to no variance if the second intervention was delayed by two years. This was expected given the very similar results between the bundling approaches in the initial economic assessment.

As a final validation, these sensitivities were then combined together with variations applied to discount rate and modelling period to establish a range of scenarios for the economic modelling. This scenario modelling found that changes in economic outcomes were generally relative to the initial results, suggesting that the economic analysis is valid for a range of sensitivities and scenarios.

The outcome of these modelled scenarios are presented in Attachment A2.

6 Findings and Recommendations

Modelling observations, conclusions and recommendations

The Working Group has made the following observations and derived the following conclusions from the results of the modelling undertaken, together with sensitivities and scenarios tested.

The results of the modelling discussed in Section 5 has demonstrated that there is no material difference between the current approach and any of the alternative approaches in net present terms. The highest observed variance in net present cost between an alternative approach and the current approach is -7% for the Ross to Chalumbin case study, while other projects result in a positive variance. This suggests that there is no material difference between the modelled approaches.

However, in addition to economic outcomes, the alternative bundling approach has the potential benefit to defer works for longer built sections, offering flexibility in the utilisation of skilled resources and deferring more significant investment decisions until there is an improved view of trade-offs based on detailed condition assessment and cost estimates.

The asset definition made no difference to economic outcomes in almost all cases. The only exceptions to this were in respect of the Ross to Chalumbin transmission line refit, where for annual interventions the asset definition had a material impact on the economic outcomes. However, this was discounted as a non-feasible option given the high cost in net present terms, and impracticality of its implementation due to impacts on skilled resources and network outage access. There is no justification to change the asset definition (i.e. from built section), especially given the undefined costs to update systems and processes to accommodate such a change to the asset management approach.

1. It is recommended that no change be implemented to Powerlink’s asset definition for transmission lines (i.e. built section).

Powerlink has confirmed that the compliance works that was typically bundled with condition based works, such as signage replacement and replacement of climbing bolts, can be delayed in line with condition triggers for any given structure. This is not expected to result in any additional material compliance risk, while any emerging minor risks will be addressed under maintenance.

2. It is recommended that compliance works are only undertaken on structures where condition based work is to be performed.

There is no single most efficient option for all cases. This suggests the need to compare single and multiple staged bundling approaches to any given asset reinvestment decision, based upon the most detailed condition and cost information available at the time, and the emerging energy environment and resulting network needs. This is consistent with the RIT-T principles, which requires alternative credible options to be assessed as part of the investment decision.

3. It is recommended that both Powerlink’s current approach and the alternative bundling approach be modelled for future transmission line refit investment decisions, and the most cost effective solution progressed based upon detailed condition and cost information, while allowing for the developing network needs to support the energy transformation. The difference between the two approaches is further described in Attachment A3.

Implementation of recommendations

It is proposed that these recommendations should be introduced as soon as practicable, as they are not expected to result in any material change in risk, provided that projects target completion of structures with a health index of 8 or greater in a timely fashion. Powerlink anticipates that these recommendations will be implemented in 2023/24.

Following completion of this review with the issue of this report, we will identify relevant asset management process documentation, such as our Asset Management Framework and Asset Reinvestment Process, and update in order to reflect the recommendations of this review. This will effectively operationalise the recommendations into our ongoing business as usual processes.

Powerlink is currently implementing enhancements to our risk cost modelling approach, in order to better quantify emerging risks at a project and an entire portfolio level. This is expected to deliver a tool to ensure that we achieve a consistent and repeatable process to quantify specific project risks. Consequently, we have started to incorporate the recommendations and the insights derived from this review into our developing risk cost modelling approach.

In parallel to the enhanced risk cost modelling approach, we will apply the alternative bundling approach to project options as part of the RIT-T economic cost benefit analysis with immediate effect. In this way, we will identify the specific option that presents the most cost effective outcome to customers while considering the benefits arising from preserving future optionality.

Aligning recommendations to AER concerns

The AER noted two key concerns with the approach taken by Powerlink in formulating its reinvestment capex forecast for transmission lines[10]. The AER went on to note two additional issues of concern, somewhat informed by and overlapping with the key concerns.

These four concerns are detailed in the following table, which also relates the specific recommendations to the original AER concerns in respect of our asset reinvestment decision making process for transmission lines.

AER concern	**Addressed by**
Powerlink does not base its transmission line replacement scope of works on individual transmission line tower cost benefit analysis[11]	• Recommendation 2 • Recommendation 3 (with further discussion in Section 3)
Powerlink's economic analysis does not consider the option of a more targeted refurbishment of the individual towers[12]	• Recommendation 3
Powerlink's use of the HI is reasonable, we still have some concerns about how the HI is modelled[13]	• Recommendation 3 (with further discussion in Section 3)
Intervention earlier than required to maintain asset performance is generally inefficient as it brings forward costs without matching benefits[14]	• Recommendation 2 • Recommendation 3

Table 6 Comparison of recommendations to AER concerns [source: Powerlink]

[10] AER, Draft Decision, Powerlink Queensland Transmission Determination 2022 to 2027, Attachment 5 Capital Expenditure, September 2021, page 16.
[11] Ibid, page 16.
[12] Ibid, page 16.
[13] Ibid, page 16.
[14] Ibid, page 17.

Aligning outcomes to the scope of the review

The following table relates the outcomes and recommendations of the review to the specific scope elements developed by the Working Group, and also identifies any issue not fully addressed as part of this review where further actions are to be progressed.

Scope element	Addressed by
Social licence to operate over the asset life	This was not addressed specifically due to the complexity and project specificity. Commitment included in next steps following completion of the review.
Built section definition and its impact on the intervention timing and scale of works	Recommendation 1 The analysis has demonstrated that there is no material benefit in changing asset definitions for transmission lines.
How to better capture the benefits, including financial, of 'bundling' condition and compliance driven works within transmission line projects	Recommendations 2 and 3 Addressing compliance only with condition triggers and consideration of both approaches in RIT-T will explicitly identify the benefits of bundling works on a project-by-project basis.
How to better capture the challenges and costs, of access for Powerlink assets, both from a remote geographic and network outage perspective	Recommendation 3 Consideration of both approaches in RIT-T will explicitly identify the costs associated with physical and network access on a project-by-project basis.
What is optimal at both a project and portfolio level	Recommendation 3 Capital expenditure forecasts to inform the portfolio impacts will reflect a balance between both approaches. Consideration of optionality will also assist in optimising portfolio level outcomes.
The AER Industry practice application note asset replacement planning	This is discussed in section 3. Powerlink considers its processes to be consistent with the AER application note.
How to incorporate best practice approaches used by other networks	Asset definition considered as part of review. Commitment also included in next steps following completion of the review.
Future-proofing – given the rapidly changing environment, there is a need to ensure improvements to asset reinvestments are sustainable of the longer-term	Recommendation 3 Consideration of optionality to address the emerging energy transformation will ensure reinvestment is only undertaken where there is reasonable confidence in an enduring need for the assets.
How to ensure predictable and repeatable outcomes	Recommendation 3 The commitment to report back to our Customer Panel will also ensure that we continue to adopt a consistent approach to reinvestment decisions.

Table 7 Comparison of outcomes to scope elements [source: Powerlink]

Working Group – key insights

The following are observations and insights provided by the Working Group members external to Powerlink.

- Supporting this review to be undertaken following the conclusion of the regulatory process was a show of faith by the AER that the good engagement undertaken by Powerlink in developing the revenue proposal gave confidence that the issue would be considered appropriately. This faith has been maintained by the thorough process that Powerlink has lead in preparing this report
- Throughout the lifecycle of the Working Group, Powerlink demonstrated transparent and collaborative behaviour. The Working Group comprised of members selected from Powerlink's Customer Panel, the AER, members of the AER's Consumer Challenge Panel (CCP23) and subject matter experts within Powerlink. Both the Terms of Reference and agendas were co-designed, which ensured the Working Group focused on achieving the intended objectives, while ensuring the approach and recommendations could be practically deployed. Clear, objective and comprehensive information was provided, which enabled the Working Group to reach the review's conclusions and recommendations. Powerlink demonstrated that the perspectives of Working Group members were incorporated in a way that shaped the overall review process, conclusions and recommendations
- The Working Group have confidence that the recommendations can be practically implemented and will improve the robustness of future investment evaluations. Powerlink have committed to publishing a report, to outline how the recommendations have been embedded into internal systems, processes, procedures and investment evaluations.

The Working Group also identified the importance of Powerlink ensuring that reinvestment decisions are made in a way that efficiently accommodates potential future scenarios, i.e. future-proof reinvestment decisions by preserving future optionality. Specifically, the Working Group noted that the alternative bundling approach could enable a more flexible delivery and resourcing model through better staging of projects based on risk, which may provide improved ability to react to the emerging energy environment and resulting network needs.

Next steps following completion of the review

We have committed to report back to our Customer Panel on the progress made in embedding the recommendations from this review into our business as usual processes, and any observed outcomes arising, one year after finalisation of the review. It is envisaged that this will be undertaken by way of an update within one of the quarterly meetings, but the approach will be discussed and agreed with the Customer Panel upon finalisation of this review. Any quantifiable benefits identiofied through specific RIT-T assessments, such as cost efficiencies or efficient utilisation of resources, will be used to inform the feedback provided tot eh Customer Panel.

In addition to these specific recommendations, and in line with our commitment to continuous improvement, we will review our contracting and resourcing approach for delivery of transmission line reinvestment works. This will be used to better inform up-front investment decisions in line with the capability and capacity of available resources. This is an internal management action to be undertaken as part of a wider review of our works delivery capability, which we have commenced, as we seek to position ourselves to deliver the energy transformation in a timely and efficient manner.

The need for further work has been identified in consideration of the trade-offs between flexible staging of works (more frequent incursions onto landholders' property) and a single bundled up-front intervention in terms of impact on our ongoing social licence to operate our assets. Although this work is not yet scoped, we expect that it will be informed through our ongoing engagement with communities and landholders, and will be factored into assessments on a project specific basis.

Finally, although the review has resulted in some actions that align with other network businesses, such as the reduction of compliance works on built sections, it demonstrated no benefit in changing the underlying definition of an asset (with the resultant impacts on classification of works between capital and operating). However, we acknowledge the need to continually review the approach of other network businesses with respect to identification of prudent practices given the prevalent circumstances. Hence, we will continue to monitor the approach of other network businesses, through our connection with Energy Networks Australia.

Powerlink considers that the recommendations to be implemented from this review, together with the next steps to be investigated following completion of the review, will assist in enhancing the future capital reinvestment forecasts for transmission lines within the current regulatory period and future regulatory periods. The scope of the review excluded consideration of use of the Repex Model for future revenue proposals, as this is not used to determine reinvestment requirements in the normal course of business. Powerlink will consider how to forecast its reinvestment expenditure ahead of commencing our 2028-32 Revenue Proposal process. Notwithstanding this, the revised approach to the bundling of works, including only addressing compliance works on a structure with condition triggers, will be reflected in our actual capital expenditure going forward.

Attachments

A1: Review process – overview

	Asset Definition					Bundling Approach (15 year period)				Compliance Works	
Preliminary options	Built Section*	Common Environment	Fixed Length	Asset Type	Common Access	Single Bundled Intervention*	Two Bundled Interventions	Three Bundled Interventions	Annual Interventions	Entire Built Section*	With Condition
Case study Ross to Chalumbin	Built Section*	Asset Type	Asset Component			Single Bundled Intervention*	Two Bundled Interventions	Three Bundled Interventions	Annual Interventions		With Condition
Further analysis (additional projects)	Built Section*	Asset Type	Asset Component			Single Bundled Intervention*	Two Bundled Interventions				With Condition
Sensitivities (2)	Built Section*	Asset Type	Asset Component			Single Bundled Intervention*	Two Bundled Interventions				With Condition
Scenario analysis (4)	Built Section*	Asset Type	Asset Component			Single Bundled Intervention*	Two Bundled Interventions				With Condition

Sensitivities:
1. Common unit rates derived from case study applied to all projects
2. Second intervention progressively deferred until no variance between options (+2yrs)

Key: * Current approach | Option retained | Option added | Option discarded

Scenario analysis:
Original analysis and sensitivities were considered independently and in combination with variations applied to discount rate and modelling period as follows:

Discount rate:	5.08%	2.54%	7.62%	5.08%
Modelling period:	30 yrs	30 yrs	30 yrs	15 yrs

A2: Comparison of variance between single up-front intervention and two interventions within 15 year period with various sensitivities

	Discount rate = 5.08% Model period = 30 years			
	Initial analysis	BS1220 costs	Stage 2 delay 2yrs	BS1220 costs +2yr
Project 2644	-0.07	-0.69	0.02	-0.55
Project 2754	-0.24	-0.77	0.36	-0.66
Project 2415	-1.39	-0.62	-0.79	-0.37
Project 2750	0.66	0.66	1.44	1.44
Average	**-0.26**	**-0.36**	**0.25**	**-0.04**

	Discount rate = 2.54% Model period = 30 years			
	Initial analysis	BS1220 costs	Stage 2 delay 2yrs	BS1220 costs +2yr
Project 2644	-0.04	-0.39	0.01	-0.31
Project 2754	-0.13	-0.43	0.20	-0.37
Project 2415	-0.78	-0.35	-0.44	-0.21
Project 2750	0.37	0.37	0.81	0.81
Average	**-0.15**	**-0.20**	**0.14**	**-0.02**

Built Section	Discount rate = 7.62% Model period = 30 years			
	Initial analysis	BS1220 costs	Stage 2 delay 2yrs	BS1220 costs +2yr
Project 2644	-0.11	-1.00	0.03	-0.79
Project 2754	-0.34	-1.12	0.51	-0.95
Project 2415	-2.00	-0.90	-1.14	-0.54
Project 2750	0.95	0.95	2.07	2.07
Average	**-0.37**	**-0.51**	**0.37**	**-0.05**

Built Section	Discount rate = 5.08% Model period = 15 years			
	Initial analysis	BS1220 costs	Stage 2 delay 2yrs	BS1220 costs +2yr
Project 2644	0.21	-0.02	0.36	0.22
Project 2754	1.48	-0.15	2.45	0.03
Project 2415	0.28	0.10	1.26	0.50
Project 2750	2.20	2.20	3.48	3.48
Average	**1.04**	**0.53**	**1.89**	**1.06**

A3: Proposed alternative approach to bundling

The alternative bundling approach enables the subdivision of refit projects into stages based on condition (grouping elements with worse condition into the first stage and others with less severe condition into subsequent stage/s). A built section refit could be completed in a single or in multiple stages depending on the most economic option, largely driven by bundling efficiencies compared with economic savings through capital deferral. A typical five-yearly staged project was found to be a repeatable approach that may provide a net benefit for longer transmission lines. No significant change in probability of failure risk is expected provided:

- the condition of all structures is known
- the project targets the completion of structures with a health index of 8 or higher in a timely fashion.

The bundling approaches are illustrated in Figure 4.

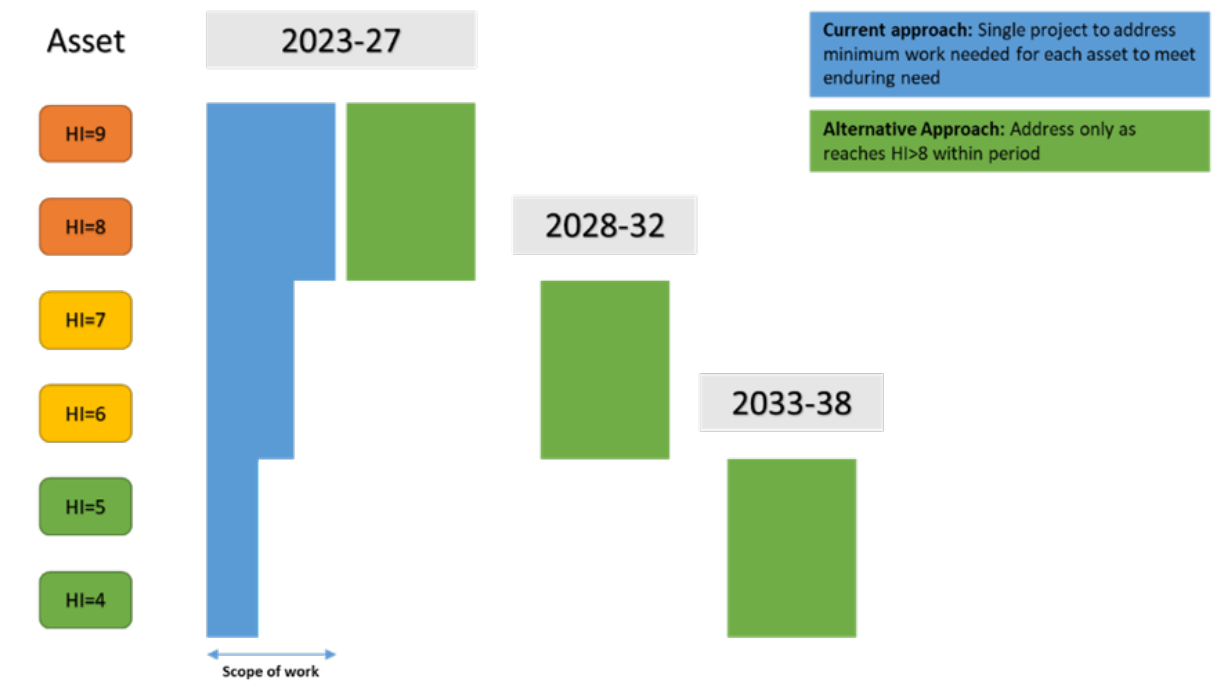

Figure 6 Summary of current vs alternative approach [source: Powerlink]

This change would effectively change the scoping for projects to introduce a new bundling method, or stages, as a standard option for life extension projects. The proposed change would have no impact on the definition of a built section (i.e. asset structure). The cost to change asset structure would likely be significant but project modelling did not demonstrate any material benefit to support this change. Nonetheless, strict application of financial accounting principles is required when determining capital or operational expenditure for projects.