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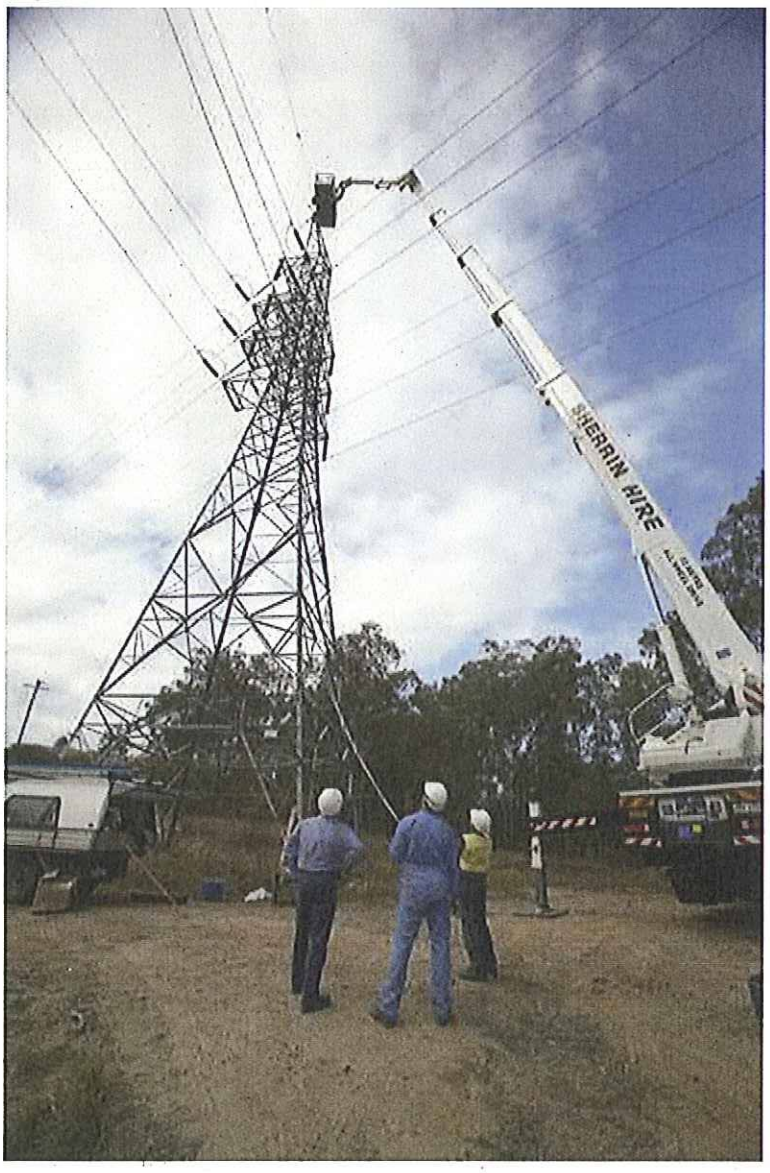
2010 NON LOAD DRIVEN PLAN

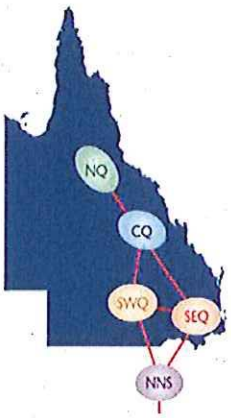
Volume 1

Powerlink QUEENSLAND

Network Strategy and Performance

Overview





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The NER provides that Confidential Information:

- must not be disclosed to any person except as permitted by the NER;
- must only be used or copied for the purpose intended in this report (namely the replacement of assets within the transmission network by Powerlink); and
- must not be made available to unauthorised persons.

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1. Introduction

The 2010 Non Load Driven Plan (NLDP) addresses how Powerlink manages the end of life of an asset through replacement, life extension or disposal activities. The non load driven planning process results in projects predominantly associated with replacement of assets to maintain capacity or capability of Powerlink's transmission network, to ensure security of Powerlink's infrastructure, or compliance with legislation and statutes. Plant refurbishment projects (operational expenditure) are covered in the Operational Refurbishment Plan.

Powerlink's forecast non-load driven network projects are developed in the context of its asset management practices embodied in the Asset Management Strategy. The strategy discusses the key business drivers for delivery of transmission services by Powerlink and sets out the strategic framework for asset management in Powerlink. Powerlink's asset replacement rationale is detailed further in the Asset Replacement Policy and relevant Methodology documents.

In light of Powerlink's various drivers for non-load driven projects, they are prepared on a risk assessment, prioritisation and management basis to optimise the timing and type of replacement against the risks associated with allowing the asset to remain in service. Plant condition assessments, asset strategies and/or performance reports provide an important input to this assessment.

Once a non-load driven need has been identified, similar to the load driven projects, and where applicable, a detailed option assessment and evaluation is carried out. This includes scoping and estimating the cost of a number of credible options. Where options exist, these costs are compared along with the resulting network risk to establish the optimum and most efficient solution.

Powerlink's proposed load and non-load driven network development plans have also been designed to coordinate asset replacement requirements with the broader capital works program where appropriate.

Volume One of the NLDP describes the background and approach taken to identify the project need and the most efficient solution.

Volume Two of the NLDP provides a summary of the asset age profiles, committed replacement projects and details relating to forecast projects including replacement need, the associated analysis and recommended solution.

2. Replacement Policy and Triggers

Asset replacement planning is an ongoing and iterative process where future asset and network needs are coordinated within and between plant areas. The plan to address asset replacement needs is reviewed, prepared and documented in a Non-Load Driven Plan.

Powerlink's overall network development planning includes coordination of the asset replacement requirements with the broader capital works program. Synergies between projects from different triggers may arise through work type, geographical location or timing.

The Queensland State Government has issued a Transmission Authority Number T01/98 to Powerlink Queensland. Clause 6.2 of this Transmission Authority requires Powerlink to plan and develop its transmission network according to an "N-1" criterion. It is fundamental to this obligation to maintain the functionality of the plant to continue to meet this criterion.

At the end of their technical life ('End of Life') assets do not perform as required and will be either, be unreliable, obsolete, unsupported by the original manufacturer, or may no longer be compliant with current legislation and standards. For assets required beyond the end of their technical life, the objective of asset replacement planning is to mitigate such risks and ensure that assets are replaced or life extended in a timely manner through the application of technical and economic appropriate solutions.

By assessing network assets against a set of defined triggers and enduring network requirements, asset replacement needs can be clearly identified. Specific triggers relating to asset replacement are age, capacity, capability and compliance.

- In the first instance, the age of an asset is used as a trigger to undertake condition assessment or other analysis that then determines whether the asset requires replacement.
- For Powerlink, asset *capacity* relates, for example, to a specific asset's ability to bear the calculated current levels required by its existing function.
- The *capability* of the asset is evaluated through the condition assessment which provides a foundation for assessing capability, particularly for assets where potential failure modes take longer to evolve and are evident through physical inspection (e.g. corrosion, mechanical wear). Powerlink maintains a program of condition assessments, planned in line with the age of the asset and based on established condition assessment methodologies, undertaken by a mix of internal personnel and external consultants.
- The final aspect of assessment for asset replacement is the consideration of *compliance* issues, which involve compliance with legislation (for example safety or environment) that can impact on the decision to replace an asset.

For each potential replacement need, the risks are identified. More specifically, each need is assessed against the following criteria:

- **Reliability** – which is an aspect of *Capability* – for example – the number of interruptions, outage duration or cost to repair under emergency situations.

- **Obsolescence** – which is an aspect of *Capability* – for example, technical support is not available from the manufacturer or within Powerlink, or the equipment is out of production and spares are unavailable..
- **Operational** – which is an aspect of *Capacity* – considers the ability of an asset to handle the load placed on it by operational service; for example, inadequate plant ratings to meet network requirements which could lead to load-shedding.
- **Compliance** which, for example, consists of
    - *Safety* - Potential to affect Powerlink personnel (including staff, MSPs, contractors, etc) and/or the public; and
    - *Environmental* - Potential to impact the environment, external to the asset or site. Legislative obligations result in absolute compliance triggers.

Once a need has been established, options to satisfy the need are developed and evaluated. A preferred solution is identified based on technical, economic and risk comparison of the feasible options..

2.1 Asset Types

It is useful to consider assets by type when assessing their ability to deliver transmission services as it relates to age, condition or obsolescence. The replacement needs are therefore identified and managed in groups according to asset classes. For this purpose, Powerlink uses four (4) major types:

- Substations (including transformers)
- Transmission Lines which also includes HV Cables (underground)
- Secondary Systems
- Telecommunications

Projects associated with each of these asset types are identified in the NLDP.

3. Asset Replacement Process

At the end of life of a network asset, Non Load Driven planning processes consider asset replacement, life extension and disposal needs in order to manage existing assets in a way that:

- Optimises whole of life cycle costs, risk and benefits in support of the long term needs of the transmission network, while
- Ensuring that an appropriate level of asset related risk is maintained that can be managed through normal operating and maintenance practices.

Asset replacement, life extension and disposal activities are essential parts of Powerlink's capital investment program that ensure network assets:

- are maintained in a condition that is safe and environmentally sound, and accordingly compliant with relevant legislation and statutory requirements
- operate in a reliable and secure manner that supports Powerlink's mandated reliability of supply obligations
- are able to be operated and maintained with the support of manufacturers and competent and trained people who are supplied with essential spares and equipment
- remain fit for purpose and capable of meeting the changes in operating requirements as business, network and customer needs evolve.

Powerlink's approach to asset replacement, life extension and disposal activities form an intrinsic component of Powerlink's asset management philosophy, reflected within the Asset Management Strategy, Asset Replacement Policy and relevant Asset Methodology documents.

Asset replacement, life extension and disposal needs are addressed through replacement options that are selected through an integrated assessment of technical, economic and risk factors. Within the NLDP, recommended projects reflecting the recommended option include a technical solution, nominated timing for implementation and estimated cost.

3.1 Option Development and Selection

The high level process for identification of a replacement option is summarised in Figure 1:

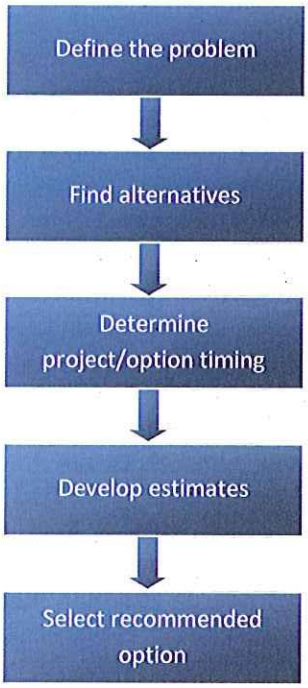
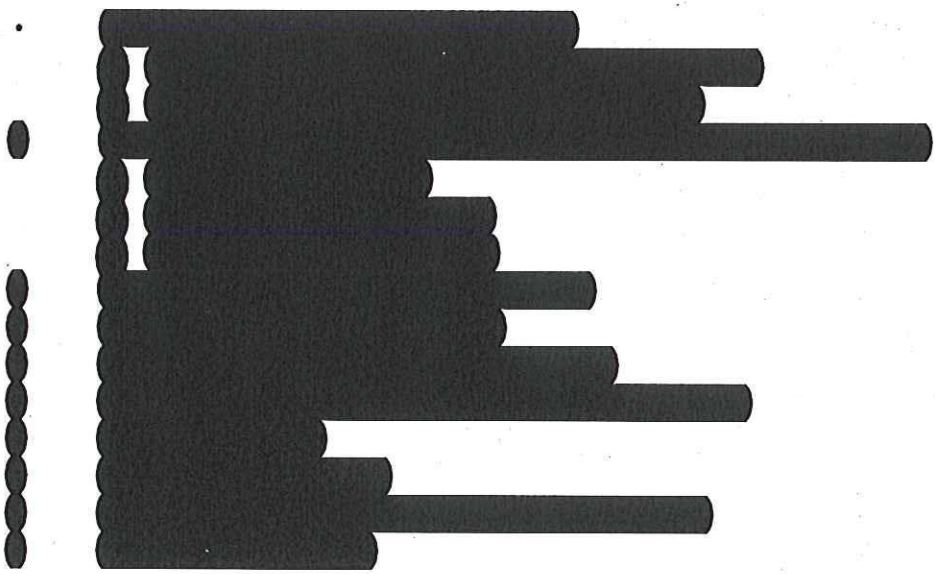


Figure 1 - High level process for identification of a replacement project

The details of the individual steps are described in the following sections:

Define the problem

The following information provides source data from which specific replacement needs are developed:



From these sources of information, the asset risk associated with Reliability, Obsolescence, Operational and Compliance can be established. Where necessary a replacement need is developed from which options and subsequently, detailed scopes, risk profiles and estimates are developed.

Replacements are progressed when the existing identified specified "absolute risk" – that is to say Reliability, Obsolescence, Compliance or Operational – is at an Unacceptable (or High) level.

Projects that do not meet this criterion are deferred and if deemed necessary other works (e.g. maintenance) is carried out. The level of risk associated with each replacement need can also be used as an input to prioritising and timing of a replacement project.

Find alternatives

A range of alternative solutions are developed and documented including continuing with routine and emergency maintenance. Each of the options developed must address, in some effective way, the drivers of unacceptable (or High) risk or they are discounted as viable options.

If there are only limited options, documentation of the decision to not pursue other options must take place along with the associated reasoning. This can take the form of a recommendation from a report, or an internal memorandum.

The "Maintenance Only" (also known as "Do Nothing") option is fundamentally allowing the normal aging processes to take place and to allow the maintenance routines to respond as required. It therefore provides a perspective of what the potential impact to the organisation would be if no replacement works were to take place at the nominated End of Life of the asset. It is critical to ensure that this is considered as part of the re-investment process. Where possible the project need is evaluated against the "Maintenance Only" scenario.

Determine project/option timing

The timing for the works is initially developed from:

- *Reliability risks,* one approach used is when it is more efficient to replace when an asset compared to ongoing maintenance and emergency works. Alternative approaches include investigating the reliability of supply to connections and so on.
- *Obsolescence risks*, the time to replace is fundamentally driven by a combination of factors particularly the manufacturer notification of "no further support", lack of technical support and competency with Powerlink and diminished spares levels taking into account equipment failure rates.
- *Operational risks* which includes such issues as fault levels rising beyond nominal plant ratings, these are determined on an annual basis via detailed analysis. In the example of fault levels, the planning analysis provides a forecast year-on-year fault level from which plant can be seen to be capable or not of handling the possible fault level. Other operational risks can include the non-standard operational layout of the substation (which may have compliance risks), and so on.
- *Compliance risks*, such as the changing of workplace health and safety and environmental legislation. The needs must be assessed on a case by case basis depending on the level of risk.

After the development of the "ideal" replacement timing based on the above criteria, actual replacement timing is subsequently refined where appropriate so as to achieve synergies in program delivery.

To achieve this Powerlink regularly reviews the projects and their alignment within the program of work to ensure efficiency of the overall program – that is to say works from augmentation, replacement and operational projects are considered.

Develop estimates

Each of the identified feasible options is costed in accordance with Powerlink's normal estimating processes.

Select recommended option

The estimates are then entered in the NPV tool along with a profile of the existing plant and proposed plant changes to develop an expected cost and risk profile over the expected nominal life of the plant. The option with a comparatively low (not always the lowest) NPV and that best addresses the post work risk (not always the least residual risk) over the expected life of the plant is chosen as the preferred option.

The recommended option is then passed into a more detailed scope and estimating phase of works to confirm earlier assumptions and if necessary the replacement process is repeated until the prudent and efficient solution is identified.

4. Portfolio Risk Considerations

4.1 Risk Assessment

Powerlink uses a risk assessment framework that is based on "AS/NZS ISO 31000:2009, Risk management - Principles and guidelines". These guidelines are used to assess the replacement need as well as within the option analysis. This risk assessment framework is outlined in the Powerlink Queensland Risk Management Charter.

The magnitude of the consequence of not proceeding with the project (in line with the target timing) and the likelihood of the failure are assessed in the context of the existing strategies and controls. The consequences and likelihood are combined to produce an overall level of risk associated with the asset.

Where practical and reasonable, the assessment is quantitative. The consequence and likelihood may be able to be estimated using statistical analysis and calculations, based on plant and equipment condition assessments. Other assessments can be semi-quantitative nature, or assessments and estimates may be made, based on qualitative engineering judgement. This is particularly applicable to predictive assessments for triggers occurring many years into the future. It is therefore inappropriate to assume quantitative analysis is better than qualitative analysis – it is more appropriate to ensure the best approach for the situation being analysed.

As the timing of the replacement need draws nearer, detailed assessments will be undertaken to refine the risk assessment and trigger timing.

Figure 2 depicts Powerlink's Standard Risk Matrix used to combine the consequence and likelihood, to determine the level of risk.

		Lower → Consequence → Higher						
		1	2	3	4	5	6	7
Certain ↑	A	3 - MODERATE	3 - MODERATE	4 - SIGNIFICANT	5 - HIGH	5 - HIGH	6 - CRITICAL	6 - CRITICAL
	B	3 - MODERATE	3 - MODERATE	4 - SIGNIFICANT	5 - HIGH	5 - HIGH	5 - HIGH	6 - CRITICAL
	C	2 - LOW	3 - MODERATE	4 - SIGNIFICANT	5 - HIGH	5 - HIGH	5 - HIGH	5 - HIGH
	D	2 - LOW	3 - MODERATE	4 - SIGNIFICANT	4 - SIGNIFICANT	5 - HIGH	5 - HIGH	5 - HIGH
	E	2 - LOW	2 - LOW	3 - MODERATE	4 - SIGNIFICANT	4 - SIGNIFICANT	5 - HIGH	5 - HIGH
	F	1 - VERY LOW	2 - LOW	2 - LOW	3 - MODERATE	4 - SIGNIFICANT	4 - SIGNIFICANT	5 - HIGH
Rare	G	1 - VERY LOW	1 - VERY LOW	2 - LOW	3 - MODERATE	3 - MODERATE	4 - SIGNIFICANT	4 - SIGNIFICANT

Figure 2 - Powerlink Standard Risk Matrix

Consequence and likelihood tables are outlined in the Powerlink Risk Management Charter . These scales provide examples that are used by the organisation to determine consequences and likelihoods associated with Emergency Level Network Performance, Safety, Environmental & Cultural Heritage, Financial (Assets/Revenue/Liability) and Impact on Business Objectives & Stakeholder Involvement.

Likelihood uses an order of magnitude scale to attempt to relate events across time periods. These scales have been drawn up to reflect the normal business activities.