# ElectraNet Transmission Network Revised Revenue Proposal

Appendix P ElectraNet, Capex Replacement and Maintenance Decision Framework, January 2013

# Capex Replacement and Maintenance Decision Framework

January 2013

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# Contents

# 1. Purpose

The purpose of this note is to summarise the decision making framework for network asset replacement decisions and for developing maintenance plans.

# 2. Definitions

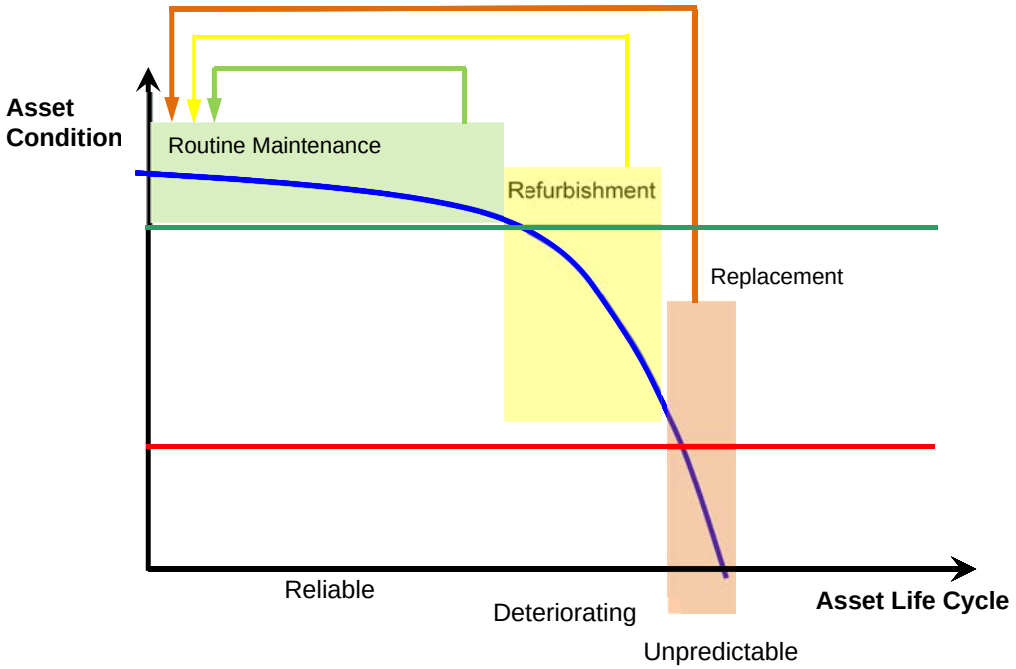
Asset refurbishment is defined as additional planned maintenance required outside the specified routine maintenance programme – generally applied to an asset in order to return it to a condition where routine maintenance will be effective (i.e. applied where routine maintenance by itself will not prevent unacceptable deterioration of safety/ environment impact or availability/ reliability).

# 3. Decision Framework

## 3.1 Background

As an asset moves through its lifecycle the relative effectiveness of maintenance on the asset changes. Therefore, maintenance decisions change in response to asset condition changes as represented in Figure 3-1 below.

**Figure 3-1: Asset Lifecycle Maintenance and Replacement**



With reference to Figure 3-1, the following asset management processes are applied:

- **Start-up to midlife** – Routine maintenance is applied as appropriate to the asset and its environment in order to maintain asset performance within acceptable limits of safety, environmental impact, reliability and availability.

  During this time condition inspection is undertaken to track the rate of change of condition of the asset in order to assess the adequacy of routine maintenance (for the purposes of optimisation of routine maintenance) and to predict the requirement for future asset refurbishment.

- **Midlife onwards** – Routine maintenance including condition inspection continues however based on condition and performance monitoring the requirement for asset refurbishment may be identified. This additional effort is based on determining the lowest cost option of maintaining the working life of the asset in preference to replacement.

- **Asset end of life** – Asset end of life is characterised by entering a phase of operation where it is no longer possible to predict key aspects of the asset behaviour (one or a combination of safety performance, asset capability or asset health). The uncertain behaviour is reflected in deteriorating asset reliability and availability performance.

## 3.2 Measures of Asset Condition

All asset maintenance plans are based on collection and analysis of asset lifecycle condition which allows the current and future performance of the asset to be efficiently managed using the following frameworks:

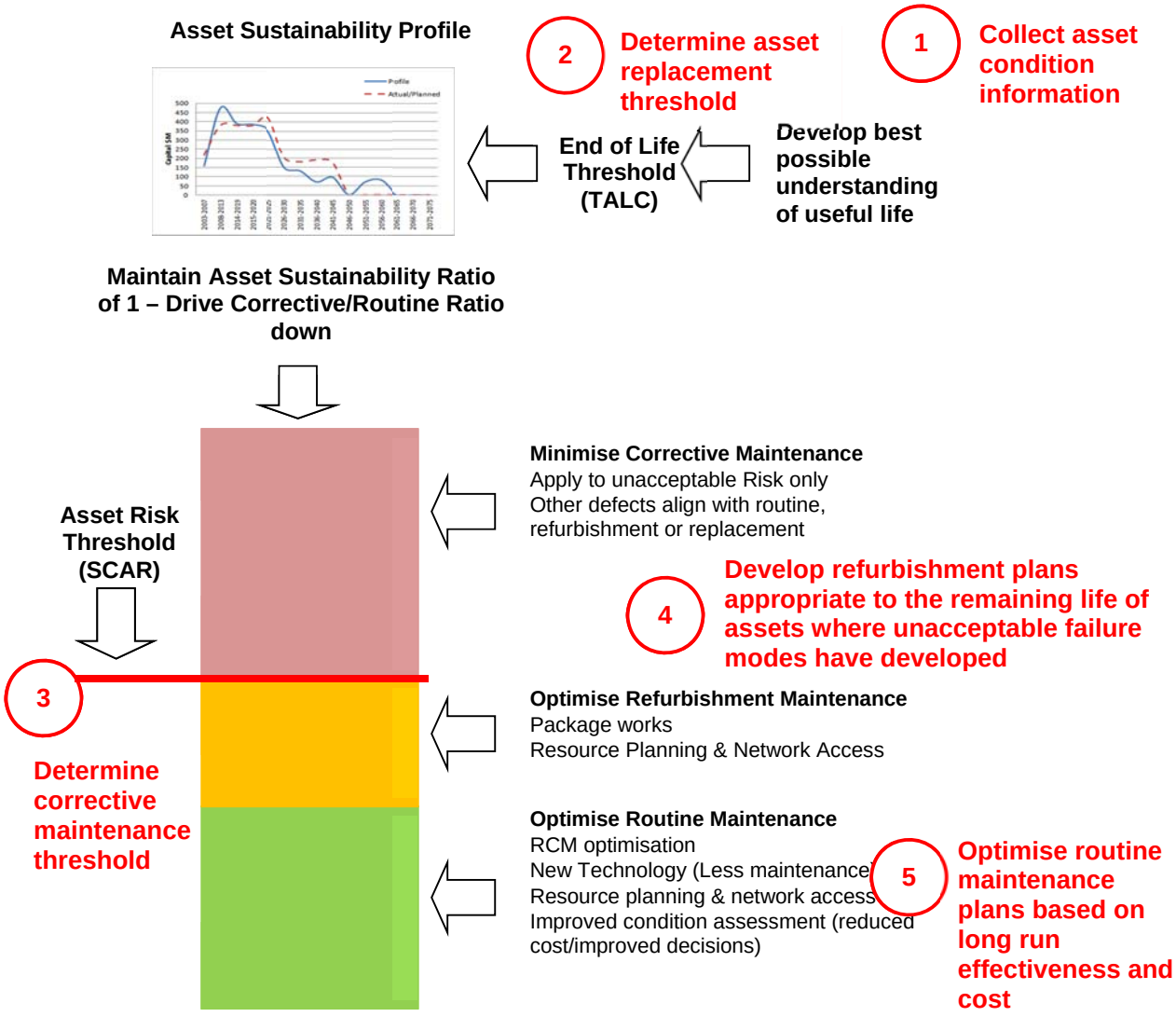
- System Condition and Risk (SCAR) has been developed to systematically and consistently describe asset condition and risk. SCAR coding of all asset failure modes and associated risk/ response is designed to limit unplanned corrective maintenance by allocating asset defects to more efficient longer term planned routine, refurbishment and replacement streams where possible. Unplanned corrective maintenance is applied only where safety/ environmental or significant operational or asset risk is present (for more information please refer ElectraNet, SCAR Framework, January 2013 document).

- Transmission Asset Life Cycle (TALC) has been developed to provide a framework for systematically identifying where an asset is in its life cycle, and more importantly when it is likely to reach end of life in order to make the most effective asset replacement investment decisions (for more information please refer ENET184 Transmission Asset Life Cycle document - A Framework for Understanding the Lifecycle of Transmission Assets).

## 3.3 Asset Maintenance / Replacement Decision Framework

The asset maintenance / replacement decision framework is set out in Figure 3-2 below; the key decision points are highlighted and discussed in detail in the following sections.

**Figure 3-2: Asset Maintenance/ Replacement Decision Framework**




## 3.4 Asset Condition Information

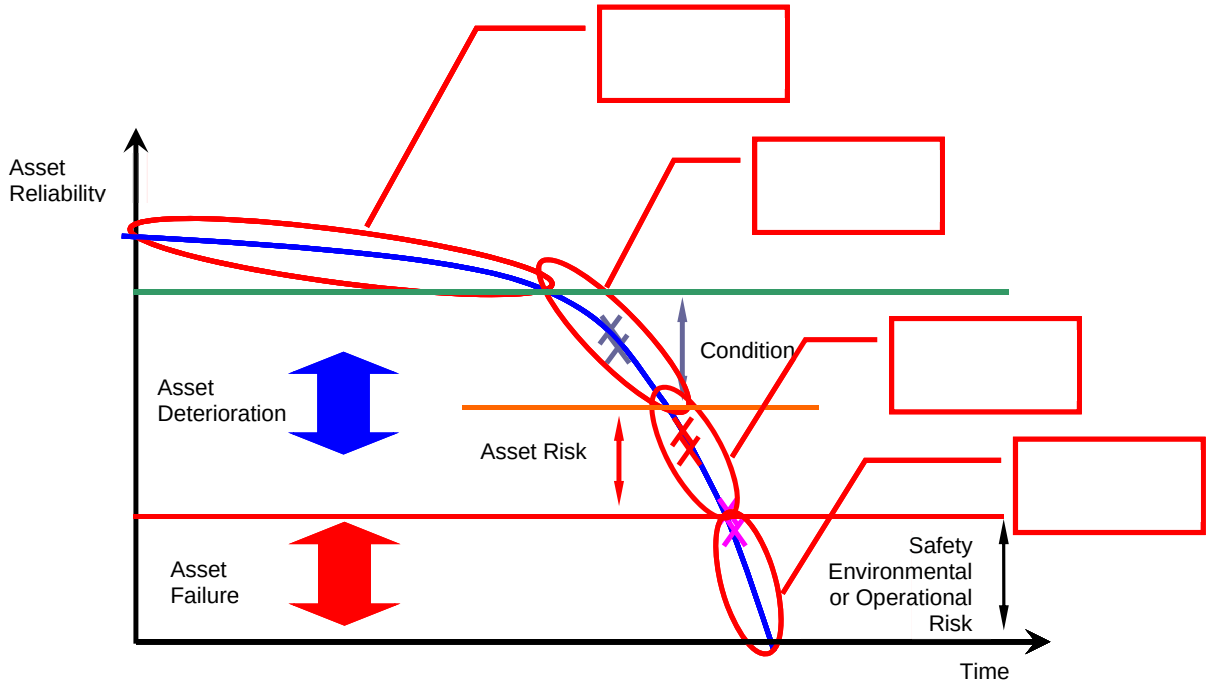
In order to manage the full lifecycle of the asset, specific information is required from each part of the asset lifecycle. The main elements used to describe the transmission asset life cycle are shown below.

In a framework where an asset manager does not have access to reliable and consistent information from each part of the asset cycle, the ability to effectively manage the asset is limited to responding to asset defects as they occur with the worst case becoming a reactive maintenance environment where long term performance of the asset is impossible to predict.

Collection of asset condition information is based on the need to have adequate information to make economic decisions, the only question being what and how much information for each category is economically justified. In this case the minimum level of information collection is determined by the need to have adequate information to assess asset P-F intervals in order to determine unacceptable failure modes and performance. Without this information the ability to potentially delay asset replacement (with the significant benefit of capital expenditure delay) is substantially reduced.

It should be noted that choosing not to collect asset condition information and rely solely on a maintenance management approach in which assets are repaired or replaced when they fail would be inconsistent with modern day asset management practices.

**Figure 3-3: Asset Lifecycle Information Categories**




## 3.5 Asset Replacement Threshold

In the transmission network, asset replacement may be justified when the performance of the asset is such that it:

- is unsafe to operate;
- is environmentally unacceptable; or
- is unpredictable and economic assessment shows that the cost of unserved energy exceeds the cost of replacement.

In order to assess asset performance and behaviour TALC and SCAR information is used to determine the position of assets on the lifecycle curve and asset risk respectively. Where unacceptable performance against the above criteria is identified (indicating end of asset life), asset replacement is recommended.

The threshold for replacement is based on evidence that the asset has reached a stage where it is no longer possible to manage one or more of its key aspects (safety/ environment impact, reliability and availability), and it is unsafe to continue in service or will have an unacceptable impact on unserved energy.

An example of the sensitivity of the value of lost load to asset availability is shown in the following typical example where the relative unavailability of an asset deteriorates over a number of years shown in Figure 3-4.

In the case where asset unavailability affects the ability to supply load, the relative change in unavailability may be related to the value of lost load shown in Figure 3-5 below. For a typical 132kV substation node the relative change in average unavailability shown would result in the value of lost load exceeding the cost of replacement in the future as indicated. At this point replacement of the asset could be economically justified.

**Figure 3-4 Change in Asset Average Unavailability**

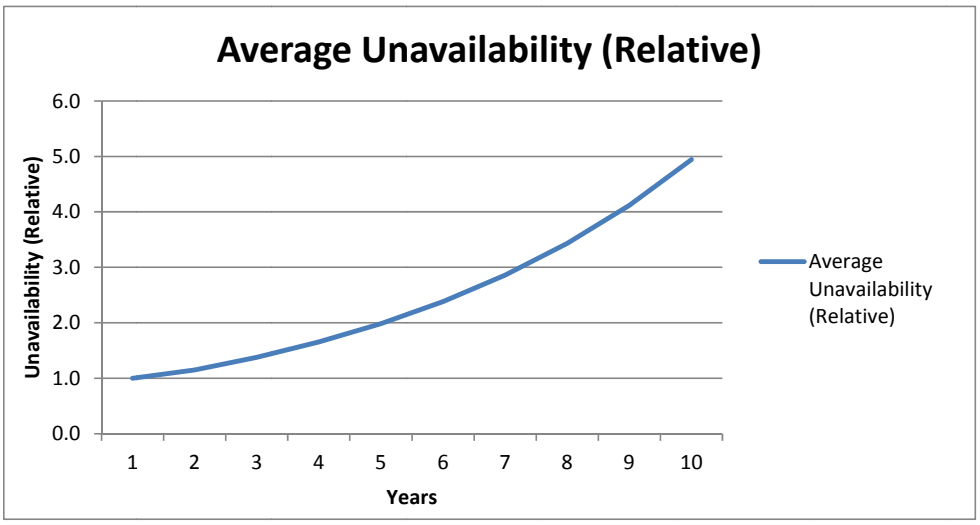
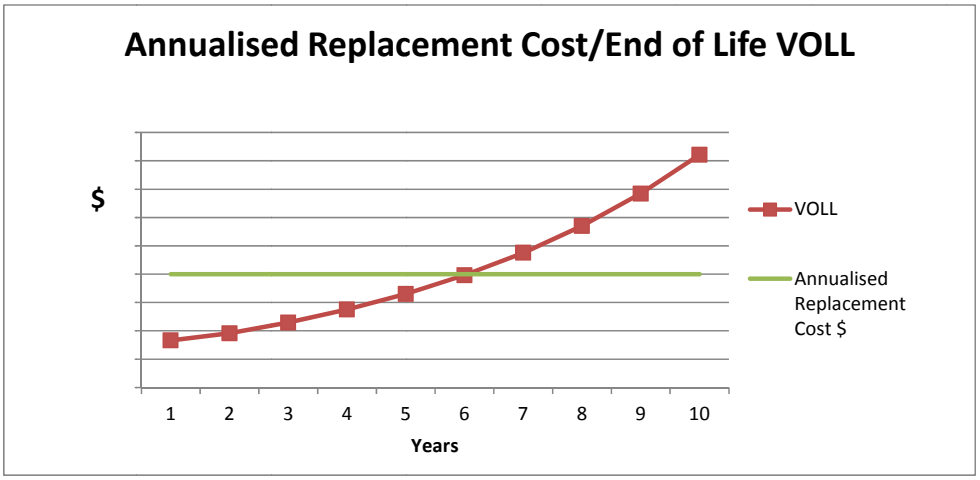



**Figure 3-5 Value of Lost Load and Replacement Cost**



ElectraNet conducts cost/benefit analysis of forecast site replacements taking into account customer benefits through improved reliability outcomes and reduced maintenance costs compared with the capital and ongoing costs of a replacement site. This analysis takes into account multiple factors including the expected reliability of a connection point, actual reliability/outage values and trends, corrective cost profile, load at risk and load growth, and residual asset value for multiple replacement timing scenarios. Refer Appendix B – Asset Replacement Cost/Benefit Methodology for description of input assumptions and methodology.

Conversely where TALC indicates overall asset performance is not unmanageable, asset replacement may be delayed, potentially deferring large capital replacement projects into future regulatory periods

## 3.6 Corrective Maintenance Threshold

The asset manager is required to manage asset defects by:

- Understanding all reasonably probable failure modes
- Identifying risk and consequence of all failure modes
- Responding on the basis of the risk analysis
- Ensuring that for unacceptable failures, inspection and response time is within the P-F interval (time between commencement of failure and actual failure)

Corrective maintenance thresholds have been set based on risk / response analysis set out in SCAR Coding (for more information please refer ElectraNet, SCAR Framework, January 2013 document).

The corrective maintenance threshold is set based on unacceptable failures with short P-F intervals. Note that unacceptable failures are those failures that are related to safety / environment impact, assets with unacceptable reliability/ availability and are likely to immediately impact network performance, or asset defect which have unacceptable consequences.

## 3.7 Refurbishment Plans

Asset refurbishment plans are developed by considering all asset defect profiles where possible by plant group (in order to be able to group and package work to maximise efficiency).

Prioritisation of each refurbishment plan is then undertaken based on:

- TALC profile of the assets
- SCAR profile of the assets
- Network Impact

Projects are categorised as follows:

- High Priority – where a direct impact on safety/ environment or asset availability / reliability is identified
- Medium Priority – where an impact on asset availability / reliability is identified (but response may be delayed and asset condition monitored)
- Low Priority – where a possible impact on asset availability/ reliability is identified but further information or monitoring is required

A summary of refurbishment projects analysis is shown in Appendix A. Note that only high priority operational refurbishment projects have been recommended for implementation.

### 3.8 Optimise Routine Maintenance

Routine maintenance plans are characterised by long maintenance cycles (typically in the order of 5 to 8 years). The maintenance plans currently in place have been developed using reliability centred maintenance techniques and are in the following stages of implementation:

- Substations – completion of first maintenance cycle
- Transmission Lines – full implementation during current regulatory period, completion of first maintenance cycle during next regulatory period

A systematic review of all substation maintenance plans will be conducted during the next regulatory period in order to identify opportunity for optimising scope and frequency.

## 4. Summary

The overall asset management framework is designed to:

- Assess asset lifecycle using TALC – based on the need to for a comprehensive framework to identify asset replacement thresholds and those asset replacements that may be delayed without affecting network performance and lifecycle cost.

  **Benefit: Delay substantial capital expenditure by only replacing assets where safety / environment impact or unreliability cost is unacceptable.**

- Identify asset failure modes and risk using SCAR – based on the requirement to identify unacceptable failure modes and respond with corrective maintenance accordingly. All other defects are allocated to more efficient planned maintenance, refurbishment or monitor / review work streams.

  **Benefit: Minimise corrective maintenance expenditure by only responding to asset condition where safety / environment impact or unreliability cost is unacceptable, or where asset defects have unacceptable consequences.**

- Assess and develop opex refurbishment projects using TALC and SCAR – based on the requirement to ensure asset availability/ reliability that will affect network performance is maintained during the life of the asset, allocate all other defects to monitor / review.

**Benefit: Minimise Opex Refurbishment and Asset Replacement expenditure by only responding to asset condition where safety/ environment impact or unreliability cost is unacceptable, or where asset defects have unacceptable consequences.**

Thresholds for reliability are set by assessing the risk and associated likelihood of each asset failure mode (resulting in decreased levels of safety or availability) that will directly affect network performance and associated value of lost load.

## Appendix A OPEX Refurbishment Project Analysis and Prioritisation

| Project | Work Category | TALC | | | | | | | | | | | SCAR | Network | | | | Risk | | | | Decision | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Safety | Model | Environment | Security | Maintainability | Operability | Spares | Training | Support | Corrective | Condition | Standards | Coding | Rating | Configuration | Reliability | Capability | Safety | Network | SCAR | TALC | Risk Score | Risk Driver | Risk Category | Response |
| Subs Plant Isolator Refurb | Plant OH | 4 | 3 | 5 | 2 | 2 | 1 | 3 | 4 | 4 | 1 | 2 | 3 | O-ABED | 5 | 5 | 1 | 1 | 4 | 3 | 1 | 2.7 | 1 | SCAR | High | OPEX Refurb |
| Sub Civil Site Remediation Pri 1 | Subs | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 1 | 1 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.5 | 2 | SCAR | High | Defer |
| Sub Civil Site Remediation Pri 2 | Subs | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 1 | 1 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 3.5 | 3.0 | SCAR | Medium | Defer |
| Sub Civil Site Remediation Pri 3 | Subs | 4 | 3 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 1 | 1 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 3.5 | 3.0 | SCAR | Medium | Defer |
| GIS Refurbishment | Plant OH | 4 | 3 | 4 | 2 | 2 | 4 | 2 | 3 | 4 | 1 | 3 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 2.8 | 2 | SCAR | High | OPEX Refurb |
| Structure and Footing Repair | Subs | 3 | 3 | 5 | 5 | 2 | 3 | 5 | 5 | 5 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3.5 | 2 | SCAR | High | OPEX Refurb |
| Sub Plant TF Minor Refurb | Subs | 4 | 3 | 3 | 5 | 3 | 5 | 5 | 5 | 5 | 2 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.7 | 2 | SCAR | High | OPEX Refurb |
| TIPS Under/Over Stn Removal | Subs | 4 | 3 | 5 | 2 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 3 | 3 | TALC | Medium | Defer |
| Subs Surge Arrestor Earthing Mods | Subs | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | NA | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4.8 | 4.8 | TALC | Low | Delete |
| Strategic CVT Replacement | CAPEX Unit Asset I | 2 | 3 | 5 | 5 | 2 | 5 | 5 | 5 | 5 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 2 | 5 | 2 | 3.7 | 2 | Safety | High | CAPEX |
| H209 Site Drainage Refurb & Asphalt Hardstand | Subs | 5 | 3 | 3 | 5 | 3 | 3 | 5 | 5 | 5 | 2 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 3.5 | 2 | SCAR | High | OPEX Refurb |
| H209 Gantry Footings CA Investigation | Subs | 4 | 3 | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 3 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 4 | 3 | SCAR | Medium | Monitor |
| H209 Stormwater Culvert Replacement | Subs | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | SCAR | Low | Delete |
| H209 Internal Access Road Hardstand Bituminising | Subs | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.1 | 4 | SCAR | Low | Delete |
| Subs Pumping Stn 3.3kV VT Replacement | Subs | 5 | 3 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 3 | 2 | 2 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | SCAR | Low | CAPEX |
| T211 Hold-Down Bolt Refurb | Subs | 3 | 1 | 5 | 5 | 1 | 2 | 1 | 5 | 5 | 1 | 1 | 1 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 2.5 | 2 | SCAR | High | Delete |
| TF Seismic Restraint Investigation | Subs | 5 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 1 | NA | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4.1 | 4.09091 | TALC | Low | Monitor |
| H403 Site Drainage Refurb & Asphalt Hardstand | Subs | 5 | 3 | 3 | 5 | 3 | 3 | 5 | 5 | 5 | 2 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 3.5 | 2 | SCAR | High | OPEX Refurb |
| TF Bunds Refurb - Plate Separators Replacement | Subs | 4 | 3 | 2 | 5 | 1 | 1 | 3 | 4 | 4 | 1 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2.6 | 2.63636 | TALC | High | OPEX Refurb |
| TF Bunds Refurb - Design/Construct | Subs | 4 | 3 | 2 | 5 | 1 | 1 | 3 | 4 | 4 | 1 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2.6 | 2.63636 | TALC | High | OPEX Refurb |
| TF Bunds Refurb - U/G Oil/Water Separation Tank Sample Poi | Subs | 4 | 3 | 2 | 5 | 1 | 1 | 3 | 4 | 4 | 1 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2.6 | 2.63636 | TALC | High | OPEX Refurb |
| Site Stormwater Run-off Sample Point Install | Subs | 5 | 5 | 3 | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.45455 | 4 | SCAR | Low | Monitor |
| H255 TIPS-A Stormwater Culvert Replacement | Subs | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.09091 | 4 | SCAR | Low | Delete |
| H161 Para Stormwater Culvert Replacement | Subs | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.09091 | 4 | SCAR | Low | Delete |
| H209 Fire Hydrant Refurbishment | Subs | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 4 | 2 | SCAR | High | OPEX Refurb |
| Fire water Tank & Pump Replacement | Subs | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 4 | 2 | SCAR | High | OPEX Refurb |
| H220 Fire water Tank Replacement | Subs | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 4 | 2 | SCAR | High | Delete |
| H209 Fire water Tank Replacement | Subs | 4 | 1 | 5 | 5 | 1 | 1 | 1 | 5 | 5 | 1 | 1 | 1 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2.45455 | 2.45455 | TALC | High | Delete |
| Battery Charger Upgrades - Pri 1 | Subs | 5 | 2 | 5 | 2 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 2.9 | 2.90909 | TALC | High | OPEX Refurb |
| Battery Charger Upgrades - Pri 2 | Subs | 5 | 2 | 5 | 5 | 2 | 4 | 2 | 2 | 2 | 3 | 3 | 3 | R-NSO | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | SCAR | Medium | Defer |
| Porcelain Surge Arrestor Replacement | Subs | 4 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.63636 | 4 | Safety | Low | Monitor |
| TIPS De-Energised 66kV U/G Oil-filled Cable Removal | Subs | 5 | 3 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.45455 | 4 | SCAR | Low | Delete |
| TF Bunds Refurb - Oil Blocking System Replace | Subs | 4 | 1 | 2 | 5 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 1.9 | 1.90909 | TALC | High | OPEX Refurb |
| TF Bunds Refurb - Oil Separator Install | Subs | 4 | 1 | 2 | 5 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 1.9 | 1.90909 | TALC | High | OPEX Refurb |
| TF Bunds Refurb - Design/Construct | Subs | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | NA | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4.63636 | 4.63636 | TALC | Low | Delete |
| TF Bunds Refurb - U/G Oil/Water Separation Tank Sample Poi | Subs | 5 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | NA | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4.63636 | 4.63636 | TALC | Low | Delete |
| Asset Online CA Monitoring Equipment Replacement | CAPEX Unit Asset I | 5 | 2 | 5 | 5 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 2.36364 | 2.36364 | TALC | High | CAPEX |
| Review and Applciation of LDC to isolated Connection Points | Sec Sys | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 3 | 3 | 5 | 4 | 5 | 5 | 4 | Network | Low | Monitor |

# CAPEX REPLACEMENT AND MAINTENANCE DECISION FRAMEWORK

January 2013

| Project | Work Category | TALC | | | | | | | | | | | SCAR | Network | | | | Risk | | | | Decision | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Safety | Model | Environment | Security | Maintainability | Operability | Spares | Training | Support | Corrective | Condition | Standards | Coding | Rating | Configuration | Reliability | Capability | Safety | Network | SCAR | TALC | Risk Score | Risk Driver | Risk Category | Response |
| Load Indicies | Sec Sys | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 3 | 2 | 5 | 3.75 | 5 | 5 | 3.75 | Network | Medium | Defer |
| Substation Computer Based Local Control Facilities (HMI) Rep | Sec Sys | 4 | 2 | 5 | 5 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | NA | 5 | 4 | 1 | 1 | 4 | 2.75 | 5 | 2.27273 | 2.27273 | TALC | High | OPEX Refurb |
| conductor (sample & Test) | Tx Lines | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 2 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 3.36364 | 3 | SCAR | Medium | Defer |
| F1836/1837/1833 conductor CA | Tx Lines | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.27273 | 2 | SCAR | High | OPEX Refurb |
| structures (Climbing Inspection) | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.09091 | 4 | Safety | Low | Delete |
| insulators (Volt-drop testing) | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.09091 | 4 | Safety | Low | Delete |
| foundations (NDT & Field validation) | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.09091 | 4 | Safety | Low | Delete |
| Stobie groundline pole inspection | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.09091 | 4 | Safety | Low | Delete |
| CA Analysis (Eng support) | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | R-ABED | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 5 | 2 | SCAR | High | OPEX Refurb |
| insulator testing (Lab destructive testing) | Tx Lines | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.09091 | 4 | SCAR | Low | Monitor |
| Tx Line Mid-Span Joint Testing Baseline | Tx Lines | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.81818 | 2.81818 | TALC | High | OPEX Refurb |
| Tower earthing & assessment | Tx Lines | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.81818 | 2.81818 | TALC | High | OPEX Refurb |
| Line component testing (conductor & joints) | Tx Lines | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.81818 | 2.81818 | TALC | High | OPEX Refurb |
| Tx line thermography 3yr cycle | Tx Lines | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 2.81818 | 2 | SCAR | High | OPEX Refurb |
| Tx line corona 3yr cycle | Tx Lines | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 2.81818 | 2 | SCAR | High | OPEX Refurb |
| access track refurb | Tx Lines | 4 | 5 | 3 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 5 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.09091 | 4 | Safety | Low | Monitor |
| joint reinforcement HBFRA | Tx Lines | 4 | 3 | 5 | 5 | 5 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | NA | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4.09091 | 4 | Safety | Low | Delete |
| Low span CDR/SAE | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 4 | 4 | 2 | 1 | 5 | 2.75 | 5 | 5 | 2.75 | Network | High | Delete |
| Str/Ins photos | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 4 | 5 | 5 | 5 | 4.75 | 5 | 5 | 4.75 | Network | Low | Delete |
| Line schedule data audit | Tx Lines | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | NA | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 3.27273 | 3.27273 | TALC | Medium | Monitor |
| Aerial Hazard ID [over/under line xing markers] | Tx Lines | 2 | 2 | 5 | 5 | 2 | 1 | 5 | 4 | 4 | 1 | 1 | 1 | NA | 5 | 5 | 5 | 5 | 2 | 5 | 5 | 2.81818 | 2 | Safety | High | OPEX Refurb |
| Undercrossing fix | Tx Lines | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 2 | NA | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4.72727 | 4 | Safety | Low | Monitor |
| ERS - training | Tx Lines | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | R-NSO | 5 | 5 | 5 | 5 | 2 | 5 | 3 | 5 | 2 | Safety | High | OPEX Refurb |
| bog mats | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | SCAR | Low | Delete |
| F1812/57 footing fix pri 1 | Tx Lines | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | OPEX Refurb |
| F1830 removal | Tx Line Removal | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | OPEX Refurb |
| pt river xing removal | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Monitor |
| F1808 xing Low Span fix | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |
| F1808/1809 Gulf xing footing refurb | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |
| EPL insulator replace | Tx Lines | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | OPEX Refurb |
| Individual spun concrete pole replace | Tx Lines | 4 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4.09091 | 4 | Safety | Low | Defer |
| Std Tx Line component repair guideline | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | Safety | Low | Monitor |
| fly-ash pond bypass | Tx Lines | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Monitor |
| Twr Rusty Nut & Bolt Refurb | Tx Lines | 3 | 3 | 5 | 4 | 2 | 3 | 5 | 4 | 4 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3.27273 | 2 | SCAR | High | OPEX Refurb |
| F1802 xing refurb | Tx Lines | 5 | 3 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.09091 | 4 | SCAR | Low | Monitor |
| "safety valve" xarm assess/fix | CAPEX Re-Insulati | 2 | 2 | 5 | 5 | 2 | 3 | 1 | 2 | 2 | 1 | 2 | 1 | R-ABED | 5 | 5 | 5 | 5 | 2 | 5 | 2 | 2.36364 | 2 | Safety | High | CAPEX |
| F1836 footing fix | Tx Lines | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | Delete |
| F1837 footing fix | Tx Lines | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | Delete |
| F1910 Brinkworth-Davenport Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| F1911 Para-Brinkworth Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| F1864 Penola West-South East Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| xarm refurb/replace F1846/1866 (TB xarm ???) | Tx Lines | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.27273 | 4 | SCAR | Low | Monitor |
| tower earthing refurb | Tx Lines | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.27273 | 4 | SCAR | Low | Defer |
| Stobie pole plating/replace | Tx Lines | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.27273 | 4 | SCAR | Low | Monitor |

# CAPEX REPLACEMENT AND MAINTENANCE DECISION FRAMEWORK

January 2013

| Project | Work Category | TALC | | | | | | | | | | | SCAR | Network | | | | Risk | | | | Decision | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Safety | Model | Environment | Security | Maintainability | Operability | Spares | Training | Support | Corrective | Condition | Standards | Coding | Rating | Configuration | Reliability | Capability | Safety | Network | SCAR | TALC | Risk Score | Risk Driver | Risk Category | Response |
| Vegetation Management Analysis Tools | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 4 | 1 | 1 | 5 | 2.75 | 5 | 5 | 2.75 | Network | High | CAPEX |
| Easement GIS Mngt (Google Earth Licence) | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | Safety | Low | Delete |
| F1938/F1945 Lightning Performance Improvement | Tx Lines | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | SCAR | Low | Delete |
| F1912 "safety valve" xarm change-out | Tx Lines-OH | 2 | 2 | 5 | 5 | 2 | 3 | 1 | 2 | 2 | 1 | 2 | 1 | R-ABED | 5 | 5 | 5 | 5 | 2 | 5 | 2 | 2.36364 | 2 | Safety | High | Monitor |
| F1808 xing Removal | Tx Line Removal | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 3.27273 | 3.27273 | TALC | Medium | Monitor |
| High Crossing Twr Climbing Inspection | Tx Lines | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.27273 | 2 | SCAR | High | OPEX Refurb |
| Insulator Testing for Z-Code Replacement | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 4.09091 | 2 | SCAR | High | OPEX Refurb |
| F1807 Insulator Testing for Z-Code Replacement | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 4.09091 | 3 | Safety | Medium | Delete |
| F1818 Insulator Testing for Z-Code Replacement | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 4.09091 | 3 | Safety | Medium | Delete |
| F1846 Insulator Testing for Z-Code Replacement | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 4.09091 | 2 | SCAR | High | Delete |
| F1847,1849,1853 Insulator Testing for Z-Code Replacement | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 4.09091 | 3 | Safety | Medium | Delete |
| NDT Foundation CA | Tx Lines | 4 | 2 | 5 | 5 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.63636 | 2.63636 | TALC | High | OPEX Refurb |
| F1853 Foundation CA | Tx Lines | 4 | 2 | 5 | 5 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.63636 | 2.63636 | TALC | High | Delete |
| F1912 Foundation CA | Tx Lines | 4 | 2 | 5 | 5 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.63636 | 2.63636 | TALC | High | Delete |
| TIPS De-Energised 66kV U/G Oil-filled Cable Removal | Tx Line Removal | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.27273 | 2 | SCAR | High | OPEX Refurb |
| F1827 Tailem Bend-Keith No2 Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| F1804 Brinkworth-Mintaro Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| F1905 Magill-Happy Valley Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| F1844 Cultana-Stoney Point Re-Insulation | CAPEX Re-Insulati | 3 | 1 | 5 | 4 | 1 | 2 | 5 | 5 | 5 | 1 | 2 | 2 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 3 | 2 | SCAR | High | CAPEX |
| F1808/F1809 Connect Electrically | Tx Line Removal | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 1 | 1 | 4 | 5 | 2.75 | 5 | 5 | 2.75 | Network | High | Monitor |
| F1836 Decommission & Remove | Tx Line Removal | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | CAPEX |
| F1837 Decommission & Remove | Tx Line Removal | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | CAPEX |
| F1819 Re-energise | CAPEX Uprate | 3 | 3 | 5 | 4 | 1 | 2 | 1 | 5 | 5 | 1 | 2 | 1 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | CAPEX |
| Tx Line Dead-End Joint Testing Baseline | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-NSO | 5 | 5 | 5 | 5 | 3 | 5 | 3 | 4.09091 | 3 | Safety | Medium | Monitor |
| F1838/1839 Insulator Testing for Z-Code Replacement | Tx Lines | 3 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 3 | 3 | 3 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 4.09091 | 2 | SCAR | High | Delete |
| F1903 Insulator Testing for Z-Code Replacement | Tx Lines | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.27273 | 2 | SCAR | High | Delete |
| Comms Tower CA | Comms | 3 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 4 | R-ABED | 5 | 5 | 5 | 5 | 3 | 5 | 2 | 4.36364 | 2 | SCAR | High | OPEX Refurb |
| Comms Towers Fall Arrestor Replace | Comms | 2 | 3 | 5 | 2 | 3 | 3 | 3 | 4 | 4 | 3 | 2 | 3 | R-NSO | 5 | 5 | 5 | 5 | 2 | 5 | 3 | 3.18182 | 2 | Safety | High | OPEX Refurb |
| Comms Towers Remediation Stage 5 | Comms | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | SCAR | Low | Monitor |
| Frequency Rationalisation | Comms | 5 | 3 | 5 | 5 | 3 | 3 | 3 | 5 | 5 | 5 | 5 | 3 | R-ABED | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 4.09091 | 2 | SCAR | High | Delete |
| Network Management Enhancement | Comms | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 4 | 1 | 1 | 5 | 2.75 | 5 | 5 | 2.75 | Network | High | Delete |
| ACMA Program Radio Replacement | Comms | 5 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 1 | R-ABED | 5 | 5 | 5 | 5 | 5 | 5 | 2 | 3.36364 | 2 | SCAR | High | Delete |
| Building CA Investigation | Buildings | 5 | 5 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | R-MR | 5 | 5 | 1 | 1 | 5 | 3 | 4 | 3.72727 | 3 | Network | Medium | Monitor |
| H114 Building Refurb | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H403 Synch Condensor Removal & Building Refurbishment | Sync Cond Remova | 5 | 2 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | SCAR | Medium | Defer |
| H408 Synch Condensor Removal & Building Refurbishment | Sync Cond Remova | 5 | 2 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | SCAR | Medium | Defer |
| C007 Crafers Radio Site BUILDING - BRICK (BD01) Building Sec | Comms | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| C016 Mt Charles Radio Site BUILDING - CONCRETE HUT (BD01) | Comms | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| C021 The Bluff (Port Pirie) Radio Site BUILDING - BRICK (BD01) | Comms | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| C023 Manacon Tank (Hut) Refurb | Comms | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |
| C027 Manacon Tank (Hut) Refurb | Comms | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |
| C029 Manacon Tank (Hut) Refurb | Comms | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |
| C030 Manacon Tank (Hut) Refurb | Comms | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |
| C031 Williamstown Radio site BUILDING - CONCRETE HUT (BD | Comms | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | Safety | Low | Delete |

## CAPEX REPLACEMENT AND MAINTENANCE DECISION FRAMEWORK

January 2013

| Project | Work Category | TALC | | | | | | | | | | | SCAR | Network | | | | Risk | | | | Decision | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Safety | Model | Environment | Security | Maintainability | Operability | Spares | Training | Support | Corrective | Condition | Standards | Coding | Rating | Configuration | Reliability | Capability | Safety | Network | SCAR | TALC | Risk Score | Risk Driver | Risk Category | Response |
| H396 Bungama BUILDING - BRICK (BD01) Refurb - Major | Buildings | 4 | 3 | 5 | 5 | 2 | 2 | 3 | 5 | 5 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 3.27273 | 3.3 | TALC | Medium | Defer |
| T399 Control Building Refurb/Replace | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H161 Para BUILDING - BRICK (BD01) Removal | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Monitor |
| CC02 BUCC Building Refurb/Replace | Comms | 4 | 3 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2.72727 | 2.72727 | TALC | High | Delete |
| T399 Berri BUILDING - BRICK (BD01) Building Security Hardeni | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T339 Blanche BUILDING - BRICK (BD01) Building Security Harde | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H207 Cherry Gardens BUILDING - BRICK (BD02) Building Securi | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H426 Davenport BUILDING - BRICK (BD01) Building Security Ha | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| U284 Dry Creek Power Station BUILDING - BRICK (BD01) Buildi | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T135 Snuggery BUILDING - BRICK (BD01) Building Security Hard | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H114 Tailem Bend BUILDING - BRICK (BD02) Building Security I | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T134 Whyalla Terminal BUILDING - BRICK (BD01) Building Secu | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T440 Leigh Creek South BUILDING - TRANSPORTABLE (BD01) R | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T400 North West Bend BUILDING - BRICK (BD01) Refurb - Med | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H161 Para BUILDING - METAL (BD04) Refurb - Medium | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H404 Playford A & B Power Station BUILDING - BRICK (BD01) R | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T188 Port Lincoln Terminal BUILDING - BRICK (BD01) Refurb - M | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T153 Templers BUILDING - BRICK (BD01) Refurb - Medium | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H255 Torrens A Power Station BUILDING - BRICK (BD03) Refurb | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T262 Yadnarie BUILDING - BRICK (BD01) Refurb - Medium | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T438 Angas Creek BUILDING - TRANSPORTABLE (BD01) Refurb | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T399 Berri BUILDING - BRICK (BD04) Refurb - Minor | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T525 Dorrien BUILDING - TRANSPORTABLE (BD01) Refurb - Mir | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T140 Keith BUILDING - BRICK (BD01) Refurb - Minor | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T452 Leigh Creek Coalfield BUILDING - TRANSPORTABLE (BD01 | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T440 Leigh Creek South BUILDING - TRANSPORTABLE (BD02) R | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T514 Middleback BUILDING - TRANSPORTABLE (BD01) Refurb - | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H161 Para BUILDING - BRICK (BD02) Refurb - Minor | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H215 Robertstown BUILDING - BRICK (BD01) Refurb - Minor | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| T363 Stony Point BUILDING - TRANSPORTABLE (BD01) Refurb - | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H254 Torrens B Power Station BUILDING - TRANSPORTABLE (B | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| C032 LeFevre Tower 7 Radio site BUILDING - CONCRETE HUT (B | Comms | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| C033 Torrens Island Tower 8 Radio site BUILDING - CONCRETE | Comms | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | Delete |
| H161 BUILDING - BRICK (BD01) Refurb - Medium | Buildings | 4 | 3 | 5 | 5 | 2 | 2 | 3 | 5 | 5 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 3.27273 | 3.3 | TALC | Medium | Defer |
| U/G HV Cable Oil Plant Workshop & Test Facility | CAPEX Building | 3 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | NA | 5 | 5 | 5 | 5 | 3 | 5 | 5 | 3.54545 | 3 | Safety | Medium | CAPEX |
| Substation Building Security Hardening & Refurb | Buildings | 4 | 3 | 5 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.54545 | 2.5 | TALC | High | OPEX Refurb |
| Communications Building Security Hardening & Refurb | Buildings | 4 | 2 | 5 | 2 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.72727 | 2.72727 | TALC | High | OPEX Refurb |
| T399 Berri BUILDING - BRICK (BD01) Refurb - Major | Buildings | 4 | 3 | 5 | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | R-MR | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 2.54545 | 2.5 | TALC | High | OPEX Refurb |

| Project | Work Category | TALC | | | | | | | | | | | SCAR | Network | | | | Risk | | | | Decision | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Safety | Model | Environment | Security | Maintainability | Operability | Spares | Training | Support | Corrective | Condition | Standards | Coding | Rating | Configuration | Reliability | Capability | Safety | Network | SCAR | TALC | Risk Score | Risk Driver | Risk Category | Response |
| Joint PD CA | U/G Cables | 4 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-ABED | 5 | 5 | 5 | 5 | 4 | 5 | 2 | 3.27273 | 2 | SCAR | High | CAPEX |
| F1914 Pit construction (Pit O & K) | CAPEX Unit Asset I | 4 | 2 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2 | 2 | TALC | High | CAPEX |
| link box refurb | U/G Cables | 4 | 2 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2 | 2 | TALC | High | OPEX Refurb |
| Aux plant refurb/upgrade | U/G Cables | 4 | 2 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2 | 2 | TALC | High | OPEX Refurb |
| U/G HV Cable Oil Plant Workshop & Test Facility | U/G Cables | 5 | 3 | 5 | 5 | 3 | 3 | 3 | 4 | 4 | 1 | 2 | 3 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3.27273 | 3.27273 | TALC | Medium | Monitor |
| F1914 Inst Upgrade - East Tce End Construction | CAPEX Unit Asset I | 4 | 2 | 5 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | R-NSO | 5 | 5 | 5 | 5 | 4 | 5 | 3 | 2 | 2 | TALC | High | CAPEX |
| CA Investigation | Weather Stns | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.09091 | 4 | SCAR | Low | Monitor |
| Obsolete Weather sensor replace | Weather Stns | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 3 | 3 | 4 | R-MR | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4.09091 | 4 | SCAR | Low | Delete |
| Solar Flare Impact | R&D | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 1 | 5 | 5 | 4 | 5 | 5 | 4 | Network | Low | Delete |
| Climate Change - increased lightning | R&D | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 1 | 5 | 5 | 4 | 5 | 5 | 4 | Network | Low | Monitor |
| Climate Change - increased dust pollution | R&D | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 1 | 5 | 5 | 4 | 5 | 5 | 4 | Network | Low | Monitor |
| Conductor Corrosion Identification | R&D | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 1 | 5 | 5 | 4 | 5 | 5 | 4 | Network | Low | Monitor |
| Insulation Destructive Testing | R&D | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 5 | 1 | 5 | 5 | 4 | 5 | 5 | 4 | Network | Low | Monitor |
| Veg ID & Mngt Tool Investigation | R&D | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | NA | 5 | 4 | 1 | 1 | 5 | 2.75 | 5 | 5 | 2.75 | Network | High | OPEX Refurb |

Note: High priority projects shown as deleted have been combined grouped into common project packages.

## Appendix B Asset Replacement Cost/Benefit Methodology

The inputs, assumptions and methodology described below are for a radial single transformer 132kV site. In this example it is assumed that the substation is at the end of its economic life.

**Assumptions:**

- Options compare replacement now to replacement in 5 years and 10 years (notionally next and following regulatory control periods)
- PV analysis is undertaken in $real
- Base level corrective maintenance costs are assumed 30 per cent of routine maintenance costs up to start of current data set
- Connection point outage rates are determined from historical outage data for the particular site using a current day 6 year moving average of historical data
- End of life corrective maintenance costs and therefore the cost of customer supply outages are inflated by a common growth factor until the substation scenario replacement date

Input Parameters – Example Site

Base level reliability calculations are below.

Note: Failure rate and value of customer reliability data is consistent with data used by AEMO (for example in review of Electricity Transmission Code reliability standards for ESCOSA)

| Category | Failure Rate (Failures/ Year) | Downtime (Hours) | Number of Units | Failures /year | Failure Downtime hrs/yr | Maintenance Frequency (Years) | Maintenance Downtime (Hours) | Maintenance Downtime Hours/Year |
|---|---|---|---|---|---|---|---|---|
| Protection Equipment | 0.0002 | 5 | 4 | 0.0008 | 0.0040 | 4.0 | 0.0 | 0.00 |
| Circuit Breakers | 0.0036 | 8 | 1 | 0.0036 | 0.0288 | 4.0 | 8.0 | 2.00 |
| Instrument Transformers | 0.025 | 24 | 3 | 0.075 | 1.8000 | 4.0 | 4.0 | 3.00 |
| Cables | 0.00613 | 19 | 0 | 0 | 0.0000 | 4.0 | 4.0 | 0.00 |
| Cable Terminations | 0.0001 | 3.8 | 0 | 0 | 0.0000 | 4.0 | 4.0 | 0.00 |
| Disconnectors | 0.0061 | 3.6 | 3 | 0.0183 | 0.0659 | 5.0 | 4.0 | 2.40 |
| Transformers | 0.0033 | 192 | 1 | 0.0033 | 0.6336 | 6.0 | 16.0 | 2.67 |
| Distribution Supply Point | 2.0000 | 2 | 0 | 0 | 0.0000 | 4.0 | 4.0 | 0.00 |
| | | | | | | | | |
| **Total** | | | | **0.1** | **2.5** | | | **10.07** |

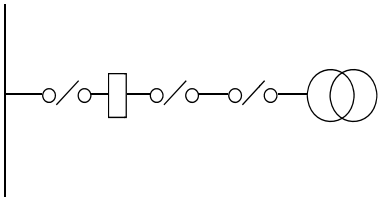
| Annualised Performance | Estimate | Unit |
|---|---|---|
| MTTF | 9.90 | Years |
| MTTR (Forced Outage) | 2.53 | Hours |
| Maintenance (Planned Outage) | 10.07 | Hours |
| Total Outage | 12.60 | Hours |
| Availability | 99.856% | |
| Unavailability | 0.144% | |

Availability = MTTF/(MTTF+MTTR) where:
MTTF is the Mean Time to Fail (1/failure rate)
MTTR is the Mean Time to Repair (loss time)

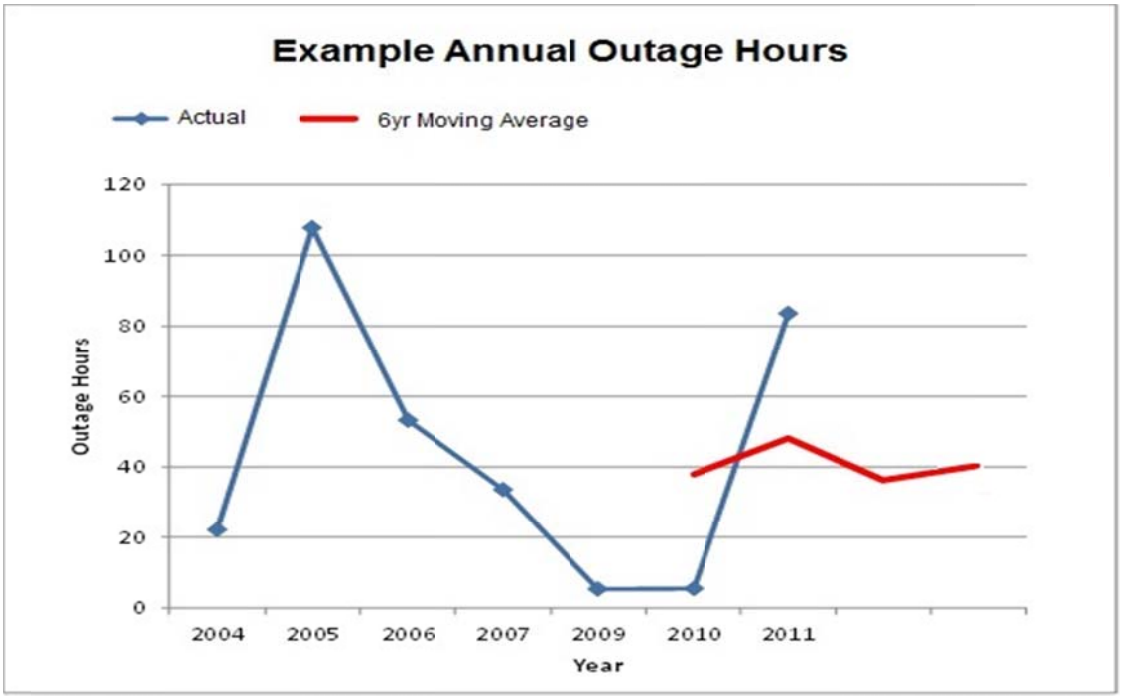
Unavailability = (1-Availability)

(Circuit 1 OR Circuit 2) = (P(C1)+P(C2))-(P(C1)*P(C2))
(Circuit 1 AND Circuit 2) = P(C1)*P(C2)

Single Line Diagram

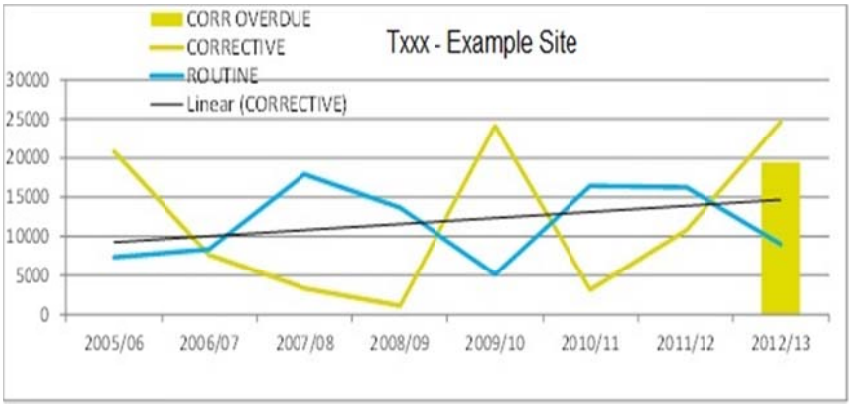


The base level reliability is compared against actual outage data for the site. This provides the base customer outage rates (hours per annum) and an indicative trend.



The base level routine maintenance costs are then calculated ($ million per annum) given the primary plant arrangement and size of site.

The corrective effort expected for the site is compared against the actual recorded data together with indicative trend indication.




The lost load (MW) and load growth (MW per annum) is taken from ElectraNet's demand forecast.

Finally these parameters are used in the cost benefit analysis together with other financial parameters.

A typical input parameter listing is shown below.

**Example Substation Replacement - Cost Benefit Analysis Inputs**

| **Data input** | |
|---|---|
| Capital cost ($m) | $ 17.5 |
| Asset life (years) | 40 |
| Discount rate | 7.43% |
| WACC | 7.11% |
| Routine maintenance costs ($m pa) | $ 0.012 |
| Corrective maint. costs (% of routine) | 30% |
| Base customer outage rate (hours pa) | 80 |
| Base customer outage rate - new sub (hours pa) | 22.5 |
| End of life customer outage rate multiplier | 1 |
| Growth in customer outage rate (pa) | 10% |
| Lost load (MW) | 4.5 |
| Load growth (pa) | 3% |
| Value of customer reliability ($/ MWh) | $ 44,300 |
| Growth in customer outage rate (pa) - Replacement | 12% |

A significantly lower value of customer reliability has been assumed for SA Water pumping station loads.