ABN 85 082 464 622

RELIABILITY MANAGEMENT PLAN

DOCUMENT NUMBER: 30160638-V1C

DATE: 17 FEB 2011

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EXECUTIVE SUMMARY

The Reliability Management Plan details the dedicated reliability maintenance programs to deliver the objectives of the Reliability Strategy. The management plan focuses on addressing reliability performance issues as measured against the reliability standards in the Tasmanian Electricity Code (TEC).

Aurora considers the effect of planned interruptions on the reliability standard as an easily controllable and cost effective improvement measure requiring no forecast capital expenditure. Aurora will use this approach to ensure compliance with the TEC.

Following the focussed reliability improvement effort over the present regulatory period, a program of reliability maintenance in specific communities and the Local Reliability Program will continue to address isolated areas of below target performance.

The forward reliability management program shows no further capital investment to improve reliability; however, capital invetsment and an increased operating expense is forecast in order to maintain existing performance.

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REV NO.	DATE	REVISION DESCRIPTION	APPROVALS	
0	17 Feb 2011	Original Issue	Prepared by	AJF
			Reviewed by	BD'A
			Approved by	MJG

1 PURPOSE

The purpose of this document is to describe, for Network Reliability:

- Aurora's approach to reliability management, as reflected through its legislative and regulatory obligations and Network Management Strategy;
- The key projects and programs underpinning activities for the period 2012/13-2016/17; and
- Forecast CAPEX and OPEX, including the basis upon which these forecasts are derived.

2 OBJECTIVES

The objectives of the Network Management Strategy are to:

- Maintain Network performance (SAIDI/SAIFI) to consumers
- Minimise cost of supply to the customer
- Minimise business operating risks

3 SCOPE

This management plan covers the activities to maintain the reliability in the distribution network.

Reliability is measured throughout the industry using the reliability indices, System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI), Customer Average Interruption Duration Index (CAIDI) and Momentary Average Interruption Frequency Index (MAIFI).

Aurora also uses the reliability measures defined in the TEC for Community and Category performance, and for managing performance in accordance with the TEC.

The Reliability Management plan delivers the objectives of the Reliability Strategy through two key programs;

- Targeted Reliability Improvement Program (maintenace phase)
- Local Reliability Management Program

Planned outage management is a key initiative to deliver compliance with the TEC without the significant cost increases to the customer through increased

Capital programs. This program is not discussed within the Reliability Management Plan.

4 BACKGROUND

Aurora is licensed by the Regulator under the Electricity Supply Industry Act 1995 as a provider of distribution network services on mainland Tasmania. As a licensed electricity entity, Aurora must comply with, amongst other things, the TEC, and the Reliability Standards contained within.

Aurora's distribution business, comprising the Network and Network Services divisions, uses a "thread management" approach to asset management, whereby staff associated with all aspects of an asset's life cycle, from planning to installation and maintenance, can be considered as an organisational unit. The Reliability thread of Aurora's Network division is responsible for managing Aurora's distribution network to comply with the jurisdictional performance standards (these are reproduced at Appendix A).

The Network Management Strategy provides an overview of Aurora's approach to managing its distribution network to achieve compliance and can be found in NW-#30065608-Network Management Strategy

This document describes the Targeted Reliability Improvement Program (TRIP) Maintenance, and the Local Reliability Management Program to achieve the objectives of the Network Management Strategy.

5 AURORA'S RELIABILITY MANAGEMENT APPROACH

Aurora has a pragmatic customer focus to managing reliability to areas that are receiving below target performance. Aurora considers the most cost effective method of achieving reliability performance in accordance with the TEC is by focussing on planned outages across the network.

5.1 Distribution Network Performance Standards

The Distribution Network Performance Standards were set within the TEC following a consultative process involving a joint working group with representatives of the Office of Energy Planning and Conservation, Aurora and the Regulator's office, and provide two separate but related measures of network performance.

The first, most general level is concerned with five community categories:

1. Critical Infrastructure,
2. High Density Commercial,
3. Urban,
4. Higher Density Rural and
5. Lower Density Rural.

Each of these five categories has an associated frequency of outage standard and cumulative outage duration standard. In accordance with the TEC, Aurora is required to use reasonable endeavours to ensure that the frequency of outages for a category, averaged over all communities in that category, and the cumulative duration of outages for a category, averaged over all communities in that category, are less than the appropriate thresholds set in the standards.

The second measure of network performance is related to individual communities. In this case, Aurora is required to use reasonable endeavours to ensure that the frequency of outages for a community, averaged over all customers in that community, and the cumulative duration of outages for a community, averaged over all customers in that community are less than the appropriate thresholds set in the standards.

5.2 Communities

One hundred and one communities are defined in the joint working group report. A community represents a geographic grouping of customers with similar energy consumption. The representation allows several advantages over the feeder grouping approach commonly used throughout Australia.

- Customers can be communicated with using references to the community they belong too. This is a more customer friendly

approach as opposed to feeder references that customers have no comprehension of.

- Aurora feeders often travel through different customer demographics. For example one Aurora feeder emanates from the West Hobart Zone, services high density commercial load close to Hobart CBD, then continues on to service urban residential load, then continues into sparsely populated rural and bush land. In this case the feeder was classified as a 'Rural' feeder.

5.3 Categories

As noted above, five categories of communities are defined in the joint working group report, and standards for each defined in the TEC. The category measure was developed to provide a more generalised measure of performance across the State.

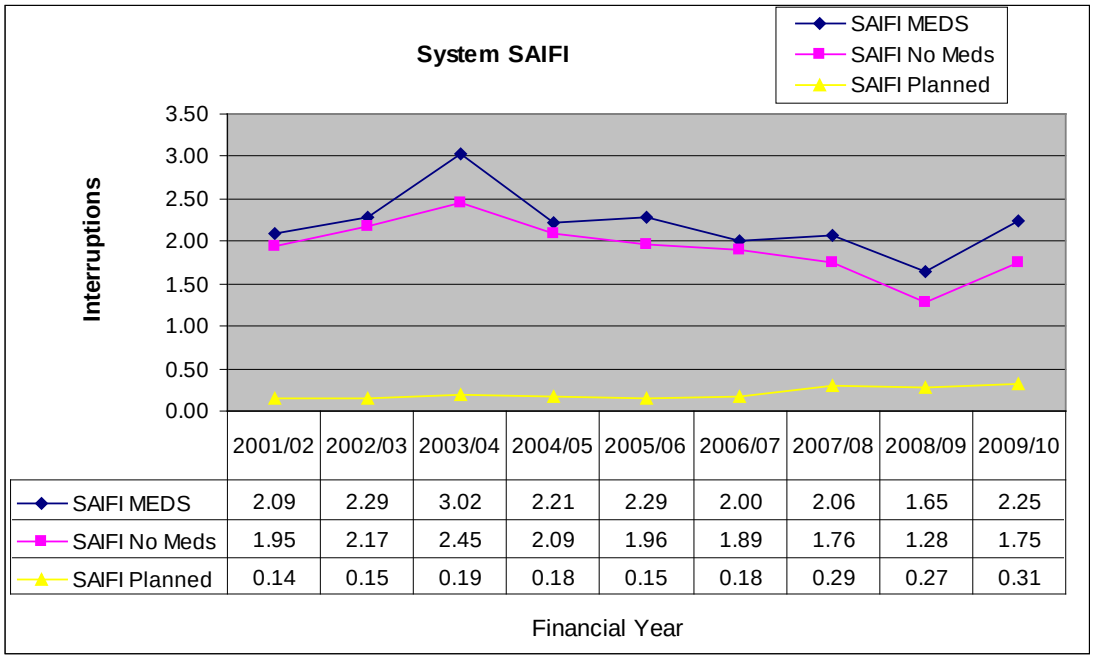
5.4 Performance Reporting

As part of the attempt to better represent reliability performance as seen by Aurora's customers, most outages are included in the measures of Community and Category performance. Notably, outages due to planned work and outages due to extreme weather events (or Major Event Days) are included in the performance measures and reported on.

6 RELIABILITY PERFORMANCE

6.1 System Reliability

The below diagram, Figure 6.1-1, shows a steadily improving trend in the overall distribution network SAIFI over the current regulatory period. An exception is 2009/10 that experienced performance deterioration due to a significant storm event in 2009 and increases in asset failures. These gave rise to increases in both SAIFI inclusive and exclusive of major event days. However; planned SAIFI remained relatively constant over the period with an increase in the last three years attributable to the increased general CAPEX and OPEX program during the current regulatory control period.



	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
SAIFI MEDS	2.09	2.29	3.02	2.21	2.29	2.00	2.06	1.65	2.25
SAIFI No Meds	1.95	2.17	2.45	2.09	1.96	1.89	1.76	1.28	1.75
SAIFI Planned	0.14	0.15	0.19	0.18	0.15	0.18	0.29	0.27	0.31

Figure 6.1-1 SAIFI Performance

The below diagram, Figure 6.1-2, shows a steady trend in the overall distribution network SAIDI over the current regulatory period. An exception is 2009/10 that experienced a decrease in performance, with the SAIDI (exclusive of MEDs) value increasing to 211 minutes due to medium sized storm events and asset failures. The MED component saw a deterioration to 420 minutes as a result of the extreme weather event during September 2009. Planned outage SAIDI increase in the last three years. This can be attributed to the increased CAPEX and OPEX in the current pricing determination.

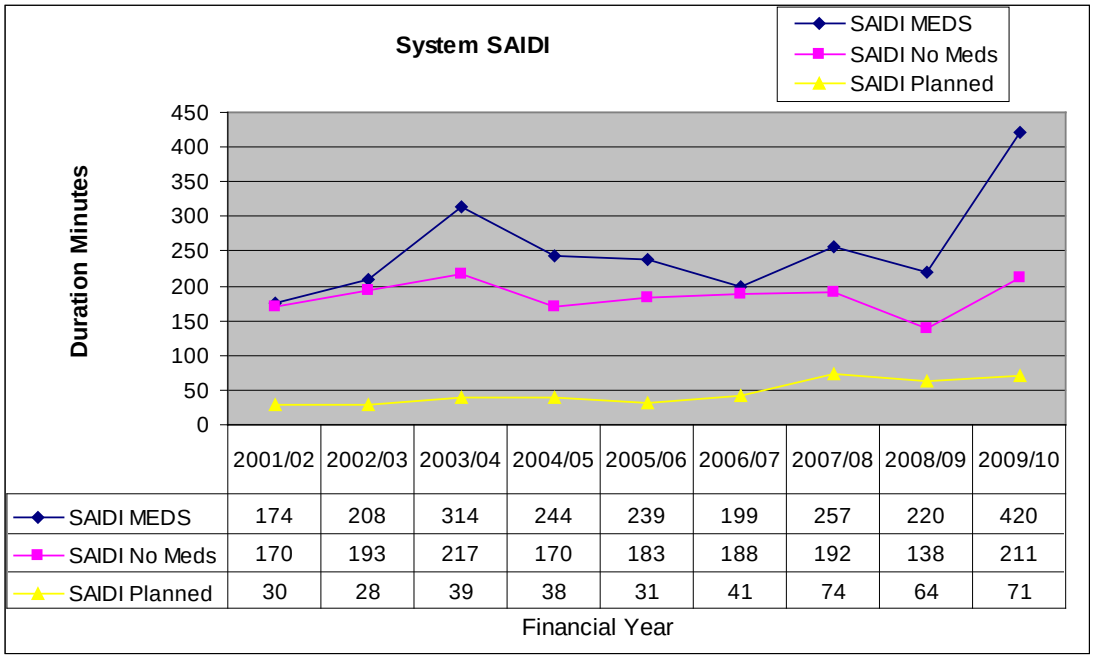


Figure 6.1-2 SAIDI Performance

6.2 TEC Category Performance

Table 6.2-1 shows the 2009/10 TEC Category performance. The Categories are all performing well against the Frequency measure, however Critical Infrastructure has shown a large historical variation on this. The Duration measures show below target performance against the standard. This below target performance is largely attributed to the significant storm event in September 2009.

Community category	Average number of interruptions		Average minutes off supply	
	Frequency Limit	09/10 Category Frequency	Duration Limit	09/10 Category Duration
Critical Infrastructure	0.20	0.19	30	21
High Density Commercial	1	0.76	60	80
Urban and Regional Centres	2	1.38	120	209
Higher Density Rural	4	3.69	480	798
Lower Density Rural	6	4.16	600	992

Table 6.2-1 Community Performance

Further analysis on Reliability performance can be found in NW-#30122676-Reliability Performance Analysis 09/10

7 MANAGEMENT PLAN

7.1 Treatment of trade-offs

7.1.1 Inspection and monitoring

Reliability Management relies heavily on accurate and timely monitoring of performance.

Reliability monitoring is undertaken at all asset levels within the network enabling reporting from overall system indices to individual installations for GSL purposes. Community and Category performance is monitored monthly for TRIP reporting.

Condition audits are undertaken on assets and vegetation as part of the design phase of projects to allow the prioritisation of work. Thermal and corona inspections are undertaken before and after asset upgrades to ensure a quality outcome.

The network is centrally monitored for supply availability down to the recloser level. At present it is not efficient to monitor further down into the network; however, Aurora aims to drive technology improvements in the area to achieve greater monitoring. Beyond reclosers the detection of supply interruptions is reliant on calls through the customer service centre. Further enhancements are underway to increase the penetration of SCADA monitoring, allowing faster response times to losses of supply.

The management plan requires that all practical aspects of the network are monitored to ensure targeted and efficient direction of effort to achieve greatest effectiveness.

7.1.2 Planned vs Reactive Renewals

Reliability is most effectively managed by preventing outages occurring. Therefore planned investment is preferred in addressing existing and emerging reliability issues.

However planned action is not always efficient for reliability issues that affect a small number of customers. In these cases it is prudent to react to reliability issues following outages.

7.1.3 Non Network solutions

Reliability solutions can take advantage of many non-network alternatives.

7.1.3.1 Procedural

The objectives within the TEC include the effects on SAIDI &SAIFI of planned works on the network that require interruptions to supply, and Aurora is required to consider the impacts of this on its customers. An opportunity exists to improve the efficiencies in timely response to identified issues, the scheduling and implementation of planned work to minimise impacts on SAIDI &SAIFI rather than expending capital on network augmentations that would permit planned works with minimum interruptions to supply. This is presently being addressed through the initiatives in the Distribution Business Strategy to

"Turn Up Once". This intiative forms the basis of Aurora's program to ensure compliance with the TEC.

7.1.3.2 Mobile and Fixed Generators

Mobile generators can provide emergency backup supplies for extended un-planned outages, and as supply during planned outages.

Aurora considers there are many opportunities within the network to deploy mobile generators to improve the average performance due to planned work and to mitigate specific Community performance issues.

Aurora is also considering the use of existing third party embedded generation for network support.

8 TARGETED RELIABILITY IMPROVEMENT PROGRAM (SUSTAIN PHASE)

8.1 Introduction

The targeted reliability improvement program (TRIP) objective has been to improve the reliability performance of individual communities. The work do date has focussed on the step change improvements necessary to bring community performance to the required level. An additional focus to maintain this performance is now necessary.

The TRIP has addressed a significant number of communities during the present regulatory period through the capital network augmentation with improvements in unplanned performance demonstrated.

However inline with the present Distribution Business Objective of "No increase to customer prices as a result of our efforts" requires adopting the least cost approach to improving reliability. To that end Aurora will focus on process improvements to reduce planned outage impacts on Reliability and does not forecast any capital expenditure for Reliability improvement.

Aurora will consolidate the reliability gains made in the present regulatory period by maintaining this performance.

8.1.1 TRIP Phases

The TRIP has five elements that aim to improve and sustain each community's performance to the Distribution Network Performance Standard (DNPS). Figure 8.1-1: The TRIP Process shows the overview of the TRIP strategy.

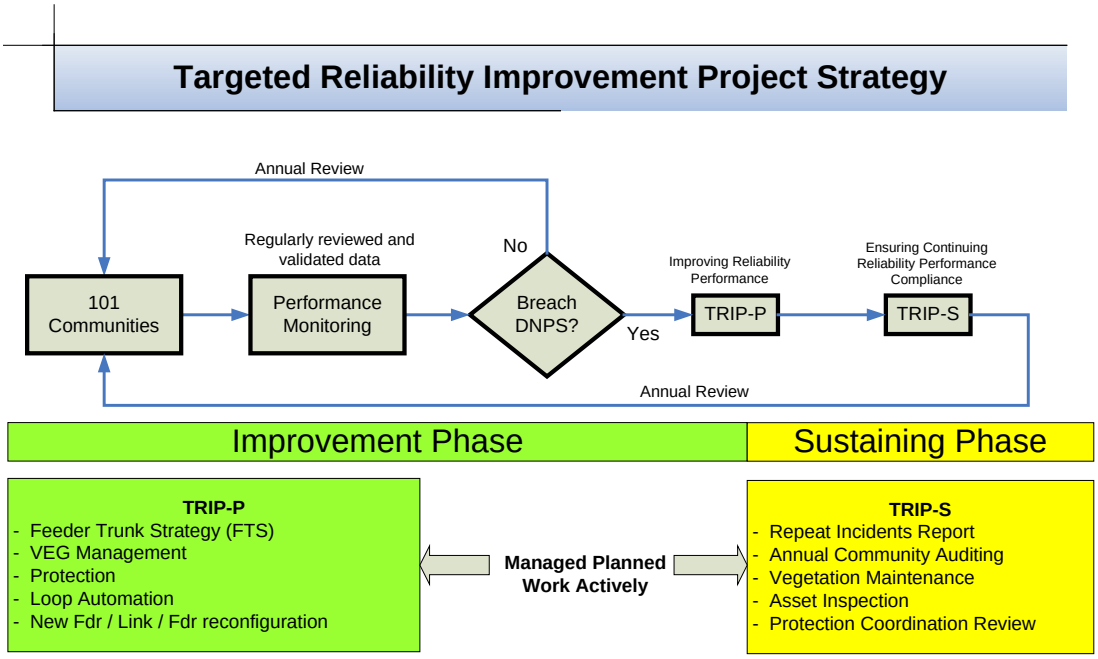


Figure 8.1-1: The TRIP Process

The TRIP Strategy consists of two phases: 1. Community Reliability Improvement Phase (TRIP-P) and 2. Community Reliability Sustain Phase (TRIP-S). The programs involved in these two phases are outlined as following.

8.1.2 Community Reliability Improvement Phase (TRIP-P)

TRIP-P is the improvement phase designed to provide a step change in reliaility performance to individual communities. This program has formed the bulk of the Reliability Management program to date and addressed over 50 communities in the present regulatory control period.

This program ceases in 2011/12 as the focus shifts to maitaining the reliability gains acheieved.

8.1.3 Community Reliability Sustaining Phase (TRIP-S)

TRIP-S is designed to maintain the reliabilty gains achieved through the TRIP-P and hence compliance with the jurisdictional performance standards.

Individual community performance is measured on a monthly basis.

Data collected by the Regional Area Managers is analysed for trends or specific issues that may affect performance, and appropriate action is taken to mitigate the effects on reliability.

In the first instance, TRIP-S will be applied to those communities that have been subject to a TRIP-P. It is expected that, over time, the TRIP-S program will be expanded until all 101 communities are included in the program.

TRIP-S will be achieved through several operational expenditure tasks, specifically:

- Vegetation maintenance
- Thermal/Corona Inspections
- Protection coordination reviews
- Performance Monitoring

9 LOCAL RELIABILITY PROGRAM

Community reliability is affected by outages smaller than whole feeder or substantial part of feeder.

The Local Reliability Program is designed to investigate small scale or commonly occurring outages identified through data analysis or following customer complaints, and to implement mitigation action where appropriate.

Aside from the direct benefits to community and classification reliability improvements this program also addresses, to an extent, multiple outage GSL payments.

The strategy responds to issues identified by the different performance monitoring systems available.

9.1 Interaction with GSL Scheme

Aurora recognises the function of averaging performance across Communities, Categories and the System can miss customers experiencing the worst performance. The GSL scheme is one method for recognising below target performance to individual customers.

Aurora recognises that there will be circumstances when restoration of supply within the GSL threshold will not occur. The reasons for not meeting the threshold are varied, including cost efficiency, and will normally be particular to the circumstances of a each supply interruption event or combination of events. However Aurora monitors this performance and implements solutions to improve performance at local levels in response to GSL payments or in an attempt to avoid future payments.

While the GSL scheme measures worst performance as experienced by the customer, it includes outages outside of the distribution network and Aurora's control, for example transmission outages. Therefore GSL is not a direct measure of distribution network performance.

Given this, the strategy will have an impact on GSL payments, but is not specifically targeted at reducing GSL payments.

Reliability is also affected by small-scale outages; for example, transformer failures, and wildlife or vegetation interactions with infrastructure. The Local Reliability Program is designed to investigate small scale or commonly occurring outages identified through data analysis or following up customer complaints, and to implement mitigation action where appropriate.

9.2 Local Reliability Program Process Overview

Reliability performance is monitored and reported in various ways throughout the business to serve different purposes. While system reliability is reported at a high level to represent performance trends, performance is also monitored at Community Level for the TRIP Strategy, and at further localised levels to highlight worst performance.

9.2.1 Past Process

The local reliability process has been a predominantly reactive process during the present regulatory period. The process has been to deal with each issue individually within the annual program of work by having budgeted funds available to respond quickly.

While this is appropriate for high priority work that needs to be resolved in less than twelve months, low and medium priority work is best managed through a prioritising system and annual programming of work.

9.2.2 New Process- Reactive and Planned Process

The process going forward is to continue the present reactive process for higher priority time critical issues and implement a new annual planning process for remaining local reliability issues.

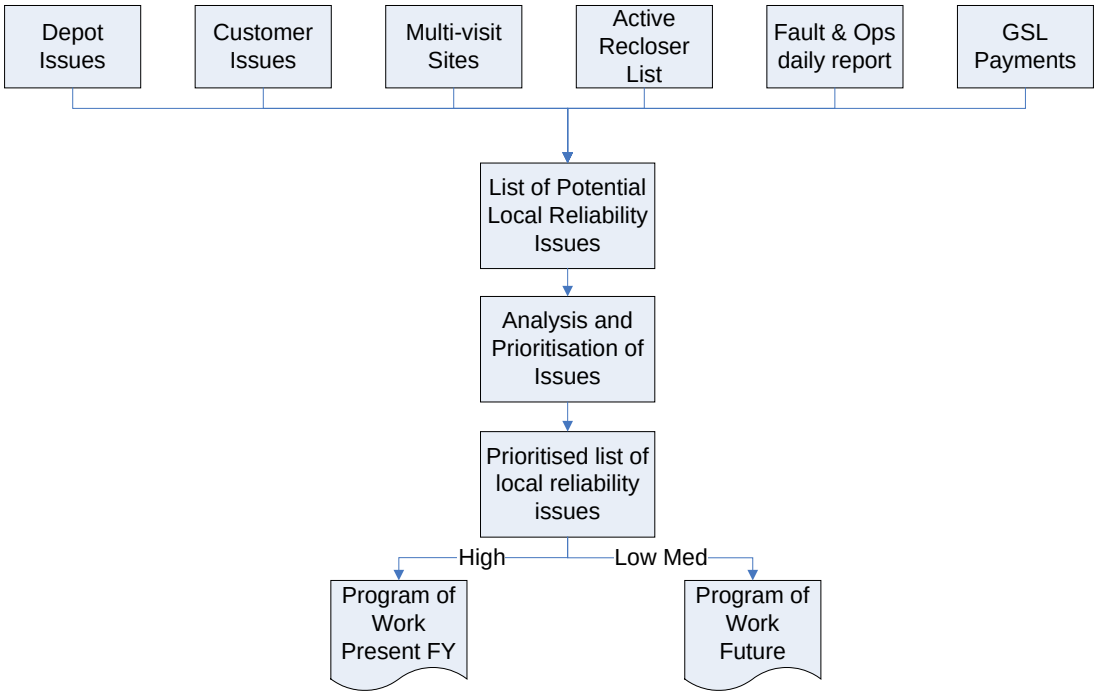


Figure 9.2-1 Local Reliability Process

There are several systems available to monitor and highlight localised below target performance in the network.

- Depot Issues

The local field crews that continually work in particular regions in the network gather valuable knowledge and experience on reliability of their "patch." Issues such as recurring outages, general trends or problem areas are identified for further investigation.

- Customer Issues

Aurora Network's Customer Advocacy Team gathers customer complaints and issues and forwards these to the reliability planning team for consideration and analysis.

- Multi-visit Site

Below target network reliability can result in control stations and transformers experiencing multiple outages. Aurora's Reliability Reporting System captures all permanent outages and displays this information on the Aurora Webmap GIS. This display easily identifies the locations that have had multiple outages and provides an indication on the outage causes.

Outages greater than two in any financial year are considered and analysed.

- Active Recloser Analysis

The active recloser list process has been developed to provide local area managers with timely information on reclosers that have recently operated in response to faults.

The active recloser list works on the premise that future permanent outages are developing while there are frequent recloser pickups and single recloses.

More details on the Active Recloser process can be found in NW-#30001890-Introduction to the New Active Recloser List

- Fault and Operations Daily Report

The Fault and Operations daily report provides daily information on distribution system outages on the preceding day. Outages are monitored for high priority issues that need to be addressed immediately. Lower priority jobs will be detected through other processes such as the multi-visit site process.

- Guaranteed Service Level

Aurora monitors GSL payment status and will respond to areas with significant GSL activity due to distribution network contribution.

9.3 Local Reliability Performance

The Local Reliability Program aims to maintain the management of local reliability issues at a local level and to maintain reliability levels at existing levels rather than reliability improvements.

Present local performance is monitored by several systems including the Multi-visit site Webmap thematic and the Active Recloser List. The programs outlined in the Local Reliability Management Plan aim to maintain reliability performance by responding to newly emerging issues as they arise. For example deteriorating assets, vegetation issues, and customer complaints will continue to develop over time, and these need to be identified and addressed before giving rise to a permanent outage.

10 RELIABILITY WORK PROGRAMS

10.1 Vegetation Clearance and Management

TRIP-P Projects receive a “V” vegetation cut where possible, providing a step change in vegetation clearances and reliability improvement. TRIP-S projects allow for the maintenance of this increased clearance zone. This level of vegetation cut exceeds the level undertaken by the Vegetation Thread and the forecast of the reliability vegetation cut has been taken into account by the Vegetation Thread.

Vegetation management is planned and coordinated in conjunction with the Vegetation Thread. The potential for double counting funding exists between the two threads. This is accounted for at a program level, whereby corresponding funding for vegetation management within TRIP reduces the Vegetation Thread funding.

Regular vegetation maintenance targets the areas that are heavily vegetated and known to have caused adverse impact on reliability performance. This includes cutting trees/branches that cause transient or permanent faults during periods of high wind activity or clearing vegetation from around the base of poles to ensure the effectiveness of possum guards.

10.2 Infrared Corona, Thermal Imaging Inspection

Deteriorating asset condition will often result in the build up of un-necessary heat or the discharge of corona ions. This poor condition can be detected during high demand periods with thermal and infra-red sensing equipment.

As part of the Feeder Trunck Strategy (FTS) work thermal/corona inspection signals replacement of poor condition assets before failure. Twelve months after an FTS has been completed, another inspection is completed to verify work completed.

Thermal/corona inspections will also be completed as part of TRIP-S every two years.

All inspection results are shared with the Overhead Assets team and all high priority work is identified daily and remediation steps are taken.

10.3 Protection Co-ordination Review

A protection review is undertaken during the TRIP-P phase to ensure the protection devices will deliver the required performance. However this level of protection accuracy can deteriorate over time as new point loads, incremental load growth and feeder reconfigurations alter the network. Therefore the protection systems in place need to be reviewed periodically to ensure ongoing performance. The protection review for TRIP-S is generally a desktop review and any changes will be very minor.

10.4 Local Work Programs

Analysis of the identified issues is undertaken to determine the root cause. The solution is then assigned to the appropriate team for action. The Local Reliability Program comprises five work categories, an overview of each is provided below.

10.4.1 Local Reliability (General) (Category PRREL)

The Local Reliability category is a budget allocation available to respond to general reliability issues identified through any of the monitoring systems. Solutions can include additional poles or delta spacing to prevent clashing, additional fault indication, additional fuses, and network reconfiguration. This program excludes mitigation of bird strikes and new feeder links.

The previous four years (07/08 - 10/11) shows volumes of work between 30 and 50 per annum with an average of 36 per annum. Aurora expects the reviewed Local Reliability Process will result in a reduction in volumes of work completed in this work category to between 15 and 25 jobs per annum.

10.4.2 Multi-visited Control Stations & Transformers (Category PRTXI)

This program aims to respond to reliability issues that result in the frequent or repetitive operation of protection devices with the view to resolve repeating outages.

The issues are identified through the Multi-visit Webmap thematic or Active Recloser List. Different protection levels are given different importance as the number of customers connected varies.

Feeder circuit breakers are given highest importance, and there are generally few repetitive trips.

Recloser trips are considered next important and frequent activity is highlighted in the Active Relcoser list as well as the Multivisit Webmap thematic.

Fuse activity is considered next as fuses only control a relatively small number of customers.

10.4.3 Portable Fault Indicator purchase

To allow faster response to emerging reliability issues it is proposed to purchase six sets of portable fault indicators.

The Active Recloser list allows faults to be detected at an early stage before a permanent outage has occurred. For example a cracked insulator may take several weeks to finally fail. The crack will allow short and intermittent fault current resulting in Recloser “pickup” events. As the fault develops the fault current will increase in duration resulting in one or two “reclose” events. Final failure will result in a permanent lockout and loss of supply to customers.

The proposed portable fault indicators will allow reliability officers to place the fault indicators at strategic locations to detect such faults before they develop into permanent outages.

This program is to aid response in individual and temporary cases, as opposed to the Overhead and Underground Fault Indication Program aimed to compliment the Remote Control Program.

10.4.4 Feeder Sections for reliability

The Feeder Sections for Reliability Program aims to identify radial areas in the network that would benefit from short feeder sections to provide alternate restoration paths. This program has been developed following feedback from field staff on areas of the network that are largely radial, but with only minor network augmentation will provide greater interconnectivity, improving fault response and SAIDI.

10.4.5 Reliability Mitigation- Bird Strike (Category PRSPT)

This program is to minimise potential for birds to collide with the distribution network, thereby reducing outages, repair costs and reducing fire risk caused by collision-induced conductor clashing.

The actual death of native wildlife as a result of contact with conductors is also of concern, particularly when the species are endangered. Aurora works closely with environmental agencies to deal with these issues.

11 SUMMARY OF PROPOSED EXPENDITURE

This section contains a summary of the forecast expenditure to undertake the reliability programs.

11.1 CAPEX

Table 11.1-1 shows the CAPEX.

	2012/13	2013/14	2014/15	2015/16	2016/17
Local	$1,615k	$1,560k	$1,550k	$1,530k	$1,515k
Other	$20k	$20k	$20k	$20k	$20k
Total	$1,635k	$1,580k	$1,570k	$1,550k	$1,535k

Table 11.1-1 Proposed CAPEX

Table 11.1-2 shows the OPEX.

OPEX	2012/13	2013/14	2014/15	2015/16	2016/17
TRIP-S	$775k	$760k	$755k	$755k	$755k
Total	$775k	$760k	$755k	$755k	$755k

Table 11.1-2 Proposed OPEX

11.2 Comparison with Historical Spend

The change in Network Strategy and corresponding reliabilty approach to maintain reliability has resulted in an significant decrease in future capital investment compared to the present regulatory control period.

The figures below show the actual investment in Reliability improvement but also include the work represented by the Protection and Control threads. For true comparison both budgetary figures should be compared.

Actual $	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
CAPEX	$2,410k	$2,990k	$3,420k	$5,200k	$8,185k	$8,265k	$11,645k

Table 11.2-1 Historical CAPEX

The reliability program now features operating expenses as the TRIP moves into the maintenance phase, Table 11.2-1. Previously the Reliability Program has not used any OPEX.

11.2.1 TRIP-S

TRIP-S increases in volume and scope to maintain the improvement on the communities addressed in the present regulatory control period. This program remains flat for the coming period and will remain at this level under the present strategy.

11.2.2 Local Reliability

The local reliability program has been in place for the current and previous regulatory periods and will see a fifty percent reduction in the coming period as the number of issues reduce and the focus moves from improvement to maintenance.

12 REFERENCES

NW-#30065608-Network Management Strategy

NW-#30122676-Reliability Performance Analysis 09/10

NW-#30077521-TRIPS/FTS Costing Template

APPENDICES

A.1 TEC Distribution Network Performance Standards

Supply Reliability Category	Annual number of supply interruptions (on average)		Annual duration of supply interruptions (on average)	
	Category	Community	Category	Community
Critical Infrastructure	0.2	0.2	30 mins	30 mins
High Density Commercial	1	2	60 mins	120 mins
Urban and Regional Centres	2	4	120 mins	240 mins
High Density Rural	4	6	480 mins	600 mins
Lower Density Rural	6	8	600 mins	720 mins

Figure 11.2-1 TEC Distribution Network Performance Standards

A.2 TEC Community Example

Figure 11.2-2 shows an example of Reliability Community. The fawn colour shows the area representing the “Midway Point” Community. Each of the 101 communities has a geographical boundary defined within Aurora’s Geographical Information System and used for reporting and analysis.

Figure 11.2-2 Midway Point Community