Mervyn Davies' Enquiry: Power and Water's Third Progress Report

December 2009

PowerWater

Executive summary

Power and Water is committed to implementing the Mervyn Davies Report recommendations and is working systematically to improve network reliability.

This is the third quarterly report detailing progress on the 37 major milestones to fulfil Mervyn Davies' recommendations. This document provides a transparent report to stakeholders, including the Government, the Utilities Commission and the wider community.

Over the past three months significant progress on replacing the failed 11kV switchboard from Casuarina Zone Substation has been made. The new permanent switchboard has been delivered, tested and is being installed in the building. It should be fully operational mid-2010.

Two temporary switchboards are installed on site. The original switchboard has been removed and taken to Power and Water's workshop for comprehensive testing.

As the condition of each asset is more thoroughly investigated a better understanding of the required remedial and ongoing maintenance work is being carried out and documented.

Since the last progress report a further three zone substations have been returned to normal operating status.

It is expected to take until December 2010 to complete the Remedial Works Plan. Progress has been consistent on each Recommendation:

- Condition-based maintenance has been carried out on all zone substation assets where appropriate;
- Training has been completed on new test gear and technically expert training managers have been appointed.
- A wide-ranging restructure of the Power Networks' business has continued and key roles have been filled.
- A leadership program and regular staff forums have commenced in Power Networks to improve collaboration with the workforce.
- A condition assessment and remedial program has commenced, with crews on many occasions working through the night to access equipment safely and with minimum disruption to customers.
- Two temporary switchboards have been installed at Casuarina to restore the substation to its original capacity, and the project for its permanent replacement is well advanced.

The Power and Water team is determined to complete the plans outlined in this report safely and with minimum disruption to customers. Work has progressed consistently and timelines, as well as the scope of works, is changing to provide the best solutions. On completion, Power and Water will offer a more reliable service, with a well-funded, well-trained and well-led workforce.

This will ultimately benefit all Power and Water's customers.

Contents

Glossary

AMC	Asset Management Capability
CAIDI	Customer Average Interruption Duration Index (a measure of reliability)
CB	Circuit breaker
CT	Current transformer
DAR	Defective Apparatus Record
EMC	Executive Management Committee
FIS	Facilities Information System
HV	High voltage
LTAP	Long Term Action Plan
MMS	Maintenance Management System
OCB	Oil circuit breaker
PEP	Project Execution Plan
RAMP	Remedial Asset Management Program
RISQ	Risk, Investigation, Safety and Quality – Power and Water's hazard investigation database, among other things
RWP	Remedial Works Plan
SAIDI	System Average Interruption Duration Index (a measure of reliability)
SAIFI	Customer Average Interruption Frequency Index (a measure of reliability)
SCADA	System Control and Data Acquisition
VT	Voltage transformer
WIMS	Works Implementation Management System

1 Introduction

This is the Power and Water Corporation's (Power and Water's) third Progress Report on the Northern Territory Government's independent inquiry into electrical equipment failures at Casuarina Zone Substation and general asset maintenance practices.[1]

This report summarises Power and Water's actions to:

- ensure that the condition of Power and Water's electrical equipment meets established industry standards;
- improve maintenance practice and performance; and so
- fulfil all the Mervyn Davies Report's recommendations.

Power and Water welcomed Mervyn Davies' preliminary and final reports on publication and has been working on the Recommendations since the preliminary report. This provides the third public progress report to stakeholders (including the Board, Utilities Commission, NT Government and the wider community).

Power and Water's overarching objective in addressing these recommendations is to provide a secure and reliable electricity supply, ensuring that all electrical assets meet established industry standards and continue to operate at those standards. Power and Water is embedding changes to maintenance practices, training, leadership and culture to secure this.

1.1 Background

In September and October 2008, a number of electrical equipment failures at Casuarina Zone Substation resulted in widespread disruption to Darwin's Northern suburbs. Consequently, the Northern Territory Government established an independent inquiry headed by Mervyn Davies to investigate these events, Power and Water's operational response and electrical substation maintenance practices in Darwin.

Throughout the investigation Mervyn Davies and his team were provided with complete cooperation and unrestricted access to Power and Water's records and staff.

A preliminary report was published in November 2008 and the final report in February 2009. The principal recommendations were that Power and Water should:

- Move its maintenance approach to 'condition-based maintenance.'
- Implement 'condition based maintenance' in substations as quickly as possible by acquiring information, support and clarifying accountabilities.
- Bed down organisational changes.
- Deliver improved systems and processes.
- Enhance policies and policy documentation.

[1] Independent Enquiry into Casuarina Zone Substation Events and Substation Maintenance Across Darwin, Final Report. Chairman: Mervyn Davies. 26 January 2009.

- Develop substations maintenance planning and works program.
- Report on maintenance delivery, asset condition, risks and failures.
- Enhance workforce capability, training, numbers and equipment.
- Implement a development program, with the objective of a more collaborative leadership style, improved communication and individual accountability.
- Review incident management and investigations, and complete some outstanding investigations.
- Undertake an overall remedial program.
- Take immediate action to replace the Casuarina Zone Substation 11kV switchboard.

The full Mervyn Davies Report recommendations are provided in Appendix A. Mervyn Davies became a member of the Power and Water Board in May 2009 and is currently Deputy Chairman.

1.2 Report structure

Power and Water's progress on and plans to meet the Recommendations are addressed as follows:

- A summary of progress on remedial works including repairs at Casuarina Zone Substation and the reform of substation maintenance operations, in Section 2.
- Longer-term measures to bring the standard of substation maintenance to established industry practice, described more fully in Section 3.
- The effect on customers of these activities, both in the short and longer term in Section 4.

Detail on each of the principal Recommendations and associated timelines is presented in Appendix B.

1.3 Future reports

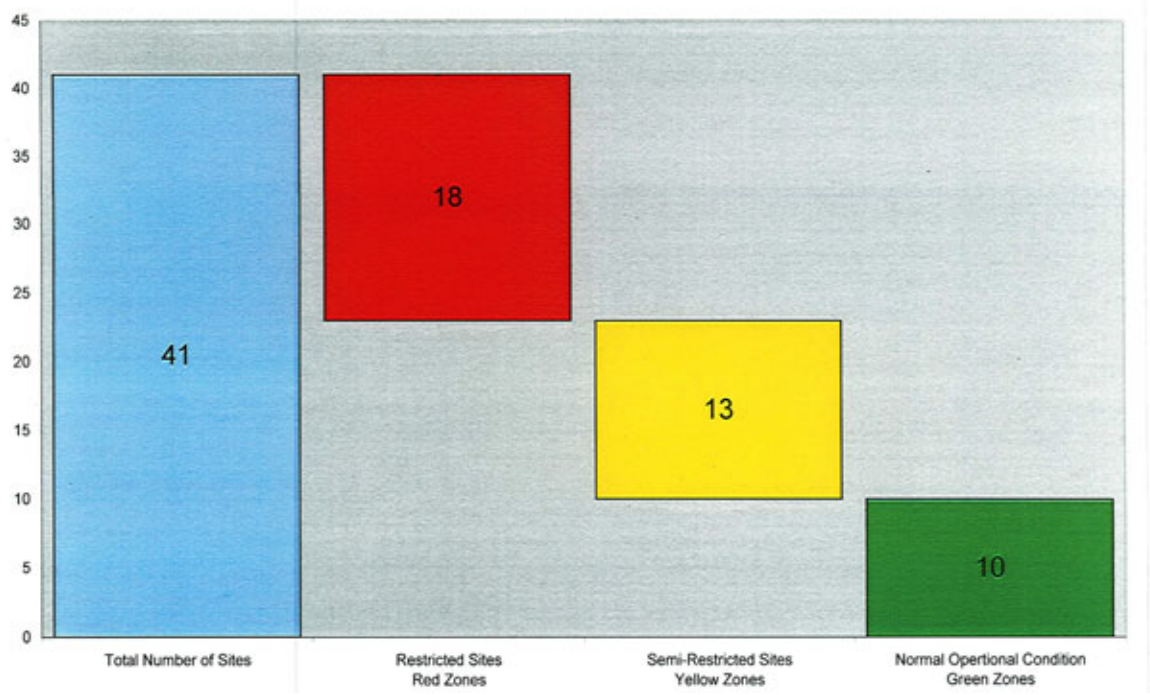
This format will form the basis for further quarterly reports to stakeholders (including the Board, Utilities Commission, NT Government and the wider community).

Feedback is welcome. This report is subject to an independent audit, an example scope of which is provided in Appendix C.

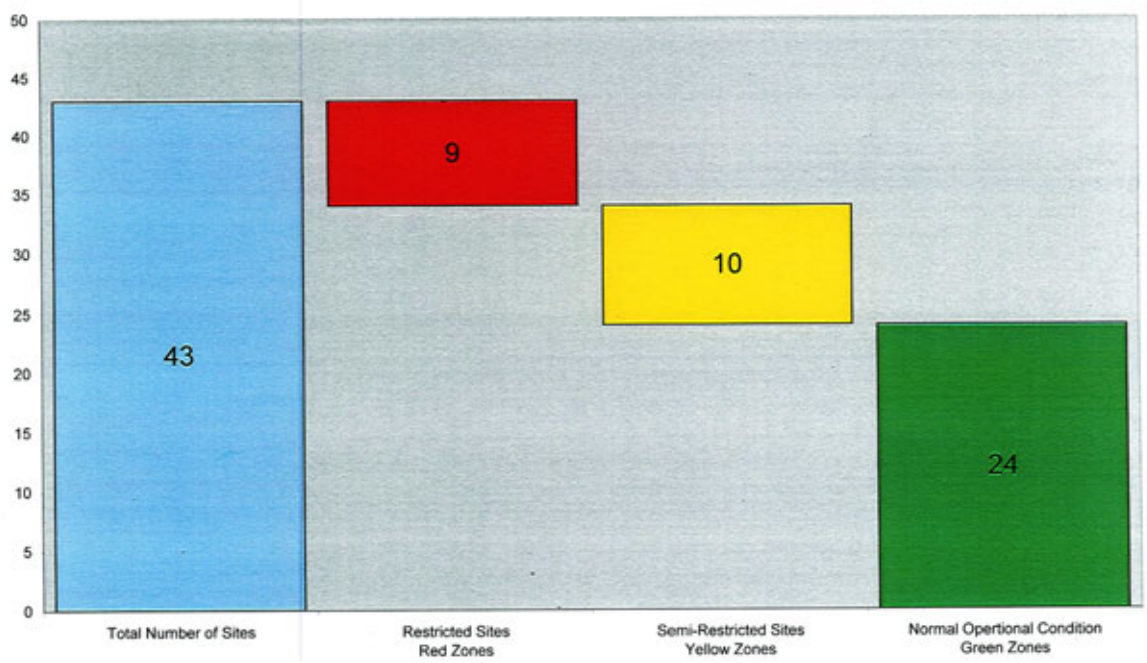
2 Progress

The graphs below illustrate the progress of the Remedial Asset Management Plan (RAMP) In October 2008, all sites were subject to condition assessment and 18 placed on "red" or restricted access and 13 on "yellow" or limited access. Since October 2008 the RAMP team has carried out significant remedial work, enabling 16 of these sites to be returned to normal "green" operating status.

October 2008



November 2009



This document summarises progress made on the Mervyn Davies Report Recommendations so far. As the scope of each task has been carefully assessed and analysed Power and Water has revised some of the tight timelines initially set. It has been possible to collapse some target dates further, however it has also been recognised that some original target dates could not be met due to the much larger scope of work required. These latter dates have been amended and are also reported against. Appendix D provides progress of implementation as assessed by external auditor AECOM Australia Pty Ltd.

Ref	Recommendation summary	Start Date	Target Completion	Status
1	Move maintenance approach to 'condition based maintenance.'	02/09	06/14	Revised to 08/12
2	Implement 'condition based maintenance' in substations as quickly as possible by acquiring information, support and clarifying accountabilities.	11/08	06/10	On track
3	Bed down organisational changes.	02/09	07/09	All but two positions filled
4	Deliver improved systems and processes.	02/08	12/10	Revised to 06/2011
5	Enhance policies and policy documentation.	11/08	06/10	Revised to 12/10
6	Develop substation maintenance planning and works program.	02/09	12/09	Revised to 03/10
7	Report on maintenance delivery, asset condition, risks and failures.	11/08	08/09	Revised to 12/11
8	Enhance workforce capability, training, numbers and equipment.	12/08	02/10	Revised to 06/10
9	Implement a staff development program, with the objective of a more collaborative leadership style, improved communication & individual accountability.	02/09	02/11	Implemented by 12/09 - ongoing
10	Review incident management and investigations, and complete some outstanding investigations.	02/09	12/09	On track
11	Undertake Remedial Programs	11/08	09/10	On track
11.3	Take immediate action to replace the Casuarina Zone Substation 11kV switchboard.	10/08	05/10	Revised to 06/10

The remainder of this section highlights the most significant areas where progress has been made. It is not intended to cover every Recommendation in detail.

2.1 Apply 'objective need' to maintenance

Recommendation 1 states Power and Water should:

> *"Accelerate the implementation of its documented planning intention of adopting a 'framework of objective need' as the basis for maintenance, progressively implement systemic and rigorous condition monitoring, and adopt asset condition as the prime basis for determining 'objective need'."*

Power and Water has made major improvements to its business planning process over the past three years. Five-year business plans were established for each business unit in 2007, with an update each year. This was fundamental to the preparation of the Corporation's 2007/08, 2008/09 and 2009/10 Statements of Corporate Intent (in effect, its business plans and budgets).

The Corporation adopted the '**objective need, capacity to deliver**' approach following an internal review of capital expenditure and maintenance practices with regard for the Blanch Report (2006). It was recognised that continuing to constrain expenditure would not ensure sustainable power supply and reliability going forward.

The impact was both immediate and dramatic. Capital expenditure in 2007/08 for Power Networks was $58 million, about 50% higher than 2006/07, with further significant increases proposed over the next three years.

Power and Water's latest business plans cover the period 2009/2010 to 2013/2014. These include detailed actions and deliverables for the first year, with strategic actions for subsequent years. This planning has resulted in a significant increase in infrastructure investment program.

In parallel, the Power Networks business has been revising its planning criteria. These revisions, commenced in early 2008, provide a clear basis for investment in the distribution network. They draw on practice across Australia and help ensure the power network is designed to similar standards as the rest of Australia. The revisions will be reviewed and the resulting criteria submitted to the Utilities Commission for approval.

2.2 Bed down organisational changes

Power and Water's Managing Director approved the Power Networks business unit restructure in March 2008. The objective was to progressively provide new roles, responsibilities, skills and processes to refresh and modernise knowledge and practices.

The restructure was put on hold pending the Mervyn Davies Report. The Report largely endorsed the restructure, providing some additional guidance on desirable maintenance outcomes, and the restructure proceeded from there.

Power Networks has appointed a number of suitably experienced managers to fill key positions. Significant changes recommended for the capital and maintenance delivery business are almost complete.

The main feature of the new organisational structure is the separation of the accountability and performance of asset management into a 'strategy and planning' team and a 'service delivery' team, which follows the "Asset Manager – Service Delivery" model.

This will better support the workforce with planning advice, technical knowledge, and documentation in the form of policies, procedures, work instructions and technical specifications.

2.3 Deliver improved systems and processes

In early 2008, Power and Water's Board approved a strategy to reform the Corporation's asset management practice. The resulting Asset Management Capability project (AMC) will upgrade asset related systems, policies, procedures and culture and ultimately drive better plant and network reliability and more efficient maintenance.

Recommendation 4 states Power and Water should:

> *"Ensure that the systems and processes delivered by the AMC, do as they are expected to do and, provide capabilities for substation maintenance management and asset condition management, that support the recommendations of this report."*

In February 2009, a detailed $29M program was approved by the Board. Tenders were assessed and the successful tenderer appointed in September 2009 for the implementation of an enhanced asset management system and geographic information system.

Roll-out is scheduled to start at the end of 2010 and progress through 2011. A successful AMC project will support the wider intent of the Mervyn Davies Report.

2.4 Enhance workforce training, numbers and equipment

The Mervyn Davies Report identified a number of areas where specific training should be improved, workforce numbers increased and equipment upgraded. Power and Water invested just under $1M in training in Power Networks in the 2008/09 financial year and a similar amount is forecast in 2009/2010. This met the recommendations for a greater level of craft-based training.

Power and Water has revitalised its training program by:

- Establishing an in-house training team to determine training needs and coordinate training to meet operational requirements. While significant training has already taken place (see below) the dedicated training unit will be operational from January 2010.
- Establishing direct contractual arrangements with a wide variety of service providers and known Industry experts. Several industry experts have been engaged and have been instrumental in providing specific training needs throughout 2009. This will continue.
- Appointing an expert technical training manager to oversee the improvement of Power and Water's network training facilities and courses.
- Appointing an expert training manager to the RAMP program, described in Section 2.5, to ensure that all training opportunities are taken as the assets are remediated.

Initial training has targeted essential knowledge to support condition monitoring associated with substation assets. This included training in partial discharge, infra red thermography and HV insulation. Subject-matter experts were contracted to assist Power and Water technical staff with this training. Low voltage, high current ductor and circuit breaker timing training are scheduled for the first quarter of 2010.

To sustain the long term success of this training:

Five staff have been enrolled in the University of Southern Queensland (USQ) Advanced Diploma of Power Systems. These courses started in 28 September 2009.

- Staff has rotated to other distributors including ETSA, Energy Australia and TransGrid. Future visits are planned to SP AusNet, Country Energy, Ergon, ENERGEX and Western Power.

To identify all training needs, a detailed task analysis of all activities associated with substations is being developed. The results will be reverse-mapped to national qualifications and a comprehensive training gap analysis developed.

To ensure the relevance and currency of training, key personnel are participating in a number of national forums. The Power Networks Training Manager is a member of the ESI National Training Advisory Group and the chair of the Substations, National Training Advisory Committee.

The Mervyn Davies Report identified a need to upgrade and modernise some items of test equipment. Modern condition-monitoring units and workshop tools have been purchased, staff are trained and using this equipment.

Power and Water has made a simple commitment to its workforce: if equipment is needed to work safely and effectively, it will be provided. In 2009 more than $250,000 was invested in state-of-the-art test equipment for substation infrastructure.

Equally, a number of necessary spare parts have been identified and ordered, many have been received and others expected to be delivered through 2010.

These steps will ensure that Power and Water's workforce receives training tailored to its needs and equipment. In parallel, Power Networks has appointed additional staff including:

- Six additional Electrical Fitter Mechanics.
- Ten apprentices, seven of whom are adult apprentices, for the 2010 intake, up from three in 2008 and five in 2009.
- Six additional people as identified in a review of System Control operations.
- Nine additional professionals as part of the overall Power Networks Restructure, who are yet to be appointed.

2.5 Remedial works Immediate priorities after Casuarina

Thermal scanning

Once the failure mechanism from the Casuarina incident was clear, thermal scanning for overheating was carried out on other indoor switchboards. 22kV and 11KV indoor switchboards and other outdoor equipment were inspected between mid October and December 2008 with no other instances of abnormal temperatures. Thermal scanning is now part of Power and Water's maintenance schedule.

Sites critical to system security

Following the Casuarina incidents, it was necessary to restrict access to it and all other zone substations with similar equipment.

Power and Water identified priority sites for assessment, based on their contribution to system security and asset type, including:

- City Zone substation
- Snell Street Zone substation
- McMinns 66/22kV zone substation
- Berrimah 66/11kV zone substation
- Katherine power station 22kV assets

Assessment took longer than expected but were all completed by the middle of August 2009, remedial work is ongoing. A number of critical assets have been returned to service, see Progress.

Remedial Works Plan

Recommendation 11 of the Mervyn Davies Report included a rigorous condition assessment of all Zone Substation equipment.

The Remedial Works Plan scheduled condition testing at 20 zone substations and switching stations for OCBs, CTs and VTs operating at 66kV, 22kV and 11kV. Timing is based on a preliminary risk assessment as recommended.

Equipment with a higher risk rating is inspected and restored to acceptable condition before equipment in lower risk ratings. These risk ratings are summarised below:

← Highest Risk			→ Lowest Risk
5	4	3	2
▪ Oil Circuit Breakers, OCB (66, 22 and 11kV) ▪ Oil insulated VTs and CTs (132, 66, 22 and 11kV) ▪ Feeder cable terminations (22 and 11kV) ▪ Equipment earths	▪ Indoor enclosed switchboards (22 and 11kV) ▪ Power transformers (132/66kV; 132/22kV; 66/22kV; 66/11kV) ▪ Protection (Sensitive earth fault, busbar) ▪ Distribution transformers (22kV/415 V; 11kV/415V) and associated switchgear	▪ Brown Boveri switchgear operating at 11kV ▪ Oil ring main units in field locations (22 and 11kV) ▪ Air break switches in field locations (22 and 11kV)	▪ Non-oil circuit breakers operating at 132, 66, 22 and 11kV

Equipment rated as risk level 5, 4 or 3 is being condition-tested as part of the Remedial Works Plan. The equipment rated as 'risk level 2' will be condition-tested as part of Power Networks' routine maintenance program.

An indication of the scale of work (the total number of zone substation plant items affected) is provided below:

Item	Number
Zone substations and switching stations	23*
132 and 66kV	
Oil CBs	65
Power transformers	39
Voltage transformers	168
Current transformers	198
11 or 22kV	
Oil CBs	74
Voltage transformers	37

* 23 of 25 Power and Water substations: 21 on the Darwin to Katherine interconnected network, 2 in Alice Springs

Substantial refurbishment has taken and is taking place at a number of sites. This has taken longer than forecast but the Remedial Asset Management Plan team is still predicting completion of condition testing and remedial maintenance work on the higher risk equipment by the end of 2010.

Aside from the priority sites described above, Power and Water has also completed remedial works at:

- Batchelor 132kV Zone Substation
- Brewer Substation
- Brocks Creek Substation
- Casuarina Zone Substation 11kV Switchroom
- Casuarina Zone Substation 66kV Switchyard
- Casuarina Substation Temporary Switchroom
- Channel Island Power Station
- Channel Island Switchyard
- Cosmo Howley Substation
- Frances Bay Zone Substation
- Jabiru Substation
- Katherine 132kV Substation
- Katherine Power Station 22kV Substation
- Lovegrove 22/11kV zone Substation
- Mandorah Centre Yard Substation
- Manton 132kV Terminal Station
- Manton 22kV Zone Substation
- McMinns Water Pumping Station
- Mitchell Street Switching Station
- Ranger Substation
- Sadadeen Substation 22kV Switchroom
- Tennant Creek Switchyard
- Tindal Substation
- Weddell Zone Substation
- West Bennett 11kV Switching Station
- Union Reef Substation

2.6 Casuarina 11kV switchboard

Mervyn Davies' preliminary report recommended that the entire 11kV switchboard at Casuarina Zone Substation be replaced. The original equipment was oil-insulated, giving rise to the risk of widespread damage from a significant fault. More modern equipment uses vacuum or gas technology which, among other things, limits the extent of any damage even if the circuit breaker fails in service.

The permanent replacement is well underway. New switchgear has been purchased from AREVA in Brisbane and a section of this switchgear is being used in a second temporary board at Casuarina. The installation of the second temporary board allowed for the entire existing 11kV Casuarina switchroom to be removed from service and replaced with no safety restrictions. The installation plan is designed to minimise customer outages and ensure staff safety.

A number of other remedial works have been carried out at Casuarina since early October 2008, including thermal scanning and refurbishment of some equipment. The remaining 66kV OCBs, CTs and VTs have been condition- assessed in accordance with the priorities established in the Remedial Works Program. The 66kV equipment was tested during the dry season and completed at the end of September 2009.

As at 31 December 2009 two temporary switchboards support Casuarina Zone Substation, allowing the decommissioning of the existing switchboard. The new permanent switchboard is now being built on site. Two of the three switchboard bus sections are in place and are currently being wired for protection systems. Completion of installation is expected by March 2010 and commissioning in June 2010.

2.7 Condition assessment and remedial works

The Remedial Works Plan addresses Recommendations 11.1, 11.2 and 11.4 from the Mervyn Davies Report, the need for urgent action in zone and distribution substations, and on busbar protection. It is based on the following principles:

- A safe working environment must be maintained when carrying out remedial works.
- Customer outages are to be avoided wherever possible. Week night and weekend work continues to reduce the need for planned outages to customers during weekdays. If customer outages are unavoidable and can be planned, advance notice to customers must be given using letterbox leaflets, newspaper or radio advertising, in accordance with the Customer Charter.
- All necessary technical training will be provided to the work teams.
- The results of equipment condition checks must be recorded in a central location and used as the basis from which to determine further maintenance actions.
- All employees within Power Networks have been consulted on the Remedial Works Plan for awareness, constructive comment, and assistance with its implementation. This will continue.
- Condition reporting and progress reporting to each Executive Management Committee meeting and each Board meeting.
- A major review when the Remedial Works Plan is roughly a third complete, to ensure that lessons are learned and planning assumptions reviewed.

Major Milestones

Milestone 1: The completion of the initial risk assessment recommended by the Mervyn Davies preliminary report to be noted by the Board by February 2009. **COMPLETED**

Milestone 2: The approval of the Remedial Works Plan by the Managing Director by April 2009. **COMPLETED**

Milestone 3: The completion of roughly a third of the Remedial Works Plan, and the consequent formal Review of progress and lessons learnt, by July 2009. **COMPLETED**

Milestone 4: The clearance of each substation in line with the schedule overleaf, following testing and remediation as required, with all substations cleared by September 2010. **ON TRACK**

2.8 Restoring Casuarina Zone Substation

Section 2.6 described the works that have already been carried out at Casuarina. The following actions remain:

- complete installation of the new permanent switchboard;
- commission the new switchboard;
- decommission temporary switchboards; and
- restore substation to normal operation.

It is then intended to replace and refurbish 66kV/11KV Transformer 1 at Casuarina.

Major Milestones

Milestone 5: The GM-RAMP to approve a final project execution plan and detailed installation plan by the end of June 2009. **COMPLETED**

Milestone 6: The GM-RAMP to accept the new switchboard for service during the fourth quarter of 2009 **COMPLETED**

Milestone 7: The GM-RAMP to accept the new transformer for service during the third quarter of 2010. **ON TRACK**

3 Long term action plan

Most of the Mervyn Davies Report recommendations relate to improving Power and Water's maintenance operations into the longer term. Power and Water has prepared a Long Term Action Plan to ensure that these recommendations are diligently implemented and to provide clear direction for its leaders and workforce.

The Long Term Action Plan covers:

- The maintenance cycle and move towards condition-based maintenance.
- Accountability and organisational structural changes.
- Documentation of policy, procedures, work instructions.
- Reporting of maintenance activity and asset condition.
- Training and development of Power Networks staff.
- Incorporating improvements into the Power Networks Business Plan.

3.1 Adopting condition-based maintenance

Recommendation 1 - Move to 'condition based maintenance'

'Condition based maintenance' refers to the practice of only carrying out intrusive maintenance on switchgear when testing, or other practices, indicate that it is required. An analogy is modern diagnostic testing for cars, where the mechanic only intervenes on the engine when the computer indicates it is necessary.

Power Networks will incorporate this approach in their business plan developed during the 2010-11 Statement of Corporate Intent process. It will be informed by the findings from the RAMP testing and remediation program.

Major Milestones

Milestone 8: The first draft Power Networks 2010-11 Five Year Business Plan and 20 Year Outlook maintenance forecasts to include a summary of planned maintenance as well as costs, based on a 'condition based maintenance' approach by August 2009. **COMPLETED**

Recommendation 2 - Implement in substations as quickly as possible

Switchgear testing now includes:

- Thermal cameras – that provide a rough indication of where overheating is occurring. This is a useful test as it must be carried out with the equipment in service and carrying load current and so there is no disruption to customers. If overheating is found, the equipment must be maintained to remove the root cause.

- Insulation resistance – that provides an indication of the quality of the equipment's insulation to earth. If insulation resistance is relatively low, it indicates that there is a higher probability of insulation breakdown and subsequent failure. Insulation resistance tests must be carried out with the equipment out of service.

- Contact resistance – that provides an indication of the quality of the equipment's current path. If contact resistance is relatively high, it causes overheating in the equipment. Contact resistance tests must be carried out with the equipment out of service.

Power and Water has engaged heavily with the Industry Working Group on switchgear and transformers, hosting its most recent meeting in Darwin. This group includes Australia's leading switchgear experts and cooperates on understanding common failure modes for different switchgear designs. This group has already contributed strongly to Power and Water's knowledge about its assets, by learning from other utilities with many times its switchgear population.

Major Milestones

Milestone 9: Source external assistance from another utility to aid with maintenance training and support by February 2009. **COMPLETED**

Milestone 10: Complete agreements with workforce to ensure that Job Model and Remuneration arrangements support 'condition based maintenance' by June 2010. **ON TRACK**

Recommendation 3 - Bed down organisational changes

Power Networks has recruited a number of staff with interstate and international experience to key positions to facilitate the implementation of other Mervyn Davies' recommendations throughout the business.

Major Milestones

Milestone 11: Appoint the Manager Strategy and Planning and the Manager Capital and Maintenance Delivery by May 2009. **COMPLETED**

Milestone 12: Confirm appointment of new trade positions by May 2009. **COMPLETED**

Milestone 13: Appoint the next level of management by July 2009 (noting that this level of management would be unaffected by Recommendation 3.2). All but two of these positions have been filled. **REVISED TO DECEMBER 2009**

Milestone 14: The Managing Director to approve a revised organisational structure for Power Networks (following discussion with Mervyn Davies on Recommendation 3.2) by July 2009. **COMPLETED**

Recommendation 4 - Deliver improved systems and processes

As acknowledged in the Mervyn Davies Report, the Asset Management Capability project will support the wider changes required in the business and it is critical Power Networks engages with this.

Major Milestones

Milestone 15: Identify process owners and ensure they have sufficient time to contribute to the AMC project by May 2009. **COMPLETED**

Milestone 16: Confirm that the Future State Design does, in fact, address the requirements of Recommendation 4.2 by December 2009. **IN PROGRESS, REVISED TO MARCH 2010**

Milestone 17: Confirm that the AMC as implemented does, in fact, address the requirements of Recommendation 4.2 by December 2010. **IN PROGRESS, REVISED TO JUNE 2011**

Recommendation 5 - Enhance policies and policy documentation

Considerable progress has been made in returning a significant number of key assets to service in an acceptable operating condition. There is still a lot of work to do to ensure that substation maintenance policies are revised to reflect the new practices, checked by our workforce, embedded in training programs and reported upon. The necessary people to carry out this work have been identified.

Major Milestones

Milestone 18: A revised Maintenance Policy based on condition-based maintenance will be approved by the GM-PN by August 2009. **IN PROGRESS, REVISED TO DECEMBER 2010**

Milestone 19: A review of high priority Maintenance Procedures, including detailed consultation with the workforce, resulting in a revised set of Maintenance Policies will be completed by September 2009. **IN PROGRESS, REVISED TO DECEMBER 2010**

Milestone 20: A Review of high priority Work Instructions, including detailed consultation with the workforce, resulting in a revised set of Maintenance Policies will be completed by June 2010. **IN PROGRESS, REVISED TO DECEMBER 2010**

Recommendation 6 - Develop substations maintenance planning and works program

As recommended by Mervyn Davies, the new structure separates decisions on "how much maintenance" from scheduling decisions. This distinction is reflected in Position Descriptions. This will be reflected in maintenance plans and schedules, once the Maintenance Policy and Procedure work described above is completed.

Major Milestones

Milestone 21: Set high-level and detailed quantum plans for substation maintenance for 2010 and the following five years by December 2009. **REVISED TO MARCH 2010**

Recommendation 7 - Report on maintenance delivery, asset condition, risks and failures

The Power and Water Board now receives regular reports of maintenance delivery and asset condition. The Board can ensure adequate resources and leadership are deployed to maintain good operational and asset health.

Major Milestones

Milestone 22: Provide example maintenance delivery and asset condition report to the Board for five asset classes by February. **COMPLETED**

Milestone 23: Provide full maintenance delivery and asset condition reporting to the Board by August 2009. **COMPLETED**

3.2 Leadership and development

Recommendation 8 - Enhance workforce training, numbers and equipment

The Mervyn Davies Report recommended that Power and Water improve its training in a number of areas, recruit more staff and obtain better equipment for its workforce. As discussed in Section 2, there has been good progress and these approaches will be formalised.

Major Milestones

Milestone 24: Appoint a Training Manager to the RAMP program with strong technical knowledge by May 2009. **COMPLETED**

Milestone 25: Appoint a Training Manager in Power Networks with strong technical knowledge by June 2009. **COMPLETED**

Milestone 26: Coordinators' development needs will be confirmed during the MyPlan Performance review by July 2009. **ONGOING**

Milestone 27: Improved supervisory training will be provided to all coordinators from November 2009. **ONGOING**

Milestone 28: revised framework for trades and technical training will be approved by October 2010. **ON TRACK**

Recommendation 9 - Improved leadership and communication

The Mervyn Davies Report recommended Power Networks improve its leadership style in general, and specifically:

- Improve communication and interpersonal skills for all personnel (structured to their role).
- Provide specific leadership, mentoring programs and personal development for those in 'people management' roles.
- Clarify role and job requirements.

As described in Section 2, this work is underway. Power Networks has started Leadership Communication forums that bring together the wider leadership team once every two months. It has recently commenced a Leadership Development Program providing targeted training and development to improve the skills of its leaders.

Major Milestones

Milestone 29: Commence first steps in Leadership Development by May 2009. **COMPLETED**

Milestone 30: Individual development plans will be formulated for each manager, which align with and contribute to their current performance development plans by July 2009. **COMPLETED**

Milestone 31: Suitable external leadership development opportunities will be assigned to each person by August 2009. **ONGOING**

Milestone 32: Development courses will commence by September 2009. **COMPLETED**

Milestone 33: All relevant managers receiving at least one session of development by December 2009. **COMPLETED**

Recommendation 10 - Review incident management and outstanding investigations

The Mervyn Davies Report recommended that Power and Water review its incident management procedure and complete outstanding investigations. The review of incident management procedures has been included in the Long Term Action Plan. Clear accountabilities for incident investigation have been identified. These individuals will provide a focus for keeping our investigation skills up to date.

Two of the three outstanding investigations have been progressed. The completion of the investigation into the Casuarina events will only be possible once the remaining Casuarina switchboard has been decommissioned. At that time, aside from removing the equipment, it will be necessary to carry out a full forensic examination of the protection and earthing systems.

Major Milestones

Milestone 34: Complete RISQ Investigation 1768 by April 2009. **COMPLETED**

Milestone 35: Commence ameliorative action in light of Manton investigation, and further information on Yorkshire switchboards by July 2009. **COMPLETED**

Milestone 36: Review incident management procedures and approve resulting Work Instruction by August 2009. **IN PROGRESS**

Milestone 37: Complete investigation into Casuarina events on access to the old switchboard by September 2009. **UNDERWAY**

4 What it means for customers

Power and Water has taken more equipment out of service than normal as part of the Remedial Asset Management Program. This has increased the number of planned customer outages. Every effort has been made to minimise these disruptions with a significant amount of work carried out at night.

In the longer term, customers will benefit from a more reliable electricity supply. Reliable switchgear will mean customer outages are less likely and, if they occur, will affect customers for a shorter time.

4.1 Short term, reliability is unlikely to improve

RAMP will drive significant maintenance activity. Careful planning will, to some extent, minimise the impact on customers:

- Customer outages will be avoided wherever possible.
- Where a planned customer outage is unavoidable, advance notice to affected customers will be given using letterbox leaflets, website, newspaper or radio advertising. Those customers will be given at least seven days' notice of any planned interruptions.
- Where maintenance action gives rise to the risk that an item of equipment cannot be returned to service within a reasonable period, arrangements will be developed to limit the impact on customers. Week night and weekend work will reduce the need for planned outages during weekdays.

Until the program is complete, Power and Water is at risk of further equipment failures and these may cause some customer disruption. The Corporation is doing all it can to put in place adequate contingency plans to minimise the impact on customers.

4.2 Long term, reliability will improve

In the longer term, an increased emphasis on maintenance will provide customers with a substantial improvement through the reliable operation of power network equipment.

Specifically, the increased emphasis on:

- education for trades people, technicians, supervisors and the management team;
- a streamlined maintenance cycle;
- increased accountability of maintenance activities;
- improvements in maintenance documentation;
- increased resources to perform the work; and
- specific requirements for reporting maintenance performance to the Board and executive management,

will ensure that maintenance practices, in line with established industry asset management practices, are kept up to date and plant failures minimised.

The costs of these improvements will be far outweighed by the community benefits of a more secure and reliable electricity supply.

Appendix A: Mervyn Davies' recommendations in full

1 Substation Maintenance Approach

11.1 Accelerate the implementation of its documented planning intention of adopting a "framework of objective need" as the basis for maintenance, progressively implement systemic and rigorous condition monitoring, and adopt asset condition as the prime basis for determining "objective need".

11.2 Take into account the circumstances of size, remoteness, climate and the lasting effects of past legacies when implementing this, its new condition based approach, and not attempt to emulate too closely the maintenance arrangements implemented in the much larger distribution businesses elsewhere in Australia.

2 Strategy for Implementing Condition Based Maintenance – in the PWC Substations Context

11.1 Negotiate and implement arrangements with one or more of the larger distribution businesses in Australia to be supplied with access to "failure mode" data, inspection and test regimes, conditional failure criteria, and requirements for corrective action. In selecting a partner choose a distributor who is well advanced in the implementation of condition based maintenance, and has the best matched asset set.

11.2 Develop the "in house" maintenance policy resource to be a pragmatic adopter of what other distributors are doing. Adapt what other distributors are doing, to the specific environmental conditions and asset set of Power and Water, with the minimum sufficient resort to analysis.

11.3 Specialise in monitoring and diagnostics. Develop the "in house" maintenance delivery resource to be a specialist in monitoring, testing and diagnostics.

11.4 Utilise the "in house" maintenance delivery resource for most routine preventative tasks and common corrective tasks, but engage outside resources for specialist and uncommonly needed skills, (as is currently done for tap changer maintenance). Negotiate and implement arrangements with external providers to undertake the highly specialised tasks, within appropriate time frames. Either as "fly in fly out "contractors or by shipping to other parts of Australia.

11.5 Foster a culture of local ownership by:

- Providing an appropriate level of autonomy and status to the Maintenance Supervisor.
- Providing adequate resourcing, and placing the responsibility and accountability for: the delivery of the substation maintenance works program and; for maintenance task outcomes, with the Maintenance Delivery section.
    - Enforcing accountability through measurement and reporting.

- Routinely involving the delivery team in the maintenance policy decision process. (By systemically seeking feedback regarding failure modes and the effectiveness of corrective actions.)

- Placing responsibility and accountability for asset condition and performance with the Asset Management section.

  - Enforcing accountability through measurement and reporting.

11.6 Implement its new condition based approach at the maximum possible pace, consistent with circumstances, and prioritise implementation to address areas of greatest benefit first.

3 Organisation

11.7 In implementing the organisational changes, currently underway, ensure the following outcomes, or alternatively make changes which do:

- Work priorities are managed so as to ensure continuity of an adequate resource allocation to routine substation maintenance.

- The Maintenance Delivery group, are empowered by providing them with a sense of control and an environment which ensures a sense of ownership, pride in the assets and their performance.

- The Asset Management group, are able to focus on asset management, without becoming embroiled in works and resource management issues. Ensure that this group can focus on integrating policies for the "what" of maintenance with replacement/refurbishment and whole of life cycle cost optimisation.

- Works management and scheduling are kept simple.

- Seamless integration of the routine condition based substation maintenance activity with the test activity is achieved.

- System access for routine maintenance and protection testing is optimally coordinated.

11.8 Consider making the following changes to the organisational arrangements, currently in the course of implementation:

- Establish "Substation Maintenance, Protection and Test" as a separate dedicated resource with direct reporting responsibility to the General Manager Power Networks.

- Operate "Substation Maintenance" and "Protection and Test" as two separate sections, within that accountability.

- Place responsibility for routine testing with the Substation Maintenance Section and upskill the workers in the Section. Advanced diagnostic testing (partial discharge, dielectric dissipation factor and high voltage withstand) should remain with the Protection and Test Section.

- Place the responsibility for works planning as well as scheduling with the Substation Maintenance, Protection and Test Section.

4 Systems and Processes

11.9 Ensure that the next phase of the AMC project, does as it is expected to do, and:

- Deliver outcomes that are in keeping with Power and Water's size, and so far as possible, avoids complexity.
- Embrace the possibility of a continuing role for suitably controlled local PC systems and avoids the pedantic pursuit of a single enterprise system.
- Address the disempowering aspects of the current WIMS system.

11.10 Ensure that the systems and processes delivered by the AMC, do as they are expected to do and, provide capabilities for substation maintenance management and asset condition management, that support the recommendations of this report regarding:

- Substation Asset condition recording.
- Substation maintenance planning and program works development.
- Substation maintenance works program reporting.
- Substation Asset condition reporting.

and incorporate:

- Condition as well as time based triggers.
- Enforcement of condition reporting and other job closure procedures.

5 Policies and Policy Documentation

11.11 Adopt a three tier approach to substation maintenance policy documentation, as described in Technical Appendix T2.2 Evaluation of Policies.

11.12 Either renegotiate the arrangements with ETSA, for the acquisition of a set of documentation that is more suitable to Power and Water's requirements, or negotiate to acquire a set from another Australian distributor. Such negotiations should make provision for the routine updating of the documentation.

11.13 Adapt the acquired documentation to the Power and Water environment and asset set.

6 Substations Maintenance Planning and Works Program Development

11.1 Ensure that quantum planning is separate from delivery planning.

11.2 Set quantum plans for substation maintenance on a one and five year basis and resource to deliver:

- Ensure that firm preventative maintenance and condition monitoring programs are set annually.
- Ensure that the plan makes adequate provision for corrective tasks, based on expected conditional failure rates.

- Ensure that the plan makes adequate provision for "breakdown maintenance" tasks, based on historical breakdown rates and trends.
- Ensure that the planning process makes adequate provision for resourcing and that the assessment of resource requirements is informed by industry benchmarks and past reporting of task times.
- Five year plans should be set on an indicative basis, suitable for use in forecasting and workforce planning.
- In the longer term (five to ten years) introduce 15 year planning as well.

7 Reporting Systems

7.1 Substations Maintenance Works Program Reporting

- Develop simple multi level reporting of work delivery targets and delivery progress against targets. (Three levels of reporting are suggested – supervisor/coordinator; Management and; Board)
- Report quantum (as well as dollars) progressively aggregated over tasks for the higher level upstream reporting.
- Report risk consequences of backlogs, monthly.

7.2 Substations Asset Condition Reporting

Systematise condition data recording:

- Maintain condition data records at the individual asset level.
- Analyse and summarise the data by asset class.
- Develop simple multi level reporting of asset class condition, structured by asset class and reporting level (Three levels of reporting are suggested – asset planners; Management and; Board.)
- Make reports available to the Maintenance Delivery. Section, as well as the Asset Management Section.
- Report key condition measures and risks, suitably aggregated or truncated for different reporting levels. For the higher level reports, highlight trends and forecast the outcomes of remediation programs.
- Incorporate asset failure reporting, at all reporting levels. Board level reporting of all failures involving risk to personnel and public safety is suggested.

7.3 Reporting Medium

- Implement ad hoc paper/PC based reporting systems, in the interim, before new AMC systems and reporting capability is developed.

8 Resources

8.1 Workforce Capabilities - Training and Development

- Provide training to refresh the craft skills of the current substation maintenance personnel. Engage an industry training provider to undertake a training needs analysis and provide tailored training.
- Provide training to refresh the testing skills of the current Protection and Test personnel. Provide specific training in the operation of all new test equipment and in the interpretation of results. Negotiate with other Australian distributors and test equipment suppliers, for assistance with the provision of such training.
- Provide specific condition monitoring training. Negotiate with other Australian distributors for assistance with the provision of such training.
- Provide generic Supervision training to supervisors (Coordinators).
- Negotiate opportunities for employee exchanges or secondments with the other Australian distributors, for trades worker, apprentices and engineering staff.
- Provide opportunities for ongoing participation by engineering staff, in relevant industry forums.

8.2 Workforce Levels

- Initially recruit an additional 6 electrically trades qualified personnel. (Ideally such additional recruits would be experienced in condition monitoring techniques.)
- Annually review the five year forecast of substation maintenance requirements and reassess the manning level required to deliver the program. Implement appropriate manpower planning (a mix of recruitment and apprentice intake) to ensure the sustained level of manning required to match the forecast works program.

8.3 Equipment

Upgrade and progressively acquire additional new condition monitoring equipment, as required to keep pace with the progress in implementing condition monitoring techniques and matched to the particular techniques adopted. Make a thorough review, of the equipment available and of the equipment in use in other distribution business around Australia. Undertake the review with the involvement of personnel who are to use the equipment, after they have received the specific training in condition monitoring techniques recommended in 8.1.

9 Human Resources Development

Devise and implement a Human Resources Development program, incorporating the following key elements:

- Communication and Interpersonal skills development training, for all personnel, (structured to their role).

- Specific Leadership and/or mentoring programs for those in "people management" roles.
- Personal development opportunities for those in key roles.
- Role and job requirements clarification.

and having the objective of delivering the following outcomes:

- A more inclusive and collaborative supervision and leadership style.
- Improved communication and collaboration between functional areas, and up and down the responsibility hierarchy.
- Strong personal ownership of roles and Power and Water initiatives.
- All personnel are confident in their role and in their personal authority within the role.
- Acceptance of individual accountability.
- Improved performance measurement and recognition.
- All personnel are all in jobs which match their individual skills sets and personal relationship styles.

10 Miscellaneous

10.1 Incident Management System and Accountabilities

Review the current incident management arrangements to ensure that the system of incident management provides for:

- Incident organisational and accountability structures.
- Intelligence gathering, consolidation and reporting arrangements.
- Escalation procedures.
- Resourcing flexibility.
- Stakeholder communication procedures.
- Procedures for coordinating with the Territory's other Emergency Management Agencies.
- Formal documentation.

That will provide Power and Water with the credibility to manage its own system incidents.

10.2 Asset Failure Investigation Accountabilities

Assign responsibility for investigating asset failure incidents as follows:

- Asset Management be assigned accountability for deciding what incidents to investigate, for coordinating the investigation, and for "close out" and reporting. (Oversight by the "Power Technical Committee" would also be appropriate.)

- Assessment and diagnoses of the incident be assigned to the testing accountability of the Protection and Test Section.
- Assessment of OH&S issues be assigned to Employee and Organisation Services.

10.3 The Manton Investigation

Pursue further the Manton Investigation, and undertake investigation work in an attempt to establish the root cause of the failure and to assess whether better environmental controls would help to mitigate the risk of further failures.

10.4 Residual Casuarina Incidents Investigation

As soon as access conditions at Casuarina permit, perform the access dependent residual outstanding investigation work and attempt to resolve the outstanding aspects of the failure investigations.

10.5 RISQ Hazard/Incident Report System

- Complete the investigation of Hazard/Incident No 1768, without further delay.
- Implement a system of routine monthly reporting of the number of incidents logged and resolved and of backlogs of outstanding Hazard/Incidents.

11 Remedial Programs

11.1 Initiate a program of rigorous condition assessment of all Zone Substation equipment immediately. Undertake a high level risk analysis to determine program priorities and set a timetable.

11.2 Implement a program to verify the efficacy of all frame leakage protection systems (or other high speed busbar protection systems) and remediate, if necessary. Also review the associated earthing system designs, to verify their adequacy under all feasible fault conditions.

11.3 11.3. Take immediate action to replace the Casuarina Zone Substation 11kV switchboard.

11.4 Undertake a rigorous condition assessment of all Distribution Substation Equipment.

Appendix B: Recommendations, timelines and progress

Ref	Recommendation	Plan Ref	Owner	Target Date	Progress
1	**Move maintenance approach to 'condition based maintenance.'**	**LTAP**	**GM-PN**	**06/14**	**Condition based maintenance commenced, Maintenance Policy document to reflect new maintenance regime**
2	**Implement 'condition based maintenance' in substations as quickly as possible by acquiring information, support and clarifying accountabilities.**	**LTAP**	**GM-PN**	**06/10**	**Substation CB maintenance implemented.**
2.1	Negotiate and implement arrangements to access data.	LTAP	M-AM		Obtained ETSA & EA Maintenance instructions that were developed using failure mode analysis
2.2	Be a pragmatic adopter of what other distributors are doing on maintenance.	LTAP	M-AM		Resource identified to develop Power and Water maintenance instructions
2.3	Develop 'in house' maintenance delivery team to be specialist in monitoring, testing and diagnostics.	LTAP	M-C&MD		Training resources identified, substation maintenance resource on deck.
2.4	Use 'in house' maintenance delivery team for routine preventative tasks and common corrective tasks/Use outside resources for specialist and uncommonly needed skills.	LTAP	M-C&MD		Current practice, have let specialist service contracts
2.5	Foster a culture of local ownership.	LTAP	M-C&MD		Maintenance instructions to be developed with trades staff
2.6	Implement its new condition based approach at the maximum possible pace, consistent with circumstances, and prioritise implementation to address areas of greatest benefit first.	LTAP	GM-PN		Remedial Asset Management Program Documented in accordance with this.

Ref	Recommendation	Plan Ref	Owner	Target Date	Progress
3	**Bed down organisational changes.**	**LTAP**	**GM-PN**	**07/09**	**Service Agreement between Strategy& Planning and Capital & Maintenance Delivery completes this.**
3.1	In implementing organisational changes, ensure good maintenance outcomes.	LTAP	GM-PN		Maintenance Cycle process flow completed with responsibilities agreed
3.2	Consider making the changes to the organisational arrangements.	LTAP	MD		Still being considered
4	**Deliver improved systems and processes.**	**AMC**	**PD-AMC**	**12/10**	**Implementation of AMC will complete this Recommendation**
4.1	Ensure the next phase of the AMC project, does as expected, and addresses disempowering aspects of the WIMS system.	AMC	PD-AMC		Key personnel including process owners identified and allocated to AMC project development and implementation
4.2	Ensure that the systems and processes delivered by the AMC, do as expected and support the Mervyn Davies' recommendations.	AMC	PD-AMC		Long Term Action Plan addresses all recommendations
5	**Enhance policies and policy documentation.**	**LTAP**	**GM-PN**	**06/10**	**Production of maintenance procedures and implementation of staff training program will continue till target date.**
5.1	Adopt a three tier approach to substation maintenance policy documentation.	LTAP	M-AM		Adopted
5.2	Acquire a set of maintenance documentation from another Australian distributor.	LTAP	M-AM		Obtained ETSA & EA Maintenance instructions that were developed using failure mode analysis
5.3	Adapt the acquired documentation to the Power and Water environment and asset set.	LTAP	M-AM		Resource identified to develop Power and Water maintenance instructions
6	**Develop substations maintenance planning and works program.**	**LTAP**	**GM-PN**	**12/09**	**Maintenance Policy will drive one & 5 year programs**
6.1	Ensure that quantum planning is separate from delivery planning.	LTAP	M-S&P		Strategic planners identified in AM and JDs reflect role as opposed to works planners

Ref	Recommendation	Plan Ref	Owner	Target Date	Progress
6.2	Set quantum plans for substation maintenance on a one and five year basis and resource to deliver.	LTAP	M-S&P		Maintenance Policy first, manual programming next then eventually AMC solution
7	**Report on maintenance delivery, asset condition, risks and failures.**	**LTAP**	**GM-PN**	**08/09**	**Progressively implemented through to August**
7.1	Develop simple multi level reporting of work delivery targets, delivery progress and risks against targets.	LTAP	M-AM		Reporting framework complete
7.2	Develop simple multi level reporting of asset class condition, risks, and asset failure reporting.	LTAP	M-AM		Condition based index reporting complete, risk based started.
7.3	Implement ad hoc paper/PC based reporting systems, in the interim, before new AMC systems and reporting capability is developed.	LTAP	M-AM		Consultants engaged and paper-based system developed.
8	**Enhance workforce capability, training, numbers and equipment.**	**LTAP**	**GM-PN**	**02/10**	**Effective development and implementation of Workforce Training and development program**
8.1	Provide workforce and supervisor training and development.	LTAP	M-TPN		2 Power Network based training managers identified, first one commenced within RAMP team.
8.2	Recruit an additional 6 electrically trades qualified personnel experienced in condition monitoring techniques.) and annually review need.	LTAP	M-C&MD		Completed
8.3	Upgrade and progressively acquire additional new condition monitoring equipment.	LTAP	GM-RAMP		Majority of this equipment is in use. The last of this equipment will arrive first quarter 2010.
9	**Implement a Development program, with the objective of a more collaborative leadership style, improved communication and individual accountability.**	**LTAP**	**GM-PN**	**02/11**	**Leadership Program initiated. PN has also commenced regular leadership forums**
10	**Review incident management and investigations, and complete some outstanding investigations.**	**LTAP**	**GM-PN**	**12/09**	
10.1	Review the current incident management arrangements, including escalation procedures.	LTAP	M-SC		Not commenced yet but identified separately in LTAP

Ref	Recommendation	Plan Ref	Owner	Target Date	Progress
10.2	Assign clear asset failure investigation accountabilities.	LTAP	GM-PN		Not commenced yet but identified separately in LTAP
10.3	Pursue further the Manton Investigation, and undertake investigation work in an attempt to establish the root cause of the failure	LTAP	C-PTC		Identified design issue with YSF6 gear, three units will be replaced.
10.4	Complete the residual Casuarina incidents' investigation.	LTAP	GM-RAMP		The switchboard has been taken to Power and Water's workshop for investigation.
10.5	Complete the investigation of Hazard/Incident No 1768, without further delay.	LTAP	GM-RAMP		Completed.
11	**Undertake Remedial Programs**	**RAMP**	**GM-RAMP**	**09/10**	**Completion of RAMP Program**
11.1	Initiate a program of rigorous condition assessment of all Zone Substation equipment.	RWP	M-RWP		Commenced, includes immediate remediation of assets in unsatisfactory condition
11.2	Implement a program to verify the efficacy of all frame leakage protection systems.	RAMP	M-RWP		Commenced, Included in RAMP
11.4	Undertake a rigorous condition assessment of all Distribution Substation Equipment.	RAMP	M-RWP		Commenced, RAMP managing
11.3	Take immediate action to replace the Casuarina Zone Substation 11kV switchboard.	PEP	PM-C		Progress on the new switchboard installation is now about two weeks behind schedule. Once complete, the change-over from the two temporary switchboards will commence, with completion expected June 2010.

Key to People

C-PTC Chairman – Power Technical Committee
GM-PN General Manager Power Networks
GM-RAMP General Manager RAMP
M-AM Manager – Asset Management
M-C&MD Manager Capital & Maintenance Delivery
M-RWP Manager Remedial Works Plan
M-S&P Manager Strategy & Planning
M-SC Manager System Control
M-TPN Manager Training, Power Networks
PD-AMC Project Director AMC
PM-C Project Manager Casuarina

Appendix C: Scope of audit

The following indicative scope of work is for the procurement of an independent auditor to enable the Power and Water Board to enforce compliance with the controls it has established in response to the recommendations of the Mervyn Davies Enquiry for the short term and long term improvement in network maintenance activities:

B.1 Introduction

The Power and Water Corporation (Power and Water) is an entity owned by the Northern Territory Government. Power and Water operates four business units, being Generation (of electricity), Power Networks, Retail (of electricity), Water Services (including sewage services) and Remote Operations.

In the Power Networks business unit, asset management covers construction activities, response to emergency events, and network maintenance activities. The need for improvements in the undertaking of network maintenance has been a focus of the business unit for several years, including actions to review all processes in an Asset Management Capability project that commenced in late 2006 and will be progressively implemented across the organisation in 2010 and 2011. In 2008 a restructure of the Power Networks business unit was undertaken to improve the focus on network maintenance delivery. Also in 2008, and due to an interruption at a substation in the suburbs of Darwin, the reform of maintenance activities has accelerated through recommendations arising from the Mervyn Davies Enquiry, which was hand down in January 2009.

To understand the extent of compliance of the network maintenance activity with corporate controls, the Board of Power and Water require an independent auditor to undertake an audit of the maintenance activities of the Power Networks business unit.

B.2 Audit objective

The objective of the Power Networks maintenance audit is to provide an opinion on the extent of compliance of the maintenance activity against the:

- Major Milestones specified in the Power and Water's First Progress Report on the Mervyn Davies Enquiry; and
- Maintenance Policy, Maintenance Procedures and Maintenance Work Instructions that have been established and revised to control the maintenance activity.

B.3 Audit frequency and duration

The audit is to be conducted on an annual basis, and is to be based on a sample of activities that represent high or medium risk to the organisation. Twenty days of audit work are to be allocated to this task annually.

B.4 Audit report

The auditor is required to provide a report to the Audit and Risk Sub-committee in accordance with an agreed work plan which will be confirmed at the commencement of the audit. The structure of the audit report is to be agreed at the commencement of the audit, and would be expected to provide an opportunity for management to respond to any audit findings.

The auditor is to provide in the report a review opinion on compliance with the nominated controls (including specified Major Milestones) established by the Board.

AECOM Australia Pty Ltd

Power and Water Corporation
Progress of Implementation of the Recommendations of the Davies Report

Updated: 12/11/09

Legend

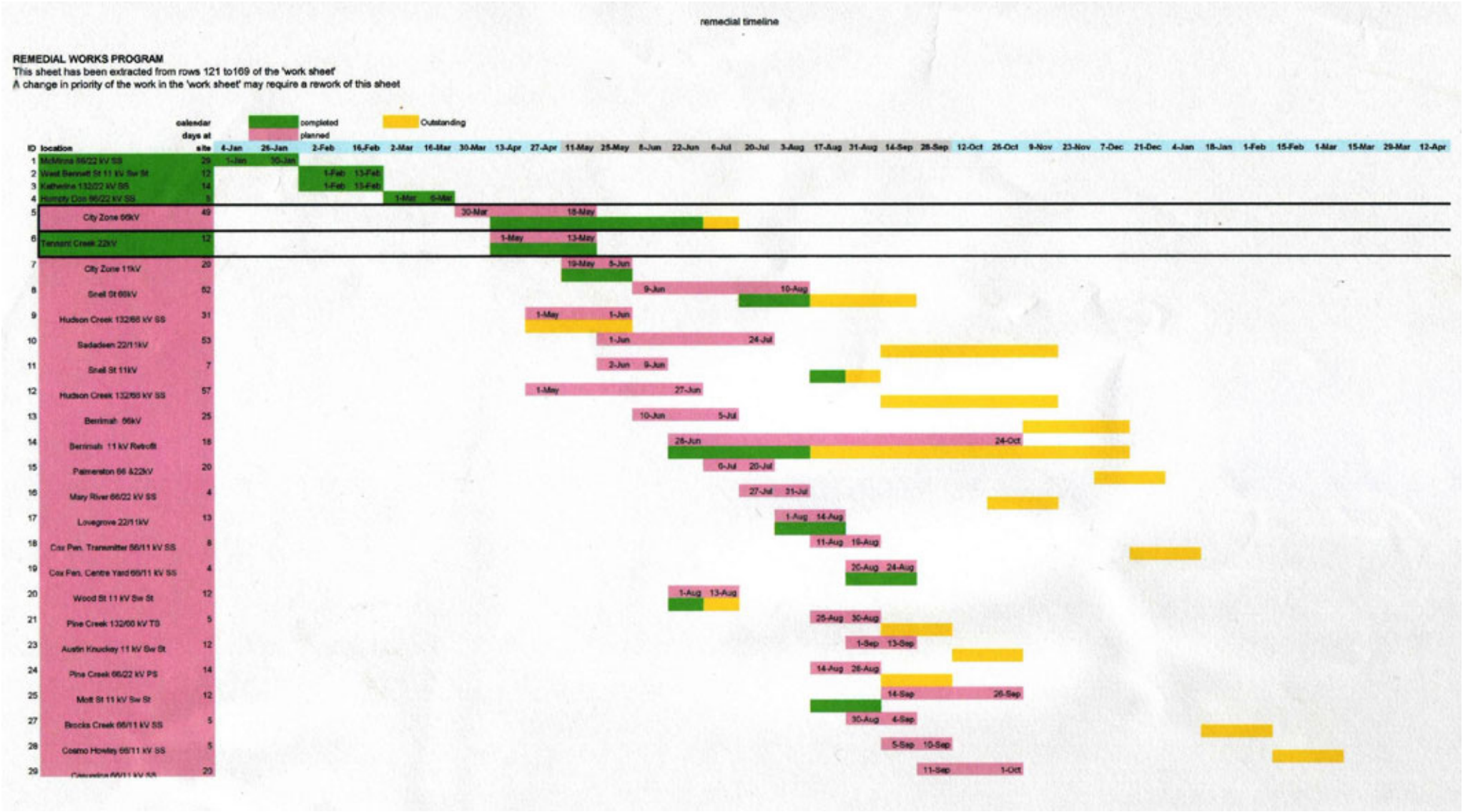
Task on Time	9 ▲ Milestone (9) Achieved
Task < 2 months behind	10 △ Milestone (10) Not Yet Achieved
Task > 2 months behind	Progress Indication (%)

Summary

	Target Completion Date	Progress 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%	Likely Completion Date
Long Term Action Plan (LTAP)	Aug-2012		Aug-2012
Remedial Asset Management Program (RAMP)	Sep-2010		Sep-2010

LTAP Overall Progress	39% complete
RAMP Overall Progress	50% complete

Davies' Ref.	Précis of Davies' Recommendation	Plan	Actions & Milestones	Target Completion Date	Progress 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%	Likely Completion Date	Progress Notes
11.1	Move substation maintenance to Condition Based Maintenance (CBM) approach	Long Term Action Plan (LTAP)	Milestone 1 - Determine surrogate asset condition indicies. Milestone 2 - 12 Month maintenance plan developed based on interim asset strategies & included in 5 year maintenance plan Milestone 3 - Determine final asset condition indicies based on industry standard practice. Milestone 4 - Design & implement new AMC asset management system	Aug-2012	1▲ 2△ 3△ 4△	Aug-2012	Maintenance plan for the next 12 months is the RWP which has been approved and put into action. Five Year Business Plan and 20 Year Outlook circulated for comment. Awaiting GM input & board approval.
11.2	Implement CBM in substations ASAP by acquiring information, support and clarifying accountabilities		Milestone 5 - Obtain maintenance training from another utility Milestone 6 - Complete workforce agreements	Jun-2010	5▲ 8△	Jun-2010	Data received from ETSA & EA. Further negotiations ongoing & a trip to Ergon planned. Job models not yet started.
11.3	Bed down organisational changes		Milestone 7 - Appoint managers to S&P and C&MD Milestone 8 - Confirm appointment of new trades positions Milestone 9 - Appoint the next level of management Milestone 10 - MD approve revised PN org structure	Jun-2010	7▲ 8△ 9△ 10△	Dec-2009	Most positions filled - two outstanding.
11.4	Deliver improved systems and processes via AMC (Asset Mangement Capability) Project		Milestone 11 - Identify process owners Milestone 12 - Confirm FSD meets requirements of Rec 4.2 Milestone 13 - Confirm AMC meets requirements of Rec 4.2	Jun-2011	11▲ 12△ 13△	Jun-2011	Initial design workshops to determine how the new asset maintenance system will work will commence in the next two weeks.
11.5	Enhance maintenance policies and policy documentation		Milestone 14 - GM-PN approval of new Maintenance Policy Milestone 15 - Develop interim Maintenance Procedures Milestone 16 - Review & revise Maintenance Procedures based on final asset condition indicies Milestone 17 - Develop Work Instructions	Dec-2010	14△ 15△ 16△ 17△	Dec-2010	Maintenance policy & WI's obtained from ETSA, EA, Ergon & Energex. Final negotiations with consultant to adapt these to PWC.
11.6	Develop substations maintenance planning and works program		Milestone 18 - Set high-level and detailed quantum plans for substation maintenance	Mar-2010	18△	Mar-2010	Further progress is dependant upon org structure of PN & new Substation Maintenance and Test section.
11.7	Report on maintenance delivery, asset condition, risks and failures		Milestone 19 - Example maintenance delivery and asset condition report provided to Board Milestone 20 - Full maintenance delivery and asset condition report provided to Board	Dec-2011	19▲ 20△	Dec-2011	Reporting framework complete by Marchment Hill and is currently being revised and simplified.
11.8	Enhance workforce capability, training, workforce numbers and CBM equipment		Milestone 21 - Appoint Training Manager to RAMP Milestone 22 - Appoint Training Manager in Power Networks Milestone 23 - Confirm Co-ordinators' development needs Milestone 24 - Improved supervisory training to all coordinators Milestone 25 - Approve revised trades and technical training	Jun-2010	21▲ 22▲ 23△ 24△ 25△	Jun-2010	Little progress on coordinators training as many positions have been unclear due to the restructure.
11.9	Implement a staff development program with the objective of developing a more collaborative leadership style, improved communication and individual accountability		Milestone 26 - Commence Leadership Development Milestone 27 - Formulate development plans for each manager Milestone 28 - External leadership development assigned Milestone 29 - Development courses commence Milestone 30 - Each manager receive one development session	Sep-2009	26▲ 27△ 28△ 29△ 30△	Dec-2009	Leadership development framework commenced and workshop held 16/09/09. Ongoing discussions on how to integrate this training within Power Networks.
11.10	Review incident management and investigations, and complete some outstanding investigations.		Milestone 31 - Complete RISQ Investigation 1768 Milestone 32 - Commence actions from Manton investigation Milestone 33 - Review incident management procedures Milestone 34 - Complete investigation into Casuarina events	Dec-2009	31▲ 32△ 33△ 34△	Dec-2009	RISQ Investigation 1768 complete but not signed off. Manton review has resulted in schedule for replacement of switchgear. Initial investigation into switchboard started.
11.11	Undertake Remedial Programs	Remedial Asset Management Program (RAMP)		Sep-2010		Sep-2010	Remedial Works Program developed and approved.
11.11.1	Perform condition assessment of all existing zone substation equipment		Milestone 35 - Initial risk assessment Milestone 36 - Approval of the Remedial Works Plan Milestone 37 - Completion of 1/3 of the Remedial Works Plan Milestone 38 - Clearance of all substations	Sep-2010	35▲ 36▲ 37△ 38△	Sep-2010	Condition assessment of substations currently underway with 9 substations completed to date.
11.11.2	Verify efficacy of all existing frame earth leakage protection systems			Sep-2010		Nov-2009	This will be undertaken seperately the substation condition assessments.
11.11.3	Replace Casuarina ZBS 11kV switchboard		Milestone 39 - Approve final Project Execution Plan Milestone 40 - Approve the new switchboard for service Milestone 41 - Approve the new transformer for service	Sep-2010	39△ 40△ 41△	Sep-2010	Both temp boards energised, awaiting Areva to install 2nd & 3rd bus of replacement board.
11.11.4	Perform condition assessment of all existing distribution substation equipment			Sep-2010		Sep-2010	All all urban overhead & city assets condition assessed. Rural assets not yet started.


remedial timeline
REMEDIAL WORKS PROGRAM
This sheet has been extracted from rows 121 to169 of the 'work sheet'
A change in priority of the work in the 'work sheet' may require a rework of this sheet
completed
planned
Outstanding
ID
location
calendar days at site
City Zone 66kV
Tennant Creek 22kV
City Zone 11kV
Snell St 66kV
Hudson Creek 132/66 kV SS
Badadeen 22/11kV
Snell St 11kV
Hudson Creek 132/66 kV SS
Berrimah 66kV
Berrimah 11 kV Retrofit
Palmerston 66 &22kV
Mary River 66/22 kV SS
Lovegrove 22/11kV
Cox Pen. Transmitter 66/11 kV SS
Cox Pen. Centre Yard 66/11 kV SS
Wood St 11 kV Sw St
Pine Creek 132/66 kV TS
Austin Knuckey 11 kV Sw St
Pine Creek 66/22 kV PS
Mott St 11 kV Sw St
Brocks Creek 66/11 kV SS
Cosmo Howley 66/11 kV SS