



# Mervyn Davies' Inquiry: Power and Water's Sixth Progress Report

## Summary

October 2010

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# 1 Background

In September and October 2008 a number of electrical equipment failures at Casuarina Zone Substation (CASZZ) resulted in widespread power 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.

The principal recommendations were that Power and Water should:

- 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 including supporting policies and policy documentation.
- Develop substation maintenance planning and works program.
- Report on maintenance delivery, asset condition, risks and failures.
- Enhance workforce capability, training, numbers and equipment.
- Review incident management and investigations and complete some outstanding investigations.
- Undertake an overall remedial program, including taking immediate action to replace the CASZZ 11kV switchboard.

The Mervyn Davies Recommendations can be seen in full on the Power and Water website at [powerwater.com.au](http://powerwater.com.au).

It is now over a year since the Mervyn Davies Report was finalised and Power and Water has been working systematically to implement these recommendations and improve network reliability.

This is the sixth report detailing progress on the 37 major milestones to fulfil Mervyn Davies' recommendations.

## 2 Progress

### 2.1 Overview

The Remedial Works Plan is progressing in line with the Mervyn Davies Report recommendations:

- 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 continue to improve collaboration with the workforce.
- A condition assessment and remedial program is nearing completion.
- Three switchboards have been installed and energised at CASZZ to restore the substation to its original capacity.

### 2.2 Progress in the past quarter

In the past quarter progress has continued as outlined below:

- Two temporary switchboards were installed at CASZZ in June 2009. Two of the three permanent boards were installed in June 2010, with the third completed in August 2010. All three have been commissioned for service and the cable changeover is nearing completion.
- The remediation of the 132kV Circuit Breakers at Pine Creek was completed.
- Initial remediation work was completed on the outdoor 66kV oil filled assets in Snell Street.
- Repair work continued on the outdoor 66kV and 22kV assets at McMinns Zone Substation (scheduled for completion in October 2010).
- Repair work continued on the outdoor 66kV and 22kV assets at Humpty Doo Zone Substation (scheduled for completion in October 2010).
- Initial remediation work began on the 66kV and 22kV oil filled assets at Palmerston Zone Substation.

In the next quarter work will focus on:

- Completing the redevelopment of the switch room building at CASZZ which is scheduled for completion this quarter.
- The replacement of Transformer 1 CASZZ which is scheduled for November 2010.
- The commissioning of a NOJA Farm to bypass the failing 11kV switchboard at Snell Street Zone Substation is scheduled for completion in November.
- The project management and installation of the new replacement Snell Street Zone Substation (scheduled to be completed in March 2011).
- The replacement of the failing 11kV Transformer cables at City Zone Substation (scheduled for dry season 2011 once system loads allow network access).
- The installation of a 22kV capacitor to relieve Generation operations at Katherine is now part of the entire 22kV switchboard replacement project.
- The investigation and remediation of 19 Power Transformers tested and showing high moisture content. (Scheduled into the Substation Maintenance five year cycle.)

## 2.3 Restoring Casuarina

Mervyn Davies' preliminary report recommended that the entire 11kV switchboard at CASZZ 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.

Following the failure of a voltage transformer at CASZZ in August 2010, Power and Water reassessed the safety and risk procedures involved with working at this site. More stringent work procedures in dealing with aged oil filled assets have now been developed, which has allowed work to continue at this site.

The permanent replacement of the 11kV switchboard is near completion. Three new switchboards have been installed to support this substation, allowing the switchboard to be decommissioned and removed.

A number of other remedial works has also been carried out at Casuarina, including thermal scanning and refurbishment of some equipment. The remaining 66kV OCBs, CTs and VTs were assessed in accordance with the priorities established in the Remedial Works Program during the 2009 dry season.

The following actions remain:

- Commission the new switchboard (scheduled for November 2010).
- Replace the 66kV/11kV Transformer 1 at Casuarina which is scheduled for November 2010.
- Restore substation to normal operation (scheduled for December 2010).

## 2.4 Substation assessment

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 26 zone substations and switching stations for OCBs, CTs and VTs operating at 66kV, 22kV and 11kV. Timing is based on the results of the preliminary risk assessment completed for all substations.

Substantial refurbishment has been carried out and continues at a number of sites. This has taken longer than forecast as improved condition assessment techniques and procedures have provided a better understanding of the condition and subsequent operating performance has helped identify more remedial work to be completed. The Remedial Asset Management Program team is still predicting completion of condition testing and remedial maintenance work on the higher risk equipment by the end of 2010.

### 3 Overall milestone progress

The following table summarises progress made on the Mervyn Davies Report recommendations. As the scope of each task has been carefully assessed and analysed Power and Water has revised some of the initial milestone dates. It has been possible to bring some target dates forward, 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.

Milestone	Initial target date	Revised target date	Status
1 Completion of the initial risk assessment recommended by the Mervyn Davies Preliminary Report to be noted by the Board.	Feb 2009		Complete
2 Approval of the Remedial Works Plan by the Managing Director.	Apr 2009		Complete
3 Completion of roughly a third of the Remedial Works Plan and the consequent formal review of progress and lessons learnt.	Jul 2009		Complete
4 Clearance of each substation as scheduled, following testing and remediation as required. Improved testing techniques have uncovered worse asset conditions than anticipated. This has added to RAMP's scope of works.	Sep 2010	Dec 2010	On track
5 General Manager Remedial Asset Management Program to approve a final Project Execution Plan and detailed installation plan.	Jun 2009		Complete
6 General Manager Remedial Asset Management Program to accept the new Casuarina switchboard for service.	Dec 2009		Complete
7 General Manager Remedial Asset Management Program to accept the new transformer for service.	Third quarter 2010		Complete
<b>Recommendation 1 – Move to condition-based maintenance</b>			
8 The first draft of Power Networks Five-Year Business Plan and 20-Year Outlook maintenance forecasts include a summary of planned maintenance as well as costs based on a condition-based maintenance approach.	Aug 2009		Complete
<b>Recommendation 2 – Implement condition-based maintenance in substations</b>			
9 Source external assistance from another utility to aid with maintenance training and support.	Feb 2009		Complete
10 Complete agreements with workforce to ensure that Job Model and Remuneration arrangements support condition-based maintenance.	Jun 2010		On track but tied to EBA negotiations
<b>Recommendation 3 – Bed down organisational changes</b>			
11 Appoint the Manager Strategy and Planning and the Manager Capital and Maintenance Delivery.	May 2009		Complete
12 Confirm appointment of new trades positions.	Jul 2009		Complete

<b>Milestone</b>	<b>Initial target date</b>	<b>Revised target date</b>	<b>Status</b>
13 Appoint the next level of management.	Jul 2009		Complete
14 Managing Director to approve a revised organisational structure for Power Networks.	Jul 2009		Complete
<b>Recommendation 4 – Deliver improved systems and processes</b>			
15 Identify process owners and ensure they have sufficient time to contribute to the AMC Project.	May 2009		Complete
16 Confirm that the Future State Design under the AMC Project does, in fact, address the requirements of Recommendation 4.2.	Dec 2009	Jun 2010	Complete
17 Confirm that the AMC Project as implemented does, in fact, address the requirements of Recommendation 4.2.	Dec 2010	Jun 2011	On track
<b>Recommendation 5 – Enhance policies and policy documentation</b>			
18 A revised Maintenance Policy based on 'condition-based maintenance' will be approved by the General Manager Power Networks.	Aug 2009		Complete
19 A review of high priority maintenance procedures, including detailed consultation with the workforce, resulting in a revised set of maintenance policies to be completed.	Sep 2009	Dec 2010	On track
20 A review of high priority work instructions, including detailed consultation with the workforce, will result in a revised set of maintenance policies.	Jun 2010	Dec 2010	On track
<b>Recommendation 6 – Develop substation maintenance planning and works program</b>			
21 Set high-level and detailed five-year quantum plans for substation maintenance.	Dec 2009		Complete
<b>Recommendation 7 – Report on maintenance delivery, asset condition, risks and failures</b>			
22 Provide example maintenance delivery and asset condition report to the Board for five asset classes.	Feb 2009		Complete
23 Provide full maintenance delivery and asset condition reporting to the Board.	Aug 2009		Complete
<b>Recommendation 8 – Enhance workforce capability</b>			
24 Appoint a Training Manager to Remedial Asset Management Program with strong technical knowledge.	May 2009		Complete
25 Appoint a Training Manager in Power Networks with strong technical knowledge.	Jun 2009		Complete
26 Confirm coordinators' development needs during the MyPlan Performance Review.	Jul 2009		Ongoing

<b>Milestone</b>	<b>Initial target date</b>	<b>Revised target date</b>	<b>Status</b>
<b>Recommendation 9 – Implement a staff development program</b>			
27 Improved supervisory training will be provided to all coordinators.	Nov 2009		Complete
28 Approve a revised framework for trades and technical training.	Oct 2010		On track
29 Commence first steps in Leadership Development.	May 2009		Complete
30 Individual development plans will be formulated for each manager, which align with and contribute to their current performance development plans.	Jul 2009		Complete
31 Suitable external leadership development opportunities will be assigned to each person.	Jul 2009		Ongoing
32 Commence development courses.	Aug 2009		Complete
33 All relevant managers receiving at least one session of development.	Dec 2009		Complete
<b>Recommendation 10 – Review incident management and investigations</b>			
34 Complete RISQ Investigation 1768.	Apr 2009		Complete
35 Commence ameliorative action in light of Manton investigation and further information on Yorkshire switchboards. The replacement of the switchboard in Alice Springs has been fast tracked, the Katherine board replacement is nearing completion and work is underway on the Batchelor substation which will benefit the Manton Switchboard.	Jul 2009		Complete <sup>1</sup>
36 Review incident management procedures and approve resulting Work Instruction.	Aug 2009		Dec 2010
37 Complete investigation into Casuarina events on access to the old switchboard.	Sep 2009		Complete

<sup>1</sup> Remedial Asset Management Program investigations are complete and the recommendation is to replace all Yorkshire switchboards. Power and Water has four Yorkshire switchboards which will be replaced with more modern technology as priority dictates.

## 4 Summary

Most of the Mervyn Davies Report recommendations relate to improving Power and Water's maintenance operations in the longer term. Power and Water has prepared a Long Term Action Plan to ensure 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 and work instructions.
- Reporting of maintenance activity and asset condition.
- Training and development of Power Networks staff.
- Incorporating improvements into the Power Networks Business Plan.

In the longer term, customers will benefit from a more reliable electricity supply. With reliable switchgear outages are less likely and - when they occur - they affect customers for a shorter time. The emphasis on the longer-term improvements 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.

# Glossary

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