



Department of Consumer
and Employment Protection
Government of Western Australia

EnergySafety

WESTERN POWER'S WOOD POLE MANAGEMENT SYSTEMS: REGULATORY COMPLIANCE AUDIT 2005 - EXECUTIVE SUMMARY

Audit Scope and Purpose

The purpose of this compliance assessment (audit) is to identify the degree to which the asset management systems and practices employed by Western Power that affected the strength and structural adequacy of its wood poles in 2005 comply with the *Electricity (Supply Standards and Systems Safety) Regulations 2001*. To this extent the Regulations through r.10 (refer Appendix 2) require a network to be designed, constructed, maintained and operated in a manner that provides (in brief) for the safety of people and property. The Regulations also require that the network operator demonstrate compliance with the Regulations and the standards and codes called up by the Regulations.

Western Power¹ is a network operator as defined in the *Electricity (Supply Standards and Systems Safety) Regulations 2001* to the *Electricity Act 1945* and is required to comply with these Regulations. As part of its obligations under the Regulations, Western Power is required to comply with the mandatory standards and codes identified in the Regulations, and to be able to demonstrate compliance with these Regulations. Western Power may also choose to comply with the other standards and codes to demonstrate compliance with the required safety outcomes.

This audit report has been limited to the networks now operated by Western Power Networks, which is responsible for the SWIS (South West Interconnected System) within Western Australia. While many of the findings and issues may also be relevant to Horizon Power, which provides integrated electricity services in remote areas, this report is not intended to address the Horizon Power issues. The compliance of Horizon's wood pole management systems and performance will be addressed in a future report.

¹ Western Power is the trading name of the corporation that has responsibility for the design, construction, operation and maintenance of the SWIS electricity network, as did its predecessor parent of the same name and SECWA prior to 1995.

The audit has been structured around the generic activities and processes that are part of all wood pole asset management systems covering the lifecycle of a pole from purchase through to replacement after years of installed service. The benchmarks used in the assessment have been identified from the Regulations, the standards, codes and guidelines called up by the Regulations, and Australian industry practices that have been found to support good wood pole network safety performance.

Wood Pole Safety is Important

The strength of the wood poles in Western Power's networks is important to the safety of customers, the general public, Western Power employees and contractors, and property for a number of reasons.

1. Customers' appliances and installations can be damaged by the over voltage in the electricity supply when poles fall over and power lines are tangled.
2. Employees and contractors working on power poles and lines are at a greater risk from the potential failures of unserviceable poles because the work they are doing invariably imposes additional loads on these poles.
3. The general public using roads and footpaths can suffer injury or electrocution if they collide with the fallen power poles and lines. The risk of electrocution is particularly high when the power lines either side of the failed pole are suspended near to, but above the ground supported by the power lines and adjacent poles.
4. Wildfires can start when fallen power poles allow live wires to contact trees and other vegetation.
5. Property adjacent to the power lines can be damaged physically by the falling poles and power lines, or by the wildfires started by the electrical arcing from tangled power lines.

Principal Audit Findings

Pole Failure Rates

Western Power reports annual wood pole failures (i.e. poles fell over) in its networks of between 130 and 300 per year. These pole failure rates equate to between 1.88 and 4.34 pole failures per year per 10,000 poles in the network compared with an industry target of 1 pole failure per year per 10,000 poles².

Eastern states network operators are now substantially bettering this industry target and achieving pole failure rates of between 0.2 and 0.4 pole failures per 10,000 poles. These include utilities with urban and rural wood pole networks. Western Power's reported pole failure performance is between 5 and 22.5 times worse than the performance being achieved by other Australian network operators.

² Electricity Council of NSW guide EC 8 - 1994

Western Power has acknowledged its pole failure rates are exceeding the industry targets and has committed to achieving the industry target of 1 pole failure per 10,000 poles in its networks by June 2009.

The following findings identify why Western Power's pole failure rates are substantially higher than those of its peer organisations.

Pole Condemnation Rates

Western Power's wood pole condemnation rates are less than those of comparable Australian network operators. This raises concerns about the ability of Western Power's wood pole inspection practices to reliably identify poles that are not safe and the wood pole inspection backlog that it has accumulated. Both these factors will contribute to a low condemnation rate.

Pole Replacement Rates

Western Power has 689,000³ wood poles in its distribution and transmission networks and reported⁴ that only 1672 poles had been replaced in the 12 months to 30 April 2006. This equates to 0.24% of the poles in its South West Interconnected System networks and is less than half the replacement rate of the poles in the eastern states network (0.5 to 0.6%). While the latter replacement rates are much greater than the Western Power replacement rates, it is considered that even these are still too low to achieve acceptable wood pole safety performance.

Western Power's reported pole replacement rate infers an average pole life of 414 years (100/0.24), which is not credible and will not deliver acceptable wood pole network safety performance. The industry considers life expectancy of untreated jarrah poles to be 15 to 25 years⁵. The life expectancy for reinforced and treated wood poles is greater and typically between 35 to 50 years. The actual service life of power poles is dependant on a number of factors including:

- The quality of the wood poles purchased and installed.
- The wood pole design and the initial factors of safety used in that design.
- The environment in which the poles are placed.
- The use (if any) and effectiveness of treatments to mitigate fungal and termite attack.
- Whether or not the poles are reinforced to extend the service life.

It should be noted that the audit has not sought to evaluate the efficacy of fungicidal treatments used by the network operator's pole inspectors, as that is not a safety issue. The key issue from a safety perspective is for the pole inspector to effectively determine the residual sound wood in the poles inspected and the residual strength of the poles to ensure that unserviceable poles are identified and reinforced and replaced as appropriate.

Credible pole replacement rates for Western Power's network with 689,000 wood poles would typically be in the range of 13,800 to 27,500 poles per annum.

³ WPN confirmed DFIS data

⁴ Hansard 13 June 2006

⁵ AS 1720.2 – 1990 Timber structures – Timber properties

EnergySafety's assessment is that Western Power's current pole replacement rates are not adequate and it is accumulating a backlog of unserviceable poles that have not been identified and should be either replaced or reinforced.

Compliance with Regulations and Industry Standards

In summary, Western Power's current wood pole asset management systems and processes do not comply with the requirements of the *Electricity (Supply Standards and Systems Safety) Regulations 2001*.

Western Power does not have adequate compliance management systems that will ensure compliance of its wood pole asset management systems and processes with the Regulations, nor does it currently have a plan to develop and implement a comprehensive compliance management plan and systems.

Part of this non-compliance with the Regulations stems from Western Power's current wood pole power line and structure designs not complying with the 1999 edition of the *ESAA Guidelines for design and maintenance of overhead distribution and transmission lines* specified in the Regulations.

The following points support the findings of non-compliance:

- **Design Compliance**

Western Power does not have records of the design calculations of its current wood pole structures being erected, nor design calculations for any of the poles that still exist in its networks that would demonstrate compliance with the technical requirements of the Regulations. There is also evidence to suggest that some of these earlier wood poles did not have the minimum required structural design factors of safety.

This lack of evidence that demonstrates the pole designs do comply with the Regulations places high reliance on the pole inspection activity to correctly identify poles that are not structurally adequate and that should therefore be reinforced or replaced.

- **Pole Inspection**

The pole inspection and strength assessment practices employed, and the serviceability criteria used do not provide confidence that the wood pole and stay⁶ inspection practices employed will adequately identify the unserviceable poles that should be reinforced or replaced. One key gap is the lack of focus on the inspection and assessment of the remaining strength of the stays and ground anchors installed. A second was the routine failure to examine the poles below ground as specified in Western Power's approved pole inspection instructions.

⁶ Stays are the galvanised steel wires, ground anchors and fixings used to support wood power line poles. Wood stay poles used with some stays to achieve ground clearance over trafficable areas are considered to be poles in this audit.

- **Asset Database (Pole) Records**

There is also concern about the accuracy of data in the asset database and the consequences of these inaccuracies for the asset management of the wood pole power lines. An adequate asset database is a key requirement of all asset management systems, and particularly the highly centralised systems used by Western Power.

- **Pole Base (Steel Member) Reinforcement**

A further concern is the pole base reinforcement arrangements and the blanket reinforcement programs Western Power has employed. Western Power's pole base reinforcement arrangements are not supported by design calculations or trials that demonstrate they do comply with the technical requirements from the Regulations and that the reinforced poles in service are safe. In addition, the blanket reinforcement programs may be reinforcing poles that do not have the necessary strength above the reinforcing steels to meet the required serviceability criteria. That is, they should be replaced, not reinforced.

Actions to Follow

- This Audit Report will be made available to Western Power⁷ for information and assessment, as the basis for discussions to give effect to actions generally identified below.
- Western Power will ultimately be required to respond to the Corrective Action Requests, following detailed discussion on them with EnergySafety, as required.
- EnergySafety will follow up with Western Power the resolution of 18 issues that were not concluded during the audit due to a lack of information at that time.

⁷ The report was made available to Western Power in mid November 2006