ELECTRICAL INCIDENT REPORT

POWER LINE FAULT AND BUSH FIRE NEAR BREAKWATER DRIVE, TWO ROCKS WESTERN AUSTRALIA ON 16 JANUARY 2009

28 January 2009

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EnergySafety WA
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1 INTRODUCTION

A bush fire occurred near Breakwater Drive, Two Rocks on 16 January 2009. The Fire and Emergency Service Authority (FESA) informed EnergySafety at approximately 1245 hours on the same day that the bush fire appeared to have originated near a Western Power (WP) 22kV overhead power line. An investigation has been conducted and this report summarises EnergySafety’s findings.

At approximately 0943 hours on 16 January 2009, two conductors clashed on a Western Power 22kV overhead power line south of Breakwater Drive, Two Rocks, between pole numbers 409142 and 409143. A short circuit fault ensued. Burn marks and metal globules on the two conductors indicate a high probability that the fault produced molten metal which fell to the ground, igniting dry stubble under the power line (Appendix B, Photograph Number 1).

This investigation was carried out and completed with the cooperation and assistance of FESA, Police and Western Power under established protocols.

1.1 Time and Date of Occurrence
Approximately 0943 hours on Friday 16 January 2009.

1.2 Notification of Incident
EnergySafety was notified of the incident by Mr Phil Cribb, Manager Fire Investigation and Analysis Unit (FIAU), Fire and Emergency Services Authority of WA (FESA) at 1245 hours on 16 January 2009. Mr Peter Wright, EnergySafety’s Acting Chief Electrical Inspector arranged for an investigation to commence with FESA, Police and WP that afternoon at Two Rocks, WA.

1.3 Investigating Inspectors
EnergySafety WA, Acting Manager Electrical Inspection (Supply), Mr Todd Bell carried out the onsite investigation.

Mr Bell inspected the bush fire scene on 16 January 2009 and again on 17 January 2009 with Police, FESA and WP investigators.

EnergySafety WA, Principal Engineer Electricity Supply, Mr Rob Thornton, Senior Engineer Electricity Supply, Mr Andrew Martin and Manager Electrical Inspection (Supply), Mr Peter Wright also carried out an investigation at the fire site on 22 January 2009.
2 SUMMARY

Given the prevailing weather conditions around 0943 hours on 16 January 2009 (strong north-easterly winds) and the technical evidence available, a short circuit fault resulted from conductors clashing on a Western Power 22kV overhead power line south of Breakwater Drive, Two Rocks. The power line is the Yanchep (YP517) 22kV Feeder originating at Western Power’s Yanchep substation and extending north to Guilderton. The fault occurred approximately quarter-span between pole numbers 409142 and 409143.

The span length between these poles is 67 metres. The relevant bay is a combination of a vertical strain angle pole (Appendix B, Photograph Number 3) and a three phase intermediate pole, with a 1.8 metre crossarm installed on pole number 409143.

Investigation found that the top of the vertical strain angle pole number 409142 was split. The eyebolt securing the top phase conductor had pulled through the pole to a point where the tension of the conductor was significantly reduced. As a consequence, the distance between the top and centre-phase conductors was also reduced. Clashing occurred in the strong gusting wind and high ambient air temperature present on the day.

The ensuing short circuit fault resulted in falling hot metal particles igniting vegetation under the power line.

The clashing of conductors as described above raises the question of a deficiency in maintenance and inspection of wood poles, since other poles along the feeder line had been replaced and/or upgraded. However, the type of construction used on this power line has traditionally performed satisfactorily within the Western Power network.

Significant further investigation will be required by Western Power, in conjunction with EnergySafety, to answer the above question and to assess whether this was an isolated instance, or whether it is an indication of a more systemic problem. The type and extent of any corrective action required also must be determined.
3 ORIGIN OF THE BUSH FIRE

FESA and Police investigators formed the opinion that the bush fire’s point of ignition was on the ground in bush land south of Breakwater Drive, Two Rocks.

An inspection of the ignition point indicated that an area of grass and bush had burnt out adjacent to the Western Power 22 kV overhead power line. The bush fire had continued in a south westerly direction towards Yanchep, before heading east. This is consistent with the bush fire being driven forward from the point of ignition by wind initially coming from the northeast and then the west.
4 INVESTIGATION ANALYSIS

4.1 Examination of the 22 kV Overhead Power Line

The Western Power Yanchep YP517 overhead 22 kV feeder specifications are:

- Phase conductors (x3): Aluminium
- Pole material: Wood
- Pole heights (#409142 and #409143): 10.6 and 9.4 metres from ground level
- Span length (#409142 to #409143): 67 metres
- Crossarm material: Wood
- Crossarm length: 1.8 metres
- Orientation of power line: north/west then south/east

Inspection found evidence of damage to the overhead power line conductors between pole numbers 409142 and number 409143 on the Yanchep 22 kV Feeder line (YP517). The damage consisted of electric arc burn marks on the top and centre phase aluminium conductors over a distance of 2 metres, approximately 16 metres from pole number 409142 (Appendix B, Photograph Number 2).

Inspection of the top of the vertical strain angle pole number 409142 found that the wood was split and the eyebolt securing the top phase conductor had pulled through the pole to an extent where the tension of the conductor was significantly reduced. As a consequence, the distance between the top and centre phase conductors was reduced. Clashing occurred in the strong gusting wind and high ambient air temperature present on the day. There was no evidence of a pole-top fire in the area.

Western Power recorded a fault on the power line on 16 January 2009 at approximately 0941 hours. This fault time coincides closely with the commencement of the bush fire.

4.2 Weather Conditions and Topography

The weather conditions at Perth for 16 January 2009 as follows:

0900 hours
North easterly wind at 22 kph
Relative humidity 15%
Ambient air temperature was approximately 33.4ºC

Wind speed at Ocean Reef for 16 January 2009 as follows:

0930 hours
North easterly wind gusting at 29-50 kph

Temperature at Wanneroo for 16 January 2009 as follows:

0830 hours
Relative humidity 15%
Ambient air temperature 32.3ºC

The sky was clear and there was no evidence of lightning taking place in the area.

The ground between pole numbers 409142 and 409143 consisted of a limestone track and the surrounding area was covered with dry grass and leaf matter.
4.3 The Effect of a Short Circuit on an Overhead High Voltage Power Line

When live, bare high-voltage conductors come together they cause an electric arc to develop across the air gap between them or at the point of actual contact. In both cases a significant amount of electrical energy passes between the two conductors, producing a large quantity of heat in the metal at the arc point. This heat causes melting of the metal, resulting in the formation of molten metal globules that disperse away from the arc and fall to the ground while remaining very hot.
5 CONCLUSIONS

Related events, circumstances and factors coincided on the day of the bush fire. Taking all evidence into account it is reasonable to conclude that:

- There are no suspicious circumstances concerning the bush fire origin.
- The bush fire originated between pole numbers 409142 and 409143 on the Yanchep 22kV overhead power line (Feeder YP517), south of Breakwater Drive, Two Rocks.
- The bush fire resulted from the ignition of the dry grass and bush stubble on the ground following hot metal globules falling from two 22 kV conductors clashing on the Western Power - Yanchep YP517 power line, approximately quarter-span between poles number 409142 and number 409143.
- The top of pole number 409142 was split and the eyebolt securing the top phase conductor had pulled through the pole to a point where the tension of the conductor was significantly reduced. As a consequence, the distance between the top and centre-phase conductors was reduced. The conductors clashed in the strong, gusting wind and high ambient air temperature present on the day.
- The clashing of conductors as described above raises questions about Western Power’s inspection and maintenance system for its power poles. Had the defect been identified and rectified, the conductor clearances would have been maintained and clashing would have been much less probable.
- Significant further investigation will be required by Western Power, in conjunction with EnergySafety, to answer the above question and to assess whether this was an isolated instance, or whether it is an indication of a more systemic problem. The type and extent of corrective action required must be assessed also.
APPENDIX A: SATELLITE LOCATION IMAGE

Showing location of the origin of bush fire (Note: Image taken prior to the bush fire)
APPENDIX B: PHOTOGRAPHS

Photograph No 1: - Origin of Bush Fire
Photograph taken near Breakwater Drive on 17 January 2009 by Senior Electrical Inspector Todd Bell, EnergySafety. The origin of the bush fire as determined by FESA investigators is to the left of the large trees and underneath the powerlines.
Photograph No 2: - Burn Marks on Conductors
Photograph taken near Breakwater Drive on 17 January 2009 by Senior Electrical Inspector Todd Bell, Energy Safety. Photograph shows the burn marks on the top and centre phase conductors.
Photograph No 3: - Photograph of Pole Number 409142
Photograph taken near Breakwater Drive on 17 January 2009 by Senior Electrical Inspector Todd Bell, Energy Safety. Photograph shows the split wood at the pole top and the phase conductor eyebolt (top left) that was pulled through the pole.