



Department of Consumer  
and Employment Protection  
Government of Western Australia

*EnergySafety*

## **ELECTRICAL INCIDENT REPORT**

# **POWER LINE FAULT AND WILDFIRE NEAR BASTIANI ROAD AND SOUTH COAST HIGHWAY PARRYVILLE WESTERN AUSTRALIA ON 7 MARCH 2007**

22 March 2007

**Report prepared by:**

*EnergySafety* WA

EIS 2007-269

## TABLE OF CONTENTS

|     |  |    |
|-----|--|----|
| 1   | INTRODUCTION .....   | 3  |
| 1.1 | Time and Date of Occurrence .....  | 3  |
| 1.2 | Notification of Incident.....  | 3  |
| 1.3 | Investigating Inspectors .....   | 3  |
| 2   | SUMMARY .....  | 4  |
| 3   | ORIGIN OF THE WILDFIRE.....  | 5  |
| 4   | INVESTIGATION ANALYSIS.....  | 6  |
| 4.1 | Examination of the 22 kV Overhead Power Line .....                         | 6  |
| 4.2 | Weather Conditions and Topography.....                                     | 6  |
| 4.3 | Other Sources of Ignition - Eliminated.....                                | 7  |
| 4.4 | The Effect of a Short Circuit on an Overhead High Voltage Power Line ..... | 7  |
| 5   | CONCLUSIONS .....  | 8  |
|     | APPENDIX A: LOCATION MAP .....   | 9  |
|     | APPENDIX B: SATELLITE IMAGE SHOWING POLE POSITIONS.....                    | 10 |
|     | Satellite Image: Showing Origin of Wildfire and Pole Positions .....       | 10 |
|     | APPENDIX C: PHOTOGRAPHS .....  | 11 |
|     | Photograph No 1: - Origin of Wildfire .....                                | 11 |
|     | Photograph No 2: - Burn Marks and Damage to Conductors .....               | 12 |
|     | Photograph No 3: - Damage to Underslung Earth Conductor .....              | 13 |

## **1 INTRODUCTION**

A wildfire occurred near Parryville on 7 March 2007 and the Fire and Emergency Service Authority (FESA) advised Western Power (WP) at approximately 1430 hours on 7 March 2007 that the wildfire originated near a WP three phase 22 kV overhead power line. After inspecting the site WP advised EnergySafety and an investigation has been conducted and this report summarises EnergySafety's findings.

This investigation could not have been completed without the cooperation and assistance of FESA and WP.

### **1.1 Time and Date of Occurrence**

Approximately 1412 hours on Wednesday 7 March 2007.

### **1.2 Notification of Incident**

EnergySafety was notified of the incident by Mr Laurie Seddon from Western Power at 1740 hours on 7 March 2007. Mr Michael Bunko, EnergySafety's Chief Electrical Inspector advised the Director of Energy Safety, Mr Albert Koenig. He also arranged for an investigation to commence in liaison with FESA (FESA incident number 2006071022) and WP the next day at Parryville (20 Km West of Denmark).

### **1.3 Investigating Inspectors**

The following EnergySafety WA personnel carried out the onsite investigation:

- Mr Ross Reid, Senior Electrical Inspector.

Senior Electrical Inspector Reid initially inspected the wildfire scene on 8 March 2007 and carried out a further examination on 9 March 2007 in conjunction with FESA and WP investigators.

## 2 SUMMARY

In consideration of prevailing weather conditions around 1412 hours on 7 March 2007 and all the technical evidence available, a short circuit fault resulted from conductors clashing on a Western Power 22kV (22,000 volt), 3 phase overhead power line West of Denmark. The power line is the Albany to Denmark/Walpole 22kV Feeder and the fault occurred mid span between poles number WP170 and number WP171.

The span length between poles number WP170 and number WP171 is 151 metres. The power line bay is a typical in-line construction with standard width crossarms (2.1 metres).

Investigation found that the middle white phase conductor and the underslung earth conductor made direct contact with each other in the light wind and high ambient air temperature. This is evident from the burn marks and metal globules on the conductors.

The ensuing short circuit fault resulted in hot metal globules falling and igniting dry grass near the power line.

The clashing of conductors, as described above, occurred when the white phase sagged into the underslung earth conductor. This should not have occurred, since conductor separation should have been sufficient to avoid such a fault occurring.

Further investigations are required by EnergySafety and Western Power to determine to what extent the deficiency of this particular section of the power line was of a design/construction origin, of a conductor degradation or overloading nature. It will then be possible for EnergySafety to make an assessment as to whether or not Western Power sufficiently met its obligation to manage its network in a manner that provides for the safety of persons and property.

Meanwhile the power line has been made safe by the installation of an intermediate pole.

### **3 ORIGIN OF THE WILDFIRE**

The FESA investigator estimated that the wildfire's point of ignition was on the ground in a paddock East of Bastiani Road and North of South Coast Highway approximately 20 kilometres West of Denmark.

An inspection of the ignition point (approximately 5 to 6 metres south of WP's power line) indicated that a large area of grass paddock had burnt out adjacent to the Western Power 22 kV overhead power line. The wildfire had continued in a Southerly direction, which is consistent with the wildfire being driven forward from the point of ignition by wind coming from the North.

The power line (Albany to Denmark/Walpole ALB520 Feeder) originates at WP's Albany 132/22kV substation and extends via Denmark to Walpole.

## 4 INVESTIGATION ANALYSIS

### 4.1 Examination of the 22 kV Overhead Power Line

The Western Power Albany to Walpole (ALB520) overhead 22 kV feeder specifications are:

- Phase conductors (x3): Steel cored aluminium (7/3.0 Al)
- Underslung earth conductor: Galvanised steel wire (rusted 7/1.6 Fe)
- Pole material: Wood
- Pole lengths (#WP170 and #WP171): 11 Metres
- Span length (poles #WP170 to #WP171): 151 Metres
- Crossarm material: Wood
- Crossarm length: 2.1 Metres
- Direction of power line: East West orientation

Inspection of the power line found evidence of damage to the overhead power line conductors between poles number WP170 and number WP171 on the Albany to Walpole 22 kV Feeder (ALB520). The damage consisted of electric arc burn marks on the middle steel cored aluminium conductor (white phase) and on the underslung earth conductor near and at the point where strands on the earth conductor were broken. This was immediately below the damage to the white phase conductor.

WP attended the incident scene on the afternoon of the 7 March 2007 and observed that the white phase conductor has sagged to such an extent that it was approximately at the same height as the earth conductor from the ground. WP also observed that as the temperature decreased later that afternoon the white phase conductor's sag reduced thereby increasing the separation between it and the earth conductor.

WP considered that the power line was unsafe and installed an additional pole (WP170A) between poles number WP170 and number WP171 thereby reducing the span length to approximately 75 metres and increasing the separation between the phase conductors and earth conductor to within safe limits.

WP also recorded a number of intermittent faults on the power line on 7 March 2007 between approximately 1351 hours and 1440 hours. These faults coincide with the commencement of the wildfire.

### 4.2 Weather Conditions and Topography

The weather conditions at Walpole for 7 March 2007 was recorded at 1500 hours as follows:

Northerly wind at 17 kph  
Relative Humidity 13%  
Ambient air temperature was approximately 40°C (Max 40.7°C)

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

The ground between poles number WP170 and number WP171 is formed in the shape of a gully. The ground, prior to the wildfire was covered with dry grass and small bushes.

### **4.3 Other Sources of Ignition - Eliminated**

Consideration was given to various possibilities of other sources of ignition at the power line, such as wind-borne material (such as twigs) striking and snagging on the power line, however, all the evidence led to the conclusion that the source of ignition was the clashing of the conductors.

Significantly, the earth conductor exhibited damage that is consistent with electrical arcing between it and a phase conductor and there was evidence of burn marks on the phase conductor.

### **4.4 The Effect of a Short Circuit on an Overhead High Voltage Power Line**

When a live bare high voltage conductor and earth conductor come together they cause an arc to develop across the air gap between them or at the point of actual contact. In both cases a significant amount of electric energy passes between the two conductors and a large quantity of heat is produced in the metal at the point where the arc is formed. This heat causes melting of the metal resulting in welding of the conductors and the formation of molten metal globules that would disperse away from the arc and fall to the ground whilst still hot.

## 5 CONCLUSIONS

There are a number of inter-related events, circumstances and factors that coincided on the day of the wildfire. Taking all evidence into account the conclusion is reached that:

- There are no suspicious circumstances relating to the origin of the wildfire.
- The wildfire incident originated mid span between poles number WP170 and number WP171 on the Albany to Walpole 22kV overhead power line (Feeder ALB520), near Parryville, East of Bastiani Road and North of South Coast Highway and approximately 20 km West of Denmark.
- The wildfire resulted from the ignition of the dry grass on the ground due to hot metal globules falling from a 22 kV conductor clashing with an underslung earth conductor on the Western Power Albany to Walpole overhead power line (Feeder ALB520), between poles number WP170 and WP171.
- The conductor separation between pole numbers WP170 and WP171 was insufficient and the powerline was not designed or maintained in safe condition to avoid such a fault occurring.

Further investigations are required by EnergySafety and Western Power to determine to what extent the deficiency of this particular section of the power line was of a design/construction origin, of a conductor degradation or overloading nature, It will then be possible for EnergySafety to make an assessment as to whether or not Western Power sufficiently met its obligation to manage its network in a manner that provides for the safety of persons and property.



**APPENDIX A: LOCATION MAP**



## APPENDIX B: SATELLITE IMAGE SHOWING POLE POSITIONS

### Satellite Image: Showing Origin of Wildfire and Pole Positions

Note: Image taken prior to the wildfire





**APPENDIX C: PHOTOGRAPHS**

**Photograph No 1: - Origin of Wildfire**

Photograph taken near Bastiani Road Parryville on 8 March 2007 by Senior Electrical Inspector Ross Reid, EnergySafety. New pole (WP170A) installed (centre of picture) by WP is near origin of the wildfire.



**Photograph No 2: - Burn Marks and Damage to Conductors**

Photograph taken near Bastiani Road, Parryville on 7 March 2007 by Western Power showing the damage to the earth conductor (smaller conductor) and burn marks on the white phase conductor.



**Photograph No 3: - Damage to Underslung Earth Conductor**

Photograph taken on 8 March 2007 by Senior Electrical Inspector Ross Reid, Energy Safety.

