



**POWERLINK QUEENSLAND**

**NETWORK OPERATION SERVICES  
INCIDENT SUMMARY REPORT**

**NORTH QUEENSLAND  
POWER SYSTEM EVENTS ON  
21<sup>ST</sup> JANUARY 2015**

**SUBMITTED TO**  
R Jones – Fault Management Manager

**PREPARED BY**  
Pranesh PAL – Principal Engineer - Investigations

**POWERLINK QUEENSLAND**  
33 Harold Street  
Virginia Qld 4014

PO Box 1193  
Virginia Qld 4014

Tel - 07 3860 2111  
Fax - 07 3860 2597

**NETWORK OPERATION SERVICES  
OPERATIONS AND FIELD SERVICES**

**DATE PREPARED**  
24th February 2015

## INTRODUCTION

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This report has been prepared for the purposes of meeting Powerlink's reporting obligations to AEMO as specified under clause 4.8.15 of the National Electricity Rules.

## SUMMARY

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At 1930 hrs on the 21<sup>st</sup> of January 2015, a number of transmission and generation system elements in the North Queensland area tripped from service as a result of lightning during a severe electrical storm in the vicinity of the Ross – Chalumbin 275kV Feeders 857 & 858.

A summary of the affected elements operation is as follows:

- **Coincident trip of Feeders 857 and 858 Ross – Chalumbin due to high voltage B and C Phase to ground faults**
  - Resulted in a 3 Pole Trip and successful reclose at H013 Ross & H032 Chalumbin in 5.5 seconds.
- **Trip of Feeder 7254 Tully – Elarish due to unexpected relay operation**
  - Tripped 3 poles at T171 EL Arish and reclosed 5.6 seconds later.
- **Trip of Feeder 7301 Tully – Woree due to unexpected relay operation**
  - Tripped 3 poles at H039 Woree and reclosed 10.5 seconds later.
- **Trip of Feeder 7139 Innisfail – Edmonton due to unexpected relay operation**
  - Tripped 3 poles at T050 Innisfail & T129 Edmonton and reclosed both ends 10.6 seconds later.
- **Trip of Feeder 7143 Barron Gorge - Kamerunga**
  - Tripped at T053 Kamerunga due to Power Station protection systems
- **Trip of Feeder 7184 Barron Gorge - Kamerunga**
  - Tripped at T053 Kamerunga due to Power Station protection systems
- **Trip of Kareeya Power Station Generating Unit 4.**
  - Resulted in the loss of 5 MW of generation.
- **Trip of Barron Gorge Power Station Units 1 & 2**
  - Resulted in the loss of 63MW of generation.

Restoration of the elements to service occurred as follows:

- 275kV Feeder 857 successfully auto reclosed 5.5 seconds after the trip.
- 275kV Feeder 858 successfully auto reclosed 5.5 seconds after the trip.
- 132kV Feeder 7254 successfully auto reclosed 5.6 seconds after the trip.
- 132kV Feeder 7301 successfully auto reclosed 10.5 seconds after the trip.
- 132kV Feeder 7319 successfully auto reclosed 10.6 seconds after the trip.
- H013 Ross CB 5932 manually closed 7 ½ minutes after the trip
- H032 Chalumbin CB 5032 manually closed 9 ½ minutes after the trip
- H032 Chalumbin CB 5042 manually closed 9 minutes 48 seconds after the trip
- H013 Ross CB 5052 manually closed 9 minutes 53 seconds after the trip
- T053 Kamerunga Feeder 7184 manually closed 2 hours and 2 minutes after trip.
- T053 Kamerunga Feeder 7134 manually closed 2 hours and 2 minutes after trip.

A loss of high voltage supply occurred to Far North Queensland during the feeder autoreclose time.

## EVENT DETAILS

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### OVERVIEW

At the time of this event, the loss of 275kV Feeders 876 and 877 Chalumbin to Woree had been classified as a single credible contingency due to storms in the area.

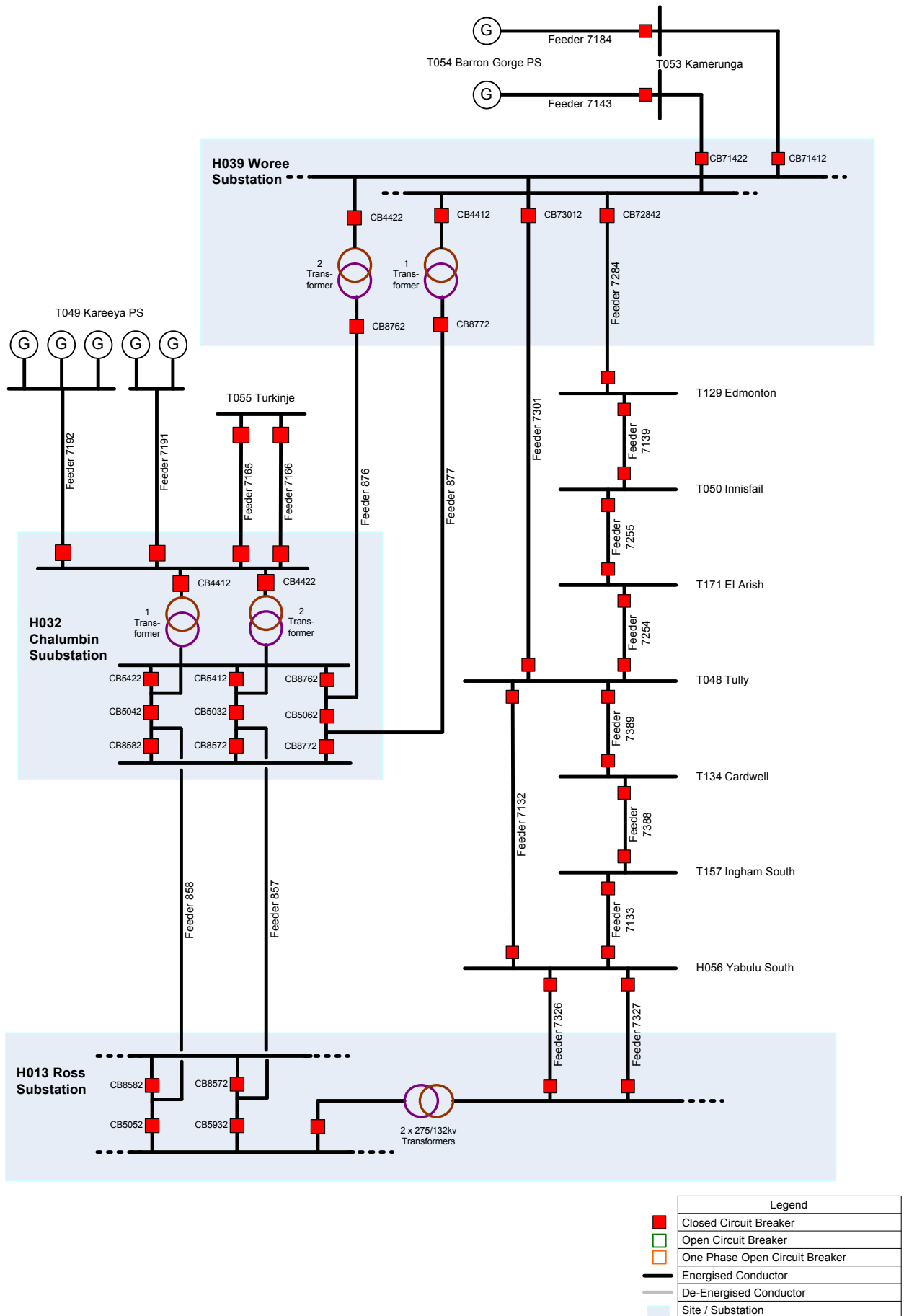
Overcurrent settings had been applied to Feeder 7132 at H056 Yabulu South and Feeder 7388 at T134 Cardwell for this contingency. These settings were implemented to trip these two 132kV feeders if an overload of the 132kV coastal network resulted from the loss of Feeders 876 and 877.

Barron Gorge Generating Unit 1 & 2 (63MW) and Kareeya Power Station Unit 4 (4MW) were generating at the time of the event.

The single line diagram of relevant power system plant, equipment and circuit breakers is shown in Figure 1 below. For clarity, only plant and equipment that operated or provides connectivity between affected sites is shown in the line diagram.

Figure 1 also shows the status of applicable circuit breakers prior to the event.

**Figure 1 - Single line diagram of relevant power system plant showing plant status prior to the event**



## EVENT SUMMARY – 2 MARCH 2013

Date/Time	Events	Comments
19:30:18.695hrs	Coincident trip of 275kV Feeders 857 and 858 Ross - Chalumbin	
19:30:19.158hrs	Trip of 132kV Feeder 7301 at Woree	
19:30:19.203hrs	Trip of 132kV Feeder 7139 at Innisfail and Edmonton	
19:30:19.228hrs	Trip of 132kV Feeder 7254 at Elarish	Loss of 275kV and 132kV supply to Far North Queensland
19:30:20hrs	Trip of Barron Gorge Power Station Units 1 and 2	
19:30:20hrs	Trip of 132kV Feeders 7143 and 7184 Barron Gorge - Kamerunga	
19:30:22hrs	Trip of Kareeya Power Station	
19:30:24hrs	Autoreclose of 275kV Feeders 857 and 858	275kV supply restored to Chalumbin and Woree substations.
19:30:24hrs	Autoreclose of 132kV Feeder 7254	
19:30:29hrs	Autoreclose of 132kV Feeder 7301	
19:30:29hrs	Autoreclose of 132kV Feeder 7139	132kV network restored to normal.
21:32:32hrs	Manual close of 132kV Feeder 7184	
21:33:06hrs	Manual close of 132kV Feeder 7143	

## HIGH VOLTAGE POWER SYSTEM FAULT

At 19:30:18hrs on 21<sup>st</sup> of January 2015, coincident high voltage faults occurred on both Ross – Chalumbin Feeders 857 and Feeder 858. B and C phase to ground faults occurred on both feeders. Protection systems operated and performed 3 pole trips on both these feeders at H013 and H032.

## TRIP OF BARRON GORGE POWER STATION GENERATORS AND 132KV FEEDERS

One second after the initial event, Barron Gorge generating Units 1 & 2 tripped resulting in the loss of 63 MW of generation. Barron Gorge Power Station protection systems also operated to trip 132kV Feeders 7143 and 7184 from service.

## TRIP OF KAREEYA POWER STATION GENERATOR

Two seconds after the initial event, Kareeya Power Station generating Unit 4 tripped resulting in the loss of 5 MW of generation.

## TRIP OF 132KV FEEDERS

The following 132kV feeders tripped unexpectedly within one second of the initial event due to operation of protection relay phase distance elements:

- Feeder 7301 tripped at H039 Woree End.
- Feeder 7139 tripped at T129 Edmonton and T050 Innisfail.
- Feeder 7254 Tripped at T171 El Arish

The following circuit breakers operated for these events:

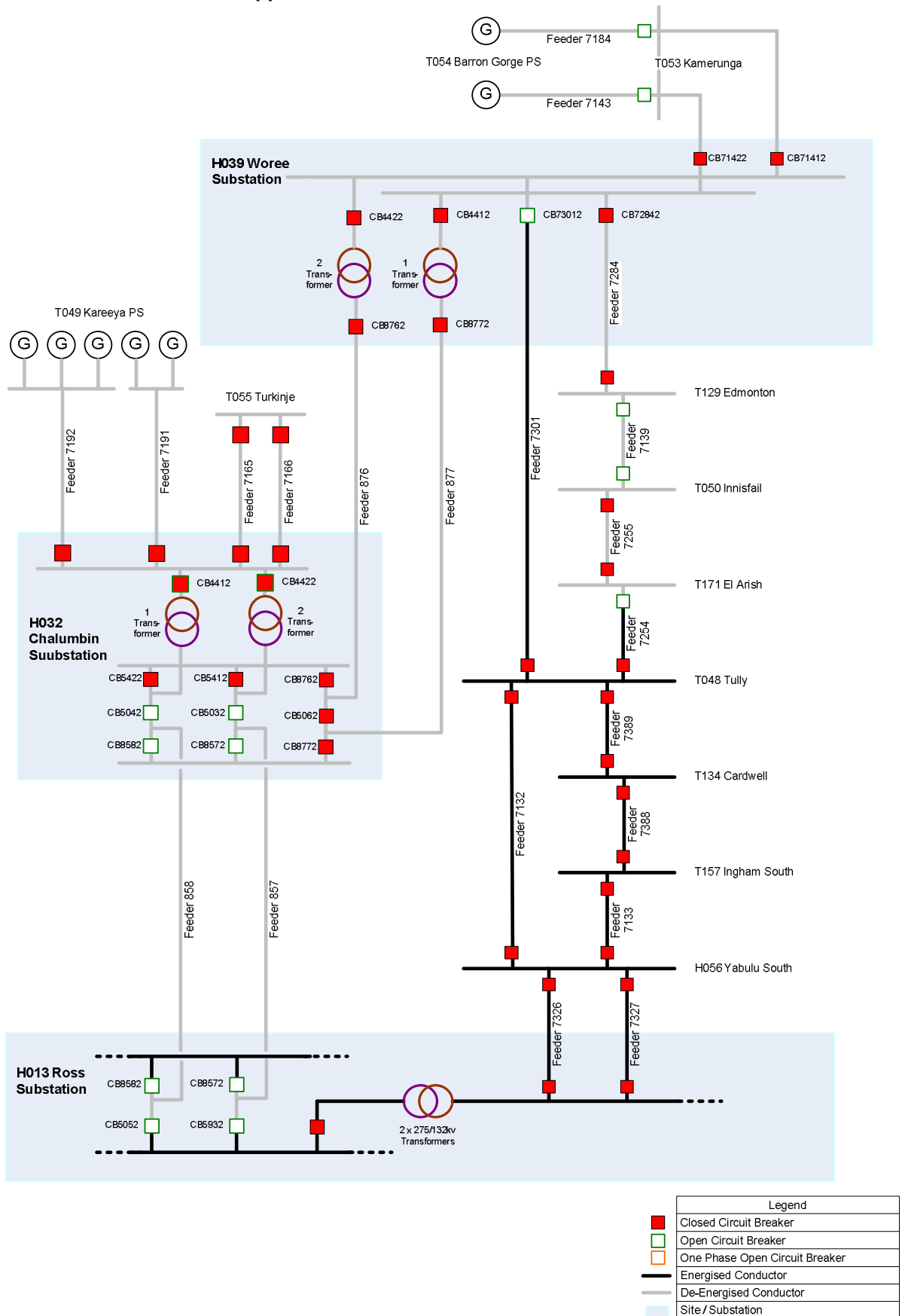
- H013 Ross CB8572 (All Poles)
- H013 Ross CB5932 (All Poles)
- H032 Chalumbin CB8572 (All Poles)
- H032 Chalumbin CB5032 (All Poles)
- H013 Ross CB8582 (All Poles)
- H013 Ross CB5052 (All Poles)
- H032 Chalumbin CB8582 (All poles)
- H032 Chalumbin CB5042 (All Poles)
- H039 Woree CB 73012 (All poles)
- T050 Innisfail CB 71392
- T129 Edmonton CB 71392
- T171 El Arish CB 72542
- T054 Barron Gorge CB B1AKA01CE001
- T054 Barron Gorge CB B2AKA01CE001
- T053 Kamerunga CB 71432
- T053 Kamerunga CB 71842
- H032 Chalumbin CB 2712
- T049 Kareeya CB P1U1

- T049 Kareeya CB P1U2
- T049 Kareeya CB P1U3
- T049 Kareeya CB P1U4

Figure 2 below shows the status of relevant power system plant immediately after all circuit breakers tripped.



**Figure 2 - Single line diagram of relevant power system plant showing plant status immediately after all circuit breakers tripped**

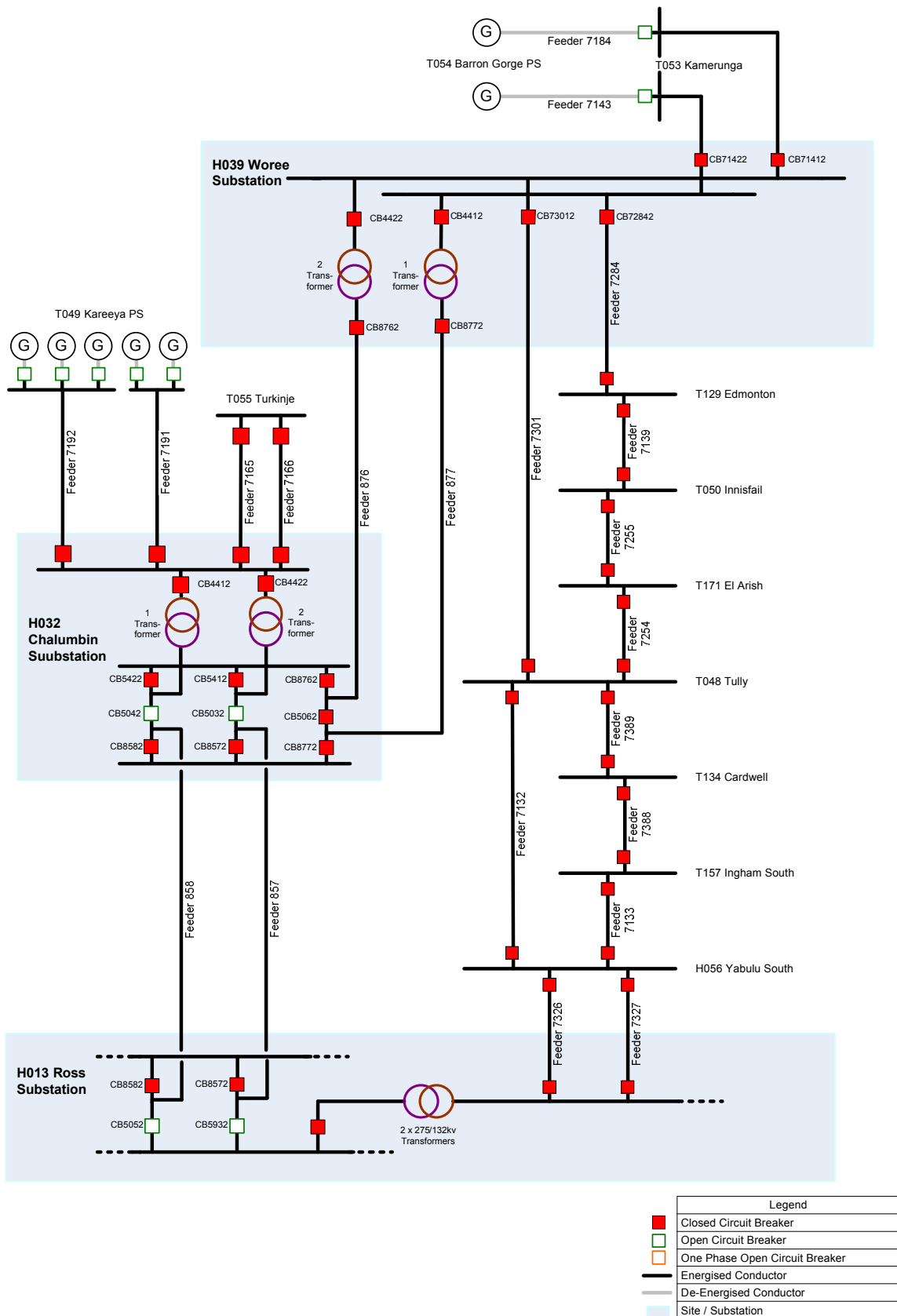


## **AUTORECLOSE**

Autoreclose functions operated to successfully return Feeders 857, 858, 7139, 7254 and 7301 to service within ten seconds of the initial events.

Figure 3 below shows the status of relevant power system plant after the autoreclose operations had occurred.

**Figure 3 - Single line diagram of relevant power system plant showing plant status after the autoreclose operations**



## **EVENT ANALYSIS**

High voltage B and C phase to ground faults occurred on conductors of both Feeders 857 and 858 during a period of electrical storm activity near the lines. The feeder fault location systems indicated that the faults occurred at similar physical locations on each feeder in the area of the electrical storm. A subsequent line patrol identified flashed insulators at the predicted fault location. The cause of the high voltage faults on both Feeders 857 and 858 has been attributed to lightning.

The operation of feeder protections associated with Feeders 7301, 7139 and 7254 was unexpected. The protection relays operated due to the rate of change of voltage and frequency conditions combined with the load on each feeder as the network collapsed after the trip of Feeders 857 and 858. This issue has been referred to the manufacturer for further investigation. The trip of Feeders 7301, 7139 and 7254 occurred before the overcurrent setting applied to Feeders 7132 and 7388 timed out to trip those feeders.

Kareeya and Barron Gorge Power Station generators that were online at the time of the event tripped due to the load in the resultant network island being greater than the combined generation online could supply.

Feeder 7143 and 7184 tripped due to operation of Barron Gorge Power Station protection systems as a result of the loss of 132kV supply to the Power Station. The power station protection systems initiated the transmission of intertrip signals to Kamerunga substation to trip both feeders.

## **PLANT RESTORATION**

Feeders 857, 858, 7139, 7254 and 7301 were returned to service by autoreclose functions within ten seconds of the initial event.

At 2132hrs on 21 January 2015, Feeder 7184 was returned to service

At 2133hrs on 21 January 2015, Feeder 7143 was returned to service

## **LOSS OF SUPPLY**

A loss of high voltage supply occurred to Far North Queensland during the feeder autoreclose time.

## **FAULT CLEARANCE**

The high voltage faults on Feeders 857 and 858 line conductors were cleared from the power system within the requirements as specified in the National Electricity Rules (NER).

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**END OF REPORT**

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