Transpower Event Review

Kieran Devine & Garth Dibley presented to:
Security and Reliability Council

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TRANSPOWER

Keeping the energy flowing

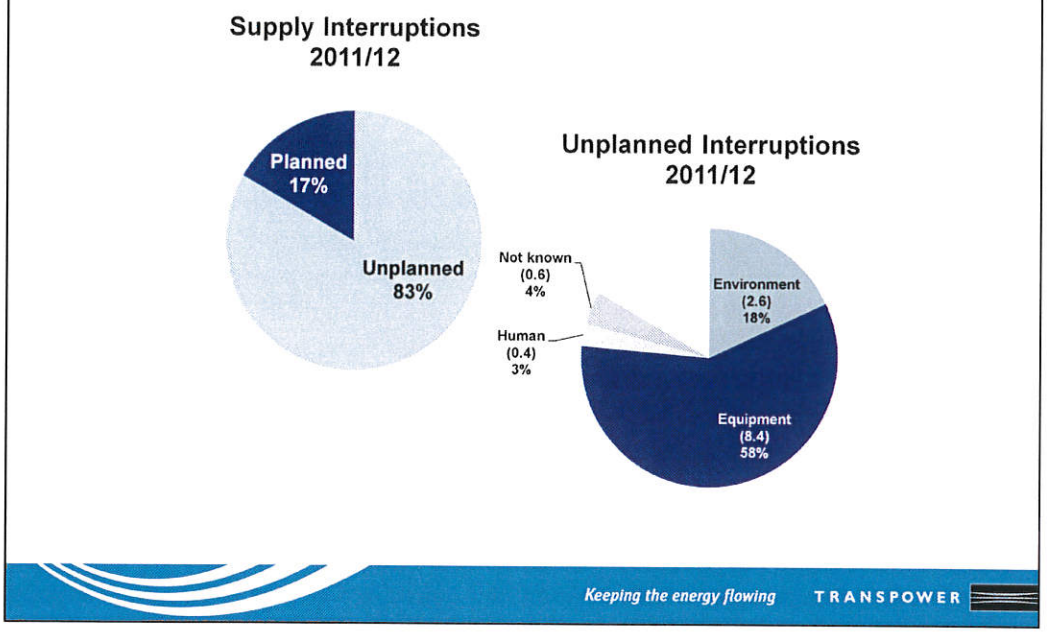
Transpower New Zealand Ltd The National Grid

The Grid 2011/12

- Transmission assets
  - Transmission lines 11,590 km
  - Underground cable 8 km
  - Cook Strait cable 40km (each)
  - Substations 177
- Connecting Generating stations
  - North Island 49
  - South Island 19
- Supplying energy from the Grid = 38,205GWh
- System Maximum Demand of 6,917 MW
- Process 8000 outage requests annually

24 hours a day, 7 days a week operation

Causes of Supply Interruptions



At the highest level supply interruptions are grouped as :

- Planned and Unplanned
- 2011/12 , 17% Planned compared to 83% Unplanned

Planned – outages for maintenance, replacement or refurbishment, as well as new construction

Unplanned – four categorises

1. Environment – lightning, storms, earthquakes , wind, snow, bird, tree contact, etc.
2. Equipment – inadequate design, installation, or maintenance, or ageing or wear and tear.
3. Human – initiated by an action by Transpower staff or contractor (although inadequate design or other factors may be an underlying cause)
4. Not known – transient line faults no positive cause or evidence found.

Huntly incident dominated supply interruptions in 2011/12. Categorised as 'equipment'

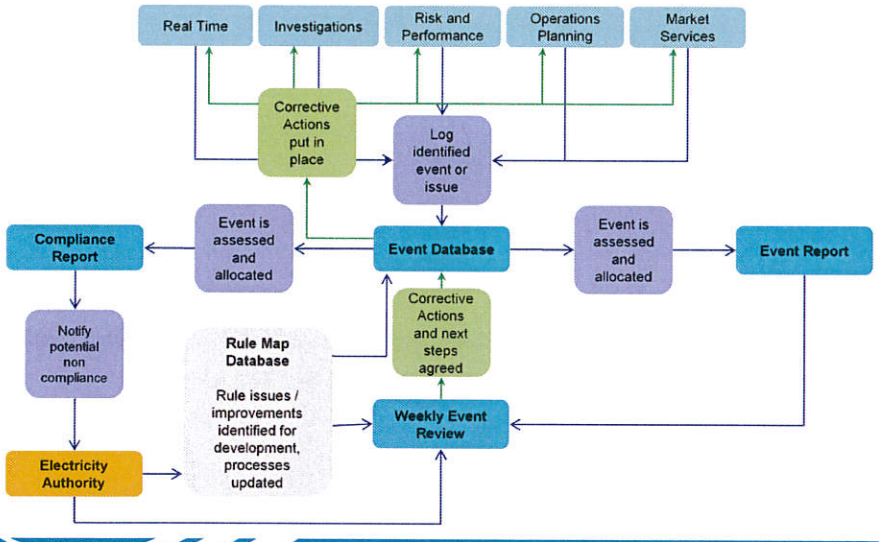
Continuous improvement culture

- no blame approach; encourage reporting
- strong, obvious senior support
- appropriately resourced
- self report all identified breaches
- investigate all events for corrective action – compliance is outcome of business improvement activities.

Continuous improvement culture

- open sharing approach of information – internal/external
- people and process based
- involvement at all levels of the business (integration)
- systematic and regular activities.

Event Review



Huntly event

- Multiple earth faults on the Huntly 230kV DC system resulted in an over voltage on the circuit breaker trip units.
- The DC over voltage resulted in the short circuit failure of relay output contacts and the tripping of three Transpower half breakers
- Huntly generators G1, G2 and G5 remained connected to the grid via Transpower circuit breakers until those tripped on CB fail signal
- Tripping HLY Station:
  - 6.9 system minutes
  - Disconnection of 850MW of generation
  - Shedding 560MW of reserves and AUFLS
  - Resulted in 48% of total non-supply for year

Reminder of the Huntly event 13th December

Huntly Event – what we did

- Short term
  - Circuitry was modified and damaged equipment replaced
  - Protection was reviewed and re-coordinated (between Genesis Huntly and Transpower)
- Medium term
  - Reviewed other sites to identify where else this could happen (no where)
  - Ensured we had a robust process for managing events to safely restore supply in the shortest time possible

Managing Supply Interruptions

- Close engagement between
  - Grid operations, maintenance and engineering
  - Grid Owner, System Operator and Distribution companies
- National event coordination and approach including rooms which can be designated as event rooms as required

Ensuring Grid Reliability

- Proactive in ensuring grid reliability
- Identify situations where a region or area will be on "N" supply (e.g. for projects or maintenance) and reduce risk
  - consideration of concurrent work, weather, public events, etc.
  - consideration of robustness of commissioning plans ensuring there is a wider understanding of the extent of risk
- Proactively identify events representing risk to supply (e.g. weather) and take action
  - reduce risk at individual sites in advance of the event
  - locate staff to respond quickly
  - Engage more closely with between TAO and SO and with distribution companies
  - coordinated event response – operations, maintenance and engineering

Ensuring Grid Reliability

- Review daily events (the little things) to address small issues before the become big issues
- Leverage the rich information from our new Asset Management Information System (Maximo):
  - Identify "type faults" and manage across the fleet
  - Preventative maintenance review through analysis of test results and test histories