

# Emergency Management



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# Grid Emergencies

# A grid emergency can occur:-

- in steady state where:
  - asset exceeding / forecast to exceed advised capability limit
  - voltage instability about to occur
  - frequency keeping unable to be maintained
- for defined event where:
  - asset will exceed advised capability limit
  - voltage stability limit being exceeded
  - frequency keeping will not be maintained for defined event
  - shortage of IR for an ECE
- after an event has occurred where:
  - an asset will exceed advised capability limit for second defined event
  - voltage stability limit would be exceeded for second defined event
  - frequency keeping will be unable to be maintained for second defined event
  - shortage of IR for binding second CE
- and: always if there is insufficient generation offers to meet load

# How is a Grid Emergency communicated to participants?

- notices issued by SO under part C, schedule C4 (policy statement)
- Warning Notice (WRN)
  - provides early indication a grid emergency situation may occur
  - may be issued from day before and up to 2 hours out for situation where SO identifies it may or will need to manage demand
  - includes a request for specified customer response
- Grid Emergency Notice (GEN)
  - issued when problem identified in real time or up to 2 hours out from real time, irrespective of whether a WRN was previously issued
  - advise participants of situation where SO may or will not be able to meet its PPOs
  - requests a response and/or instructs specific action be taken to correct situation

# Delivery mechanism

- requirements for formal notices
  - SO will issue notice orally or in writing, to relevant participants whenever, or as soon as practicable after, ..... events has occurred (EGRs, part C, technical code B)
- SO issues:
  - WRN in writing
  - GEN in writing or verbally
- EGRs state fax is primary means of transmitting a document between asset owner control room and the SO
  - issues where lines company control rooms are not staffed on a 24 by 7 basis
  - option to use SMS text messages as an alternate communication channel?
  - consider other IT options

# Load Management

- may be required when;
  - restoring load following loss of supply to GXP(s)
  - reduction of load required (e.g. insufficient generation, transmission or reactive support)
- instruction may be issued in the following form:
  - reduce total load by a %MW
  - reduce load by XMW
  - maximum demand allocation for customer or GXP
- updates to allocations may be issued verbally or by written notice. May instruct that:
  - additional load to be shed
  - load (partial or in full) may be restored

# Load Shed and Restore application (LSR):

- used by SO's Security Coordinator to apportion MW to be shed or restored across affected GXPs
- LSR uses either historical Peak MW data or historical energy usage data to apportion the MW's

# Load Management Examples

# 19 June 2006

## Background

- planned outage of MTI\_WKM circuit 2 limiting MTI and WPA generation
- full capacity not available for HVDC
- reduction in generation from TKU due to bona fide event
- load in real time higher than forecast - cold front moving up the country
- grid emergency declared at 17:35 due to insufficient energy and reserves offers
- reserve adjustment factors (RAFTs) zeroed, freed generation to meet energy requirements
- natural decrease in the load allowing RAFTs to be reset
- grid emergency ended at 20:00

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# 19 June 2006

## What would have happened if load management had been required for NI energy shortfall?

- assessment would have been made of generation offers against forecast demand in load forecast
- using LSR the Security Coordinator would determine maximum demand for each party
- demand allocation notice would be sent. This requires the party to:
  - verbally acknowledge receipt of notice within 15 minutes of issue - to Regional Operator, and
  - if unable or unwilling to comply (part or full), that party to advise Regional Operator immediately and indicate reasons

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# 19 June 2006

- if unable or unwilling to comply with the demand allocation given in the notice:
  - the Security Coordinator may instruct Regional Operator to control load for that party at a feeder or supply transformer level
  - Security Coordinator monitor system and adjusts demand allocation based on availability of assets and/or generation
  - grid emergency would cease once load control no longer required

# 1 December 2006

- loss of OTC (299 MW)
- frequency dropped to 49.19 Hz NI; 49.4 Hz SI
- following normal process RAFs zeroed (no reserves scheduled - to ensure all offered energy used to arrest frequency drop and restore frequency to normal band)
- within 30 minutes all IL had been restored
- at that point HLY U3 tripped at 90 MW

# 1 December 2006

- frequency hung low (around 49.5 Hz)
- OTA\_WKM 1 outage compounded problems:
  - with Zone 1 transmission violations
  - Genesis advised HLY 4 could have problems as well
- ECE RAFs restored to cover for an extended contingency
- 10 minutes later HLY U4 reduced by 100 MW
- Dispatch Schedules became infeasible (insufficient reserves to cover ECE)

# 1 December 2006

- GEN declared; 6% of North Island load instructed to be shed
  - Security Coordinator instructed the Regional Operator Centres (RCN and RCC) to instruct all Lines companies to shed 6% of load and hold at that load
  - RCC and RCN would have instructed all NI Lines Companies to shed 6% of load and hold that load
  - 6% reduction figure established by SC during analysis of event
  - SC deemed that formal allocation of maximum demand not required due to only hot water demand having being shed and commencement of load restoration was possible within short timeframe
- recall of the OTA\_WKM 1 outage investigated and initiated (circuit had a 2 hour recall time)
- instruction to restore all RCC load given within 20 minutes

# 1 December 2006

- instruction to restore all RCN load south of Bombay's given within 40 minutes.
- restoration of load in RCC area and south of Bombay's due to natural island load drop off, increased output from HLY U4 and reduced HVDC transfer (reducing reserves required to cover bipole contingency).
- remaining Zone 1 load could not be restored until either OTC or HLY U3 came back on line or OTA\_WKM returned to service.
- OTA\_WKM 1 circuit restored to service; remaining Zone 1 load restored. Grid emergency ended.