nationalgrid
THE POWER OF ACTION

DEMAND CONTROL



Tim Truscott – Network Operations

Safety & Housekeeping

- Fire Alarm
- Toilets
- Refreshments
- Lunch

System Balancing

- Need to Balance Energy
  - Allow for largest credible real time loss (1320MW)
  - Demand uncertainty
  - Generator breakdown
- Actions on BMU's (Demand and Generation)
- Standing Reserve (BMU's and non BMU's)
- Manual Demand Control (DNOs and Directly Connected Customers)
- Automatic Action (LF Relays)

Demand Control - Grid Code OC6.5

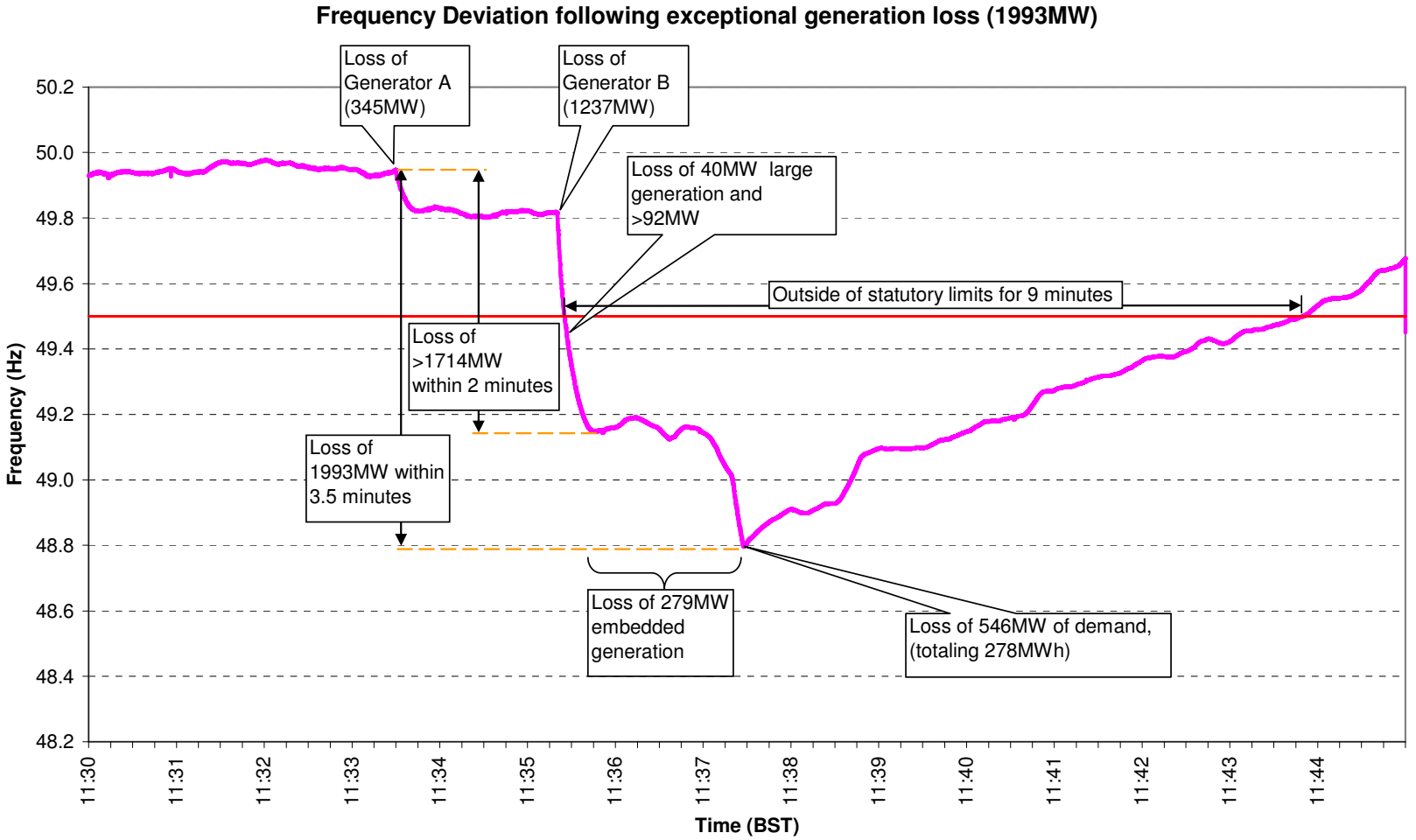
- <20% Demand Reduction in 4 blocks of 4-6%
- Reductions over 20% can be required in 5% steps up to 40% (If High Risk of Demand Reduction issued at day ahead, otherwise on best endeavours basis)
- DNO to use voltage reduction or demand disconnection to achieve target
- Reduction based on demand at the time
- Reduction must be achieved in 5 minutes
- Traditionally assumed that the first 10% of demand reduction achievable by 6% voltage reduction

Demand Control Effectiveness

- First queried during Exercise Phoenix (2006/7)
- Limited tests carried out by EDF Energy and Central Networks in Summer and Autumn 2008
- Tests were on 3 types of demand
  - Domestic, commercial & large industrial
- 3% voltage reduction gave average of 3.4% demand reduction (5% historically expected)
- Minimum 2.6%, maximum 5.1% demand reduction
- Reduction was sustained but difficult to identify amongst normal demand variation
- Customer supplies may be interrupted earlier than previously anticipated

Demand Control 27 May 2008

Loss of 2020MW in 3 mins



Demand Control 27 May 2008

- 546 MW Demand (1.5%) Tripped by LF Relay
  - Stabilised frequency
  - 2266MW Demand armed to trip at 48.8Hz
  - Relay tolerance and stable frequency prevented other trips

- Stage 1 Demand Control Instructed at 11:40 to 11:46
- Issued to 9 DNOs (5% = 1200MW)
- National Grid estimate that ~500MW delivered in 5 mins

- Demand Control not used since 1996 (at least)
- LF Relays not Operated since 1981

Demand Control - GCRP

- Exercise Phoenix Report Presented to Grid Code Review Panel February 2011
- 3% Voltage reduction more likely to provide 3% demand reduction
  - Greater use of power electronics
  - Increasing level of air conditioning
  - Reduction in manufacturing
- Single Voltage Reduction could take up to 13 Mins to implement
  - Due to functionality of current SCADA and voltage control systems
- Failure to implement manual (controlled) action increases likelihood of automatic (uncontrolled) action

Demand Control - GCRP

Exercise Phoenix Report Offered Options for way forward:

1) Modify the Grid Code to Reflect Current Status
    a) Cheap to implement
    b) Increases risk of automatic action
    c) Need to instruct earlier
    d) Risk of ‘Unnecessary’ Demand Control Instructions

Demand Control - GCRP

2) Improve Control Schemes
   a) Improves implementation speed
   b) Does not improve efficiency of voltage reduction
   c) High cost

3) Accept that Demand Control will involve Demand Disconnection
   a) Little cost
   b) Fast response
   c) Higher impact on customers

Demand Control 11 February 2012

- Very Cold Saturday Morning
- Temperatures Colder than Forecast (-13^0 C overnight -10^0 C daytime)
- Demand Above Forecast Due to Colder Weather
- 3500MW Generation Losses (07:00 to 10:00)
- Stage 1 Demand Control Issued to 5 DNOs (10:06 to 10:15)
- Stage 2 Demand Control Issued to 3 of these DNOs
- Approx 60% of the Demand Control Expected was Delivered
- Time to Implement between 15 and 25 Minutes
- All Reductions Provided by Voltage Control

Demand Control

27 May 2008

- Frequency Below Standard
- Urgent Action Required
- Low Frequency Relay Operation

11 February 2012

- Frequency Maintained
- No Reserve
- Risk from Further Generation Loss/ Demand Uncertainty
- Less Urgent Action Required

Way Forward?

1) Modify the Grid Code to Reflect Current Status
2) Improve SCADA/ Voltage Control Schemes
3) Accept that Demand Control will involve Demand Disconnection
4) ??
5) ??