

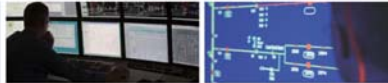
Update on Dry Year Initiatives to Maximise Power Transfer

Slides from Industry Briefing

Wellington 16 June 2008

Hamilton 19 June 2008

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Objective

- Industry briefing - Not to replace existing forums.
- Common understanding of current mitigations to increase power transfer south.
- Provide a view of future mitigations that may be required as situation develops – plus your input & ideas

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Outline

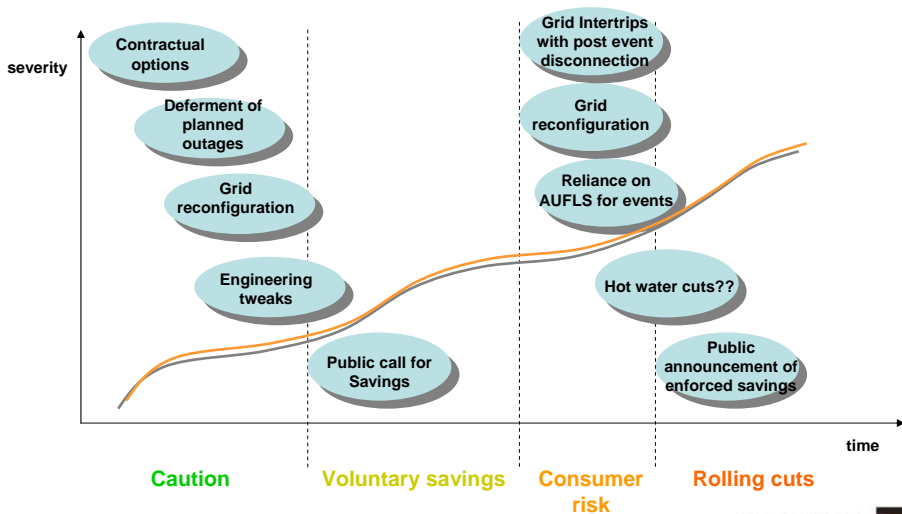
- What are the critical limits and what is being reported
- Review of current mitigations and potential future mitigations
- Reserves optimisation in the South Island
- Load shaping possibilities & Rolling cuts preparatory work
- Discussion/Questions on options & ideas
- National Winter Group update

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Response at the appropriate time

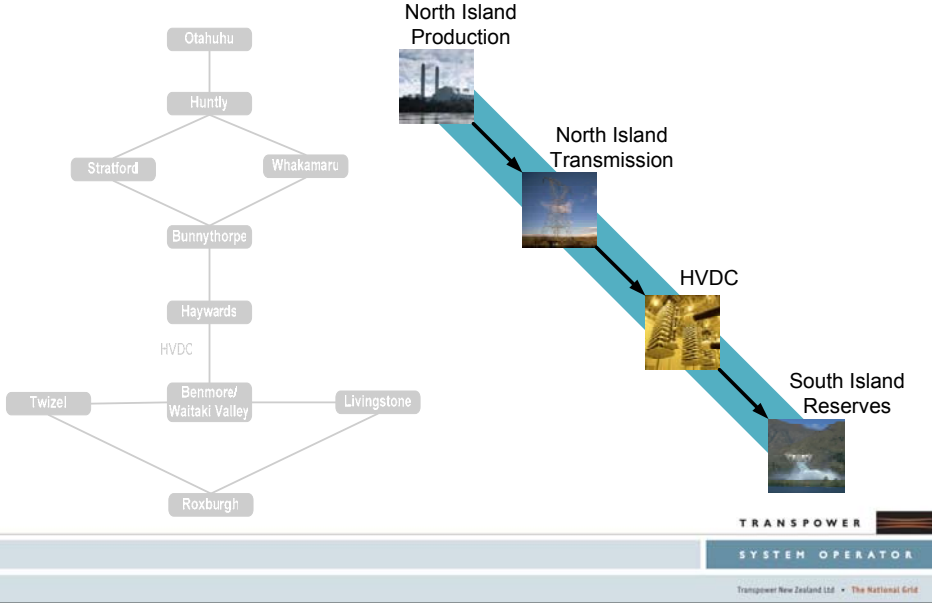


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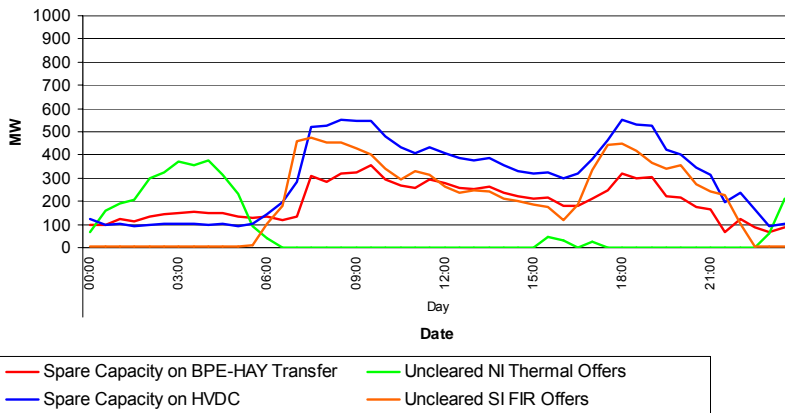
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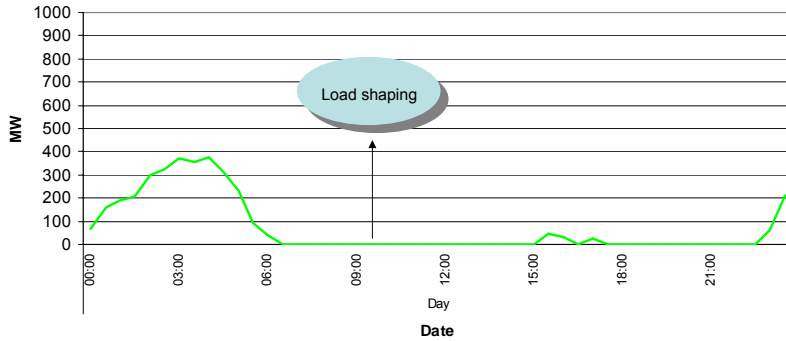
Reporting monitors 4 key areas



Daily Report Spare Capacity



North Island ability to export Spare Capacity



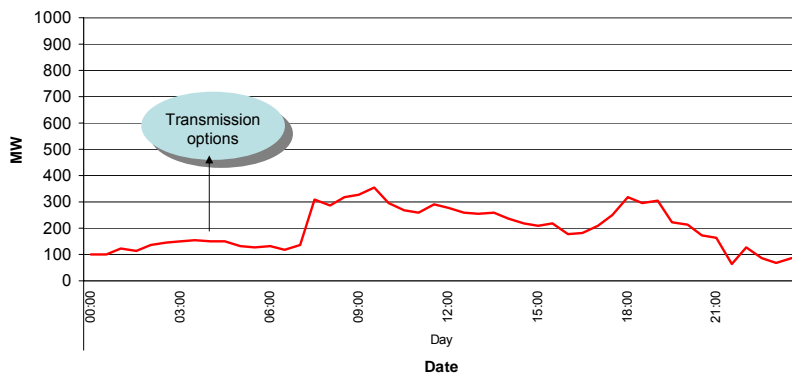
— Uncleared NI Thermal Offers

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Ability to move power to Haywards Spare Capacity



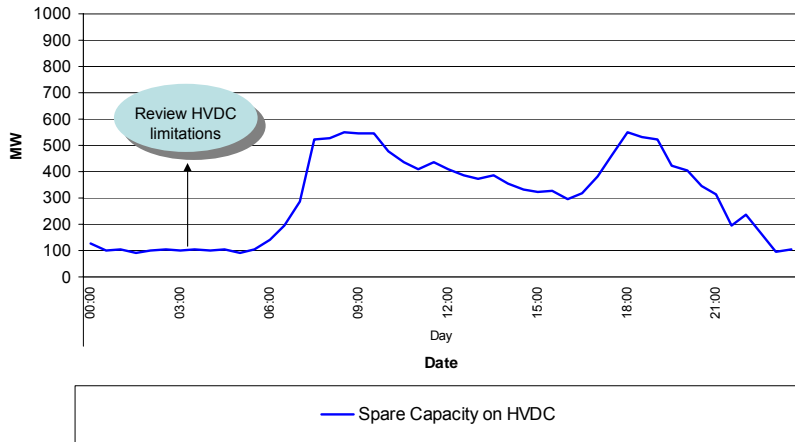
— Spare Capacity on BPE-HAY Transfer

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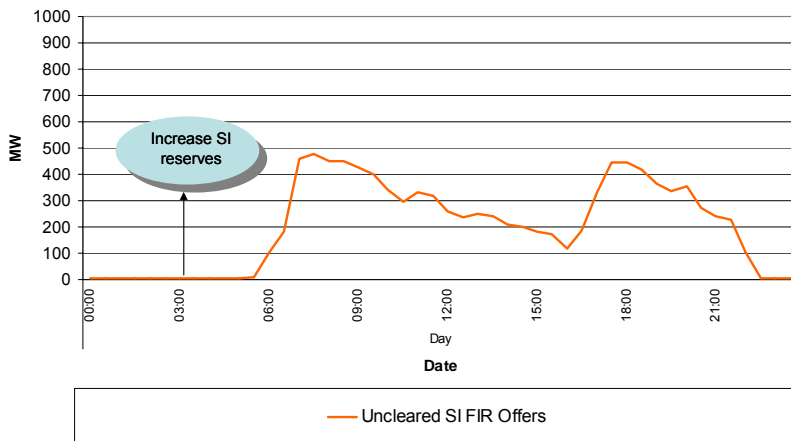
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Ability of the HVDC to send South Spare Capacity



South Island ability to absorb Spare Capacity



Review of current mitigations and potential future mitigations

- Grid reconfigurations and outage changes

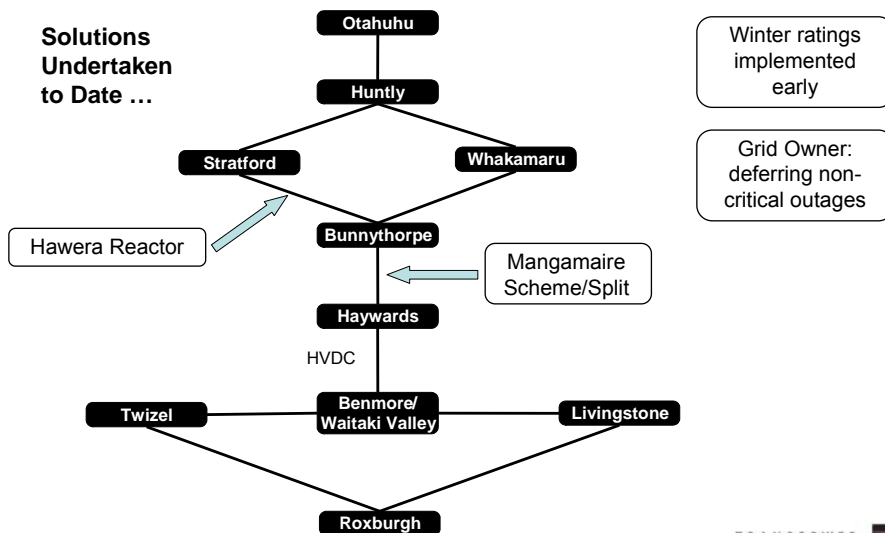
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Mitigation of North/South Transfer Constraints

Solutions Undertaken to Date ...

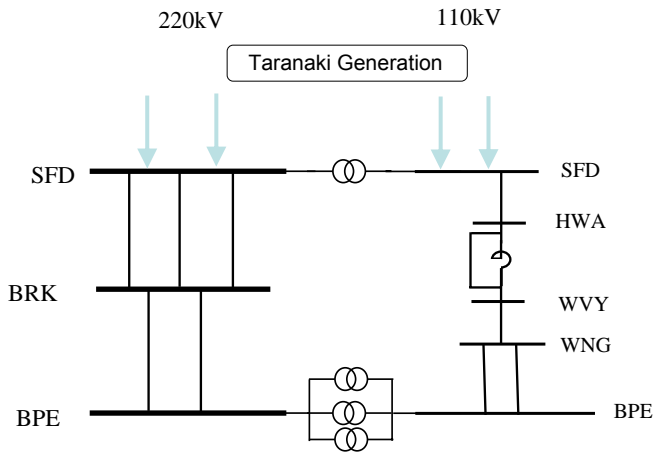


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Hawera Reactor

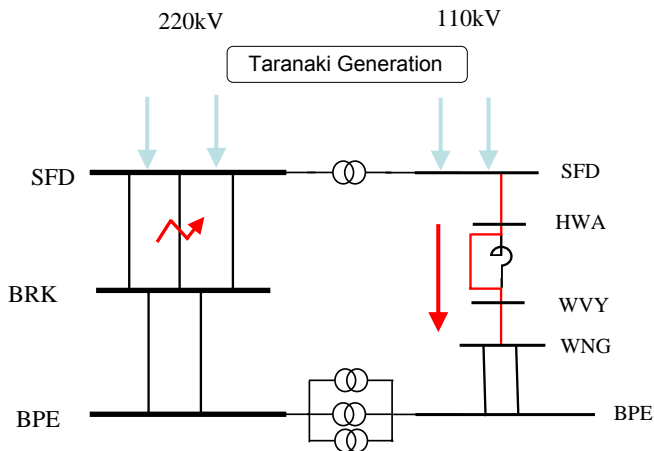


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Hawera Reactor

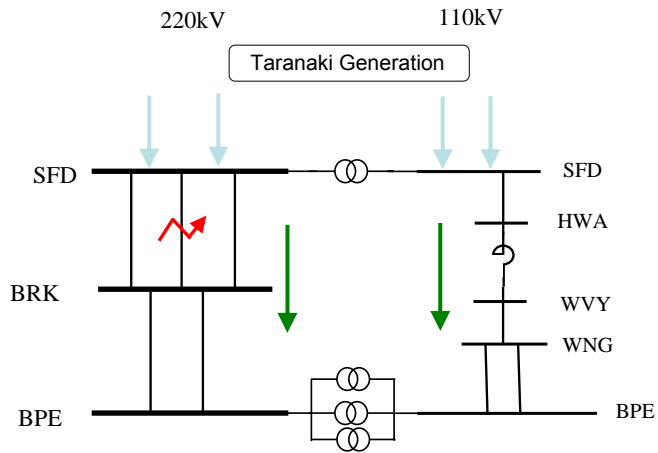


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Hawera Reactor

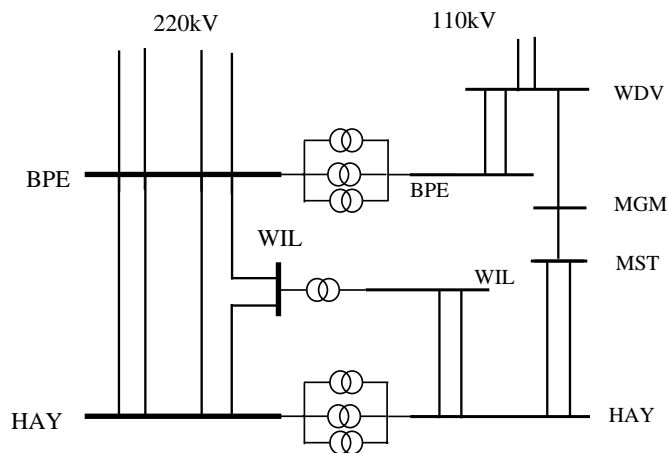


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Mangamaire Intertrip Scheme and Temporary Split

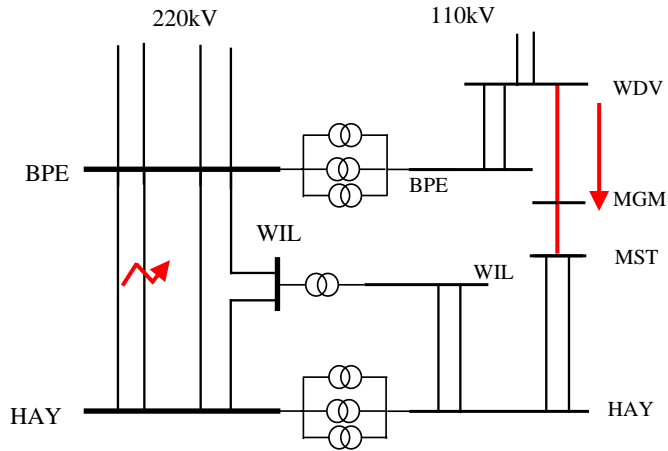


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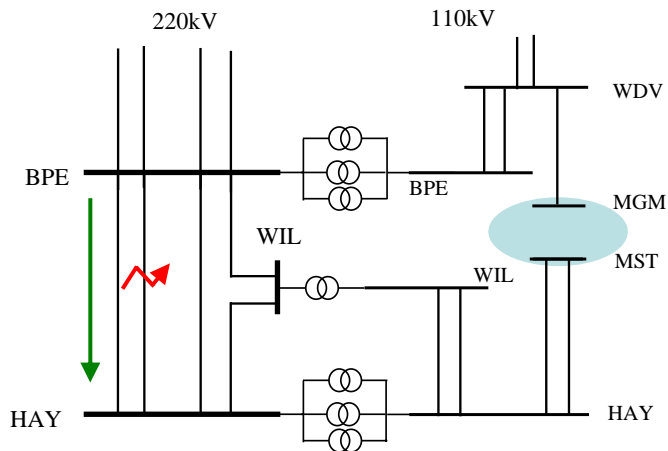
Mangamaire Intertrip Scheme and Temporary Split



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Mangamaire Intertrip Scheme and Temporary Split

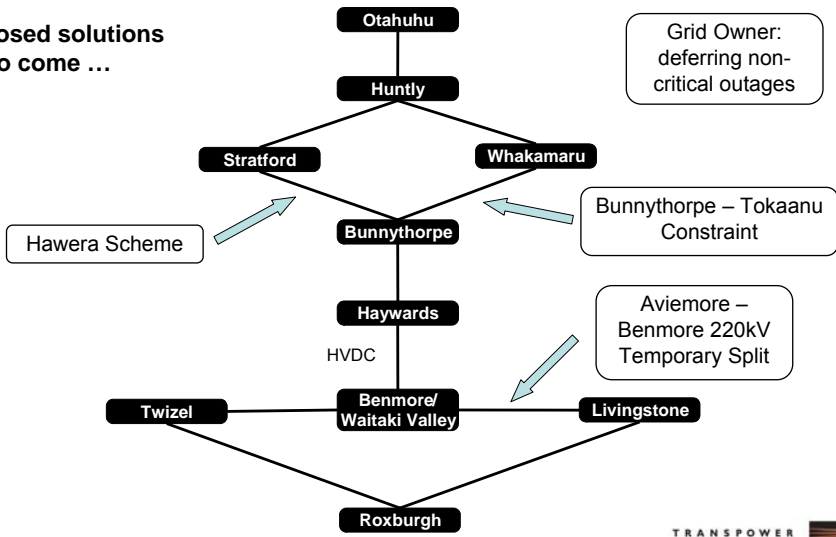


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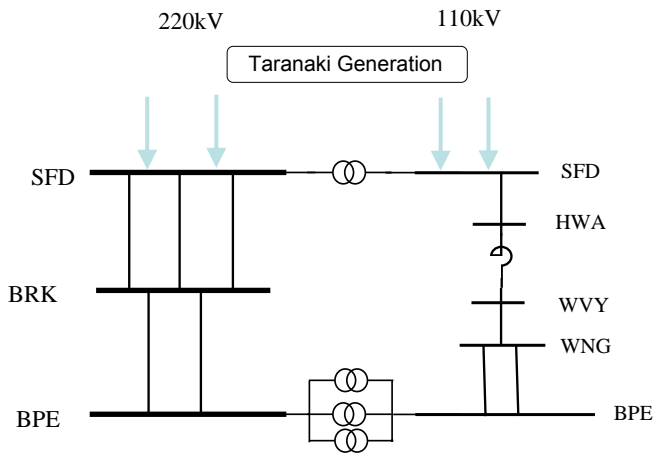
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Mitigation of North/South Transfer Constraints

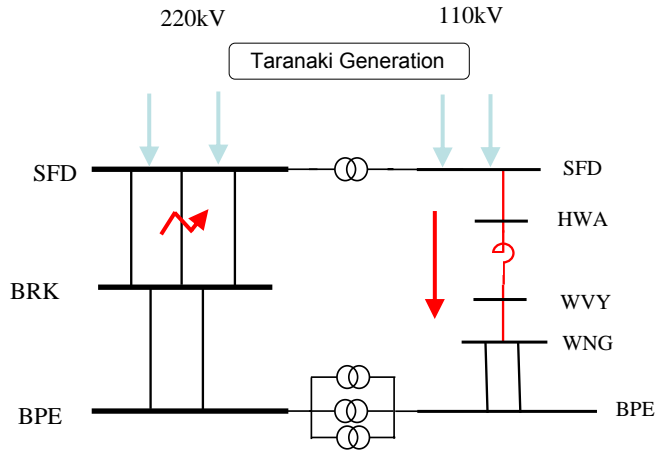
Proposed solutions still to come ...



Hawera Intertrip Scheme



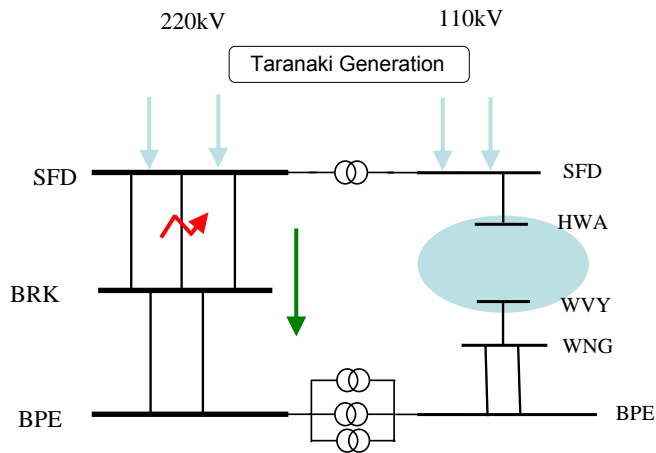
Hawera Intertrip Scheme



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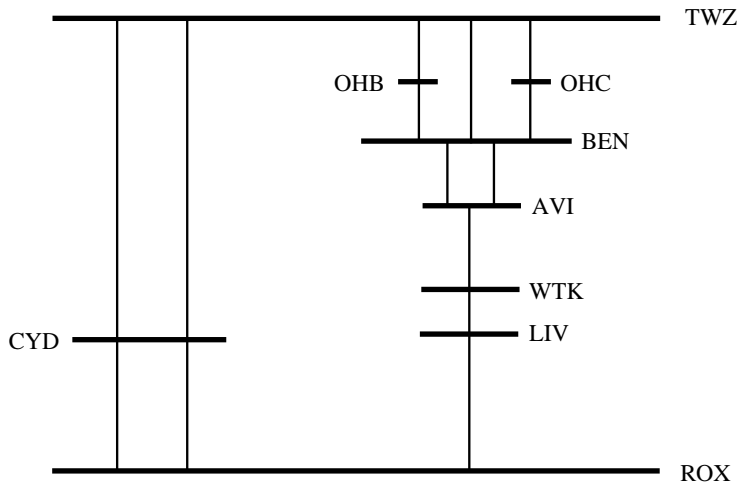
Hawera Intertrip Scheme



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Aviemore – Benmore 220kV Temporary Split

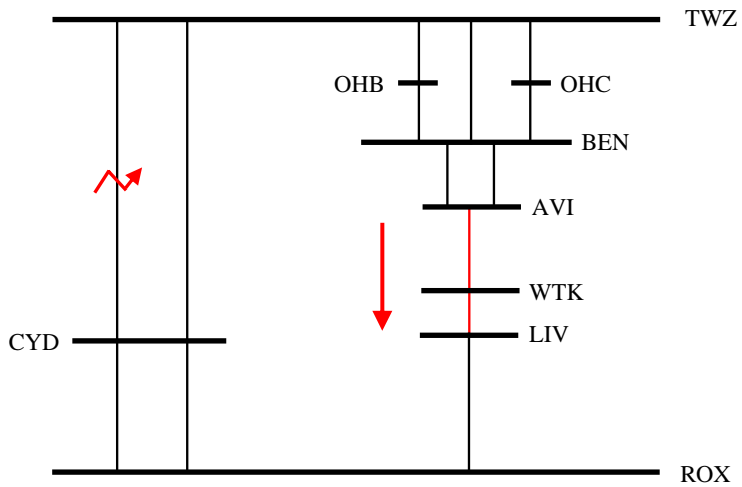


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Aviemore – Benmore 220kV Temporary Split

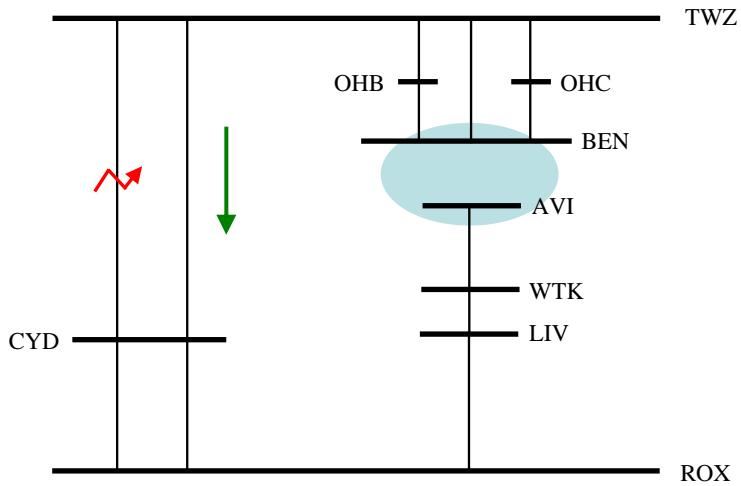


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Aviemore – Benmore 220kV Temporary Split



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Review of current mitigations and potential future mitigations

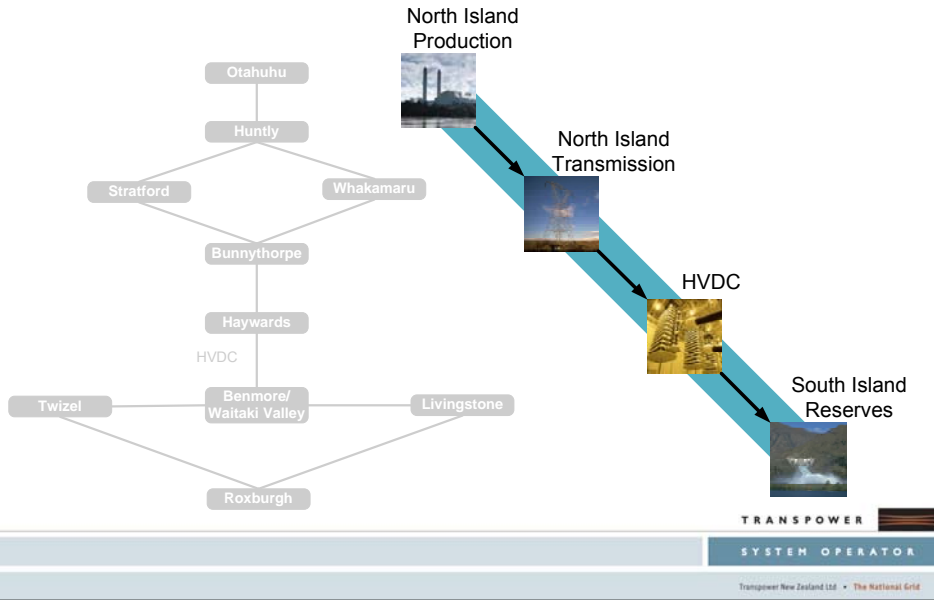
- Additional reserve modelling
- Stability limits
(aka – “engineering tweaks”)

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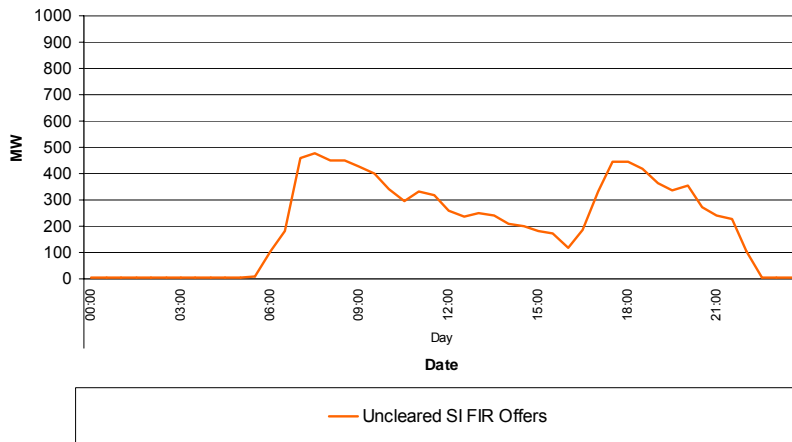
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Reporting monitors 4 key areas



No Margin in South Island Reserve Market

Spare Capacity



Improvements in South Island Reserves

- Fast Instantaneous Reserves (FIR) limiting factor
- Where we were - 350MW
- Where we are now - 590 to 630MW

- Additional reserves provided
 - Partly Loaded Spinning (PLSR)
 - Tail water depressed (TWD)
 - Interruptible Load (IL)

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Improvements in South Island Reserves

- Tiwai reduction line tripping
 - Addition of Interruptible Load (IL)

- Meridian
 - Additional reserves added at Manapouri
 - Additional reserves planned for Benmore

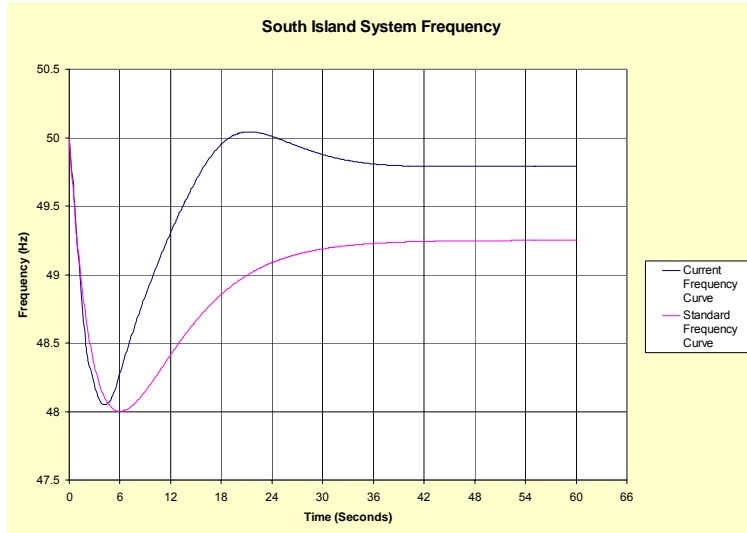
- Contact Energy
 - Additional reserves added at Clyde and Roxburgh

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Are all the reserves required?

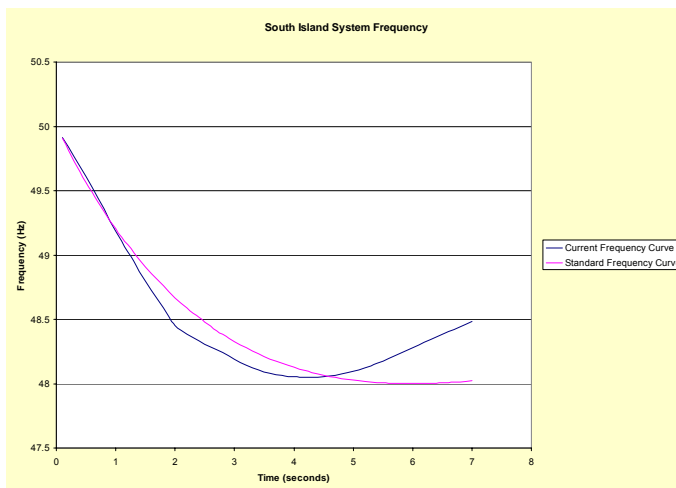


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System Frequency at 6 seconds

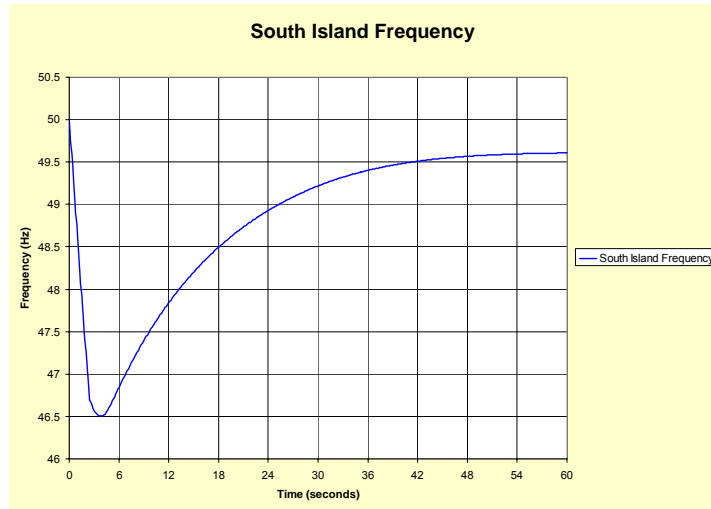


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Use of AUFLS for SI Reserves?



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HVDC Limit

- HVDC limit is 626MW
 - This limit is a dynamic stability limit on the Haywards Synchronous Condensers
 - Mitigations
 - Stability investigations being carried out
 - Possible run back of HVDC
 - Possible trip of Synchronous Condensers

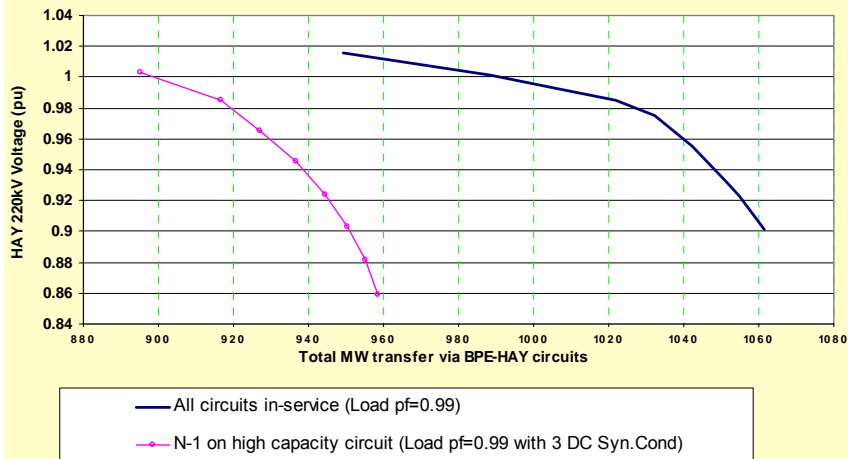
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Voltage Stability Limit

BPE-HAY Transfer Capability - sensitivity study



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Reserves Optimisation in the South Island

- Interaction of Partially Loaded Spinning Reserve and Energy offers
- NFR changes at high transfer

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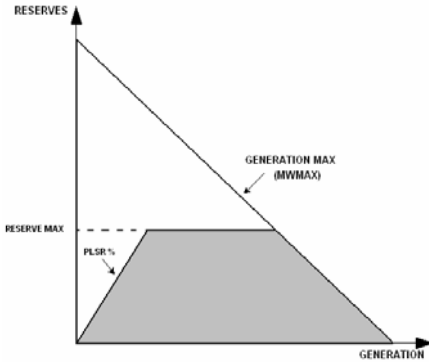
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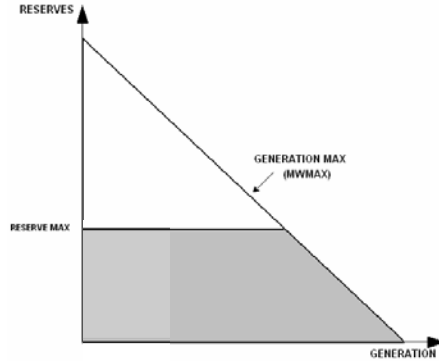
PLSR

vs

TWD



Dependent on generation



Independent of generation

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PLSR % in action

$$\text{PLSR available} = \min\{(\text{MW cleared} * \text{PLSR}\%), (\text{PLSR limit})\}$$

Cleared generation (MW)	Offered PLSR (MW)	Offered PLSR%	Available PLSR (MW)
10	20	50	5
40	20	50	20
100	20	50	20

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Energy and reserve pricing

- Price for 'next' MW
- Typically independent
- Inter-related when scheduling inter-related:

Reserve impacts energy price

Marginal generator is the risk

Energy impacts reserve price

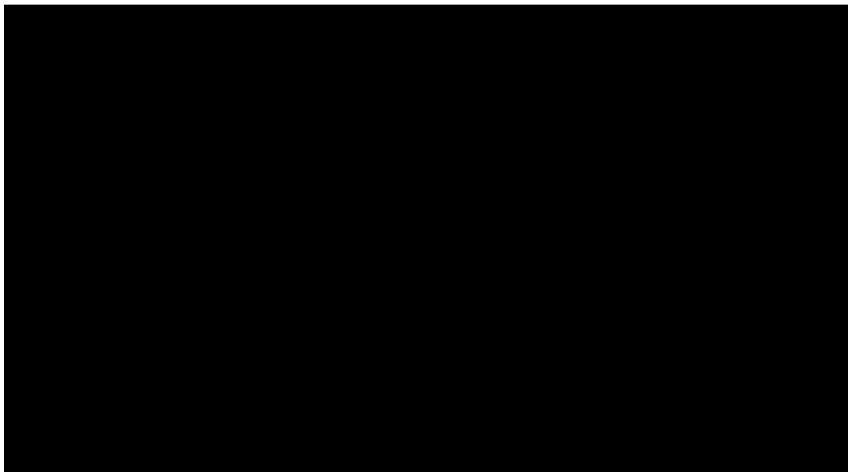
Reserve shortage

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SPD optimisation



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SI FIR final prices 03:00 26 May 08

SI reserves

	Cleared	Offered
SI FIR	570.7294MW	571.016MW
SI SIR	440.6174MW	871.003MW

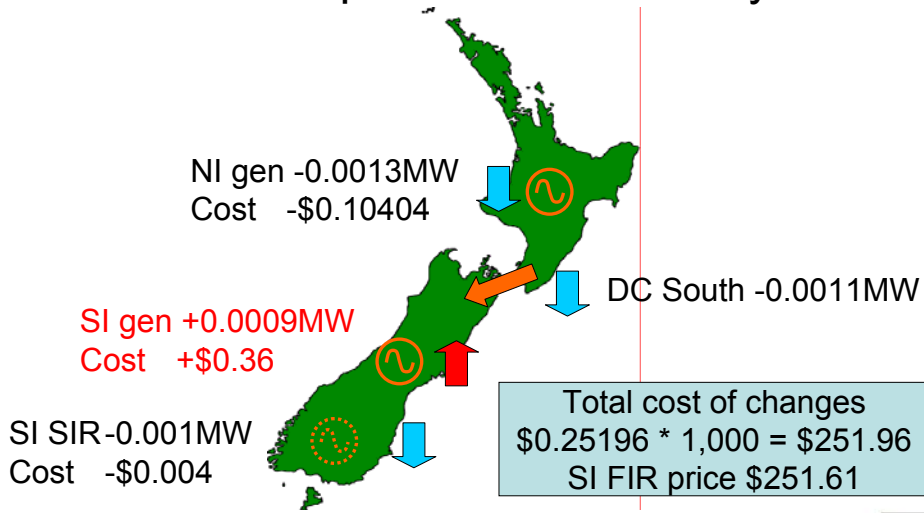
SI Risk DCS 440.6175MW

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SI FIR final prices 03:00 26 May 08



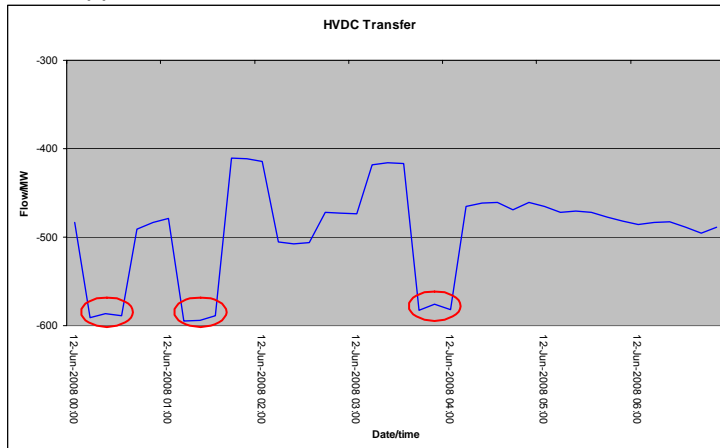
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Oscillations in High Voltage Direct Current (HVDC) Transfer

What Happened?



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Oscillations in HVDC Transfer

How it Happened?

- Net Free Reserves (NFR)
- Amount of reserves available in the system as a result of system inertia (connecting generation and its response, load response)
- NFRs are available to assist with response to a system event
- At times of high DC south transfer and low South Island load & generation, NFRs may become negative
- Negative NFRs means a higher amount of reserve in SI needs to be dispatched than the level of DC south Transfer.

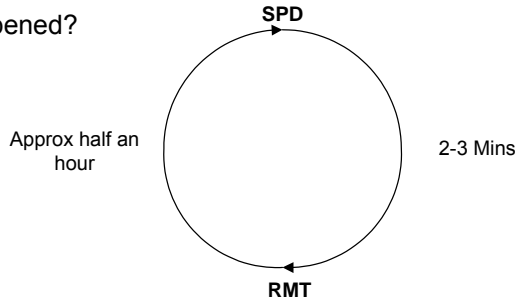
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Oscillations in HVDC Transfer

How it Happened?



SPD schedules amount of DC transfer
This value passed to RMT a few minutes later

RMT calculates amount of NFR required
This is passed to next SPD solve approx 30 mins later

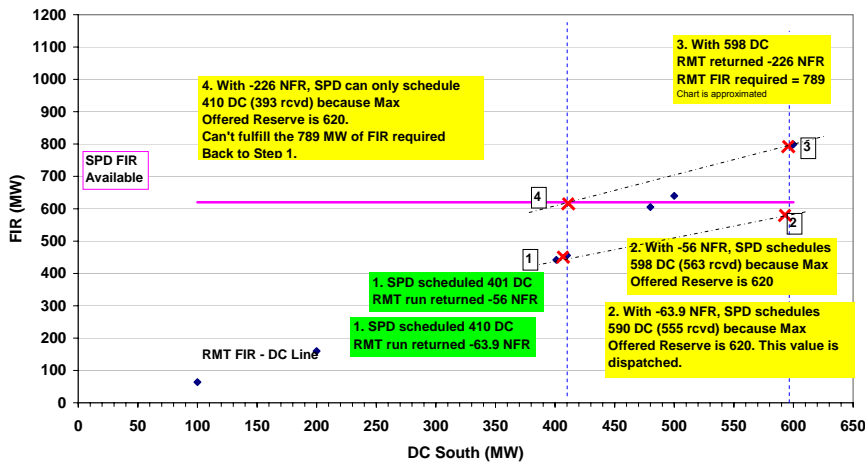
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Oscillations in HVDC Transfer

12 June 2008 TP01:00



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Oscillations in HVDC Transfer

What is being done?

- System Co-ordinators closely watching scheduled HVDC South Transfer overnight
- If the oscillations are exhibited with high levels of transfer south (well over 500MW south) then:
- System Co-ordinators will investigate further, and
- Manually over-ride RMT such that a result is obtained that is secure, and
- Dispatch the HVDC based on the reserves calculated from RMT.

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Load shaping possibilities
Water heating cuts
Rolling cuts - preparatory work

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Load shaping possibilities

- NI – Is it possible to shift demand into early morning hours?
 - Impacts on reserve market (IL availability)
- Wellington – shift demand to optimise HVDC transfer?
- SI – shift demand to increase load and reserve availability in early morning?

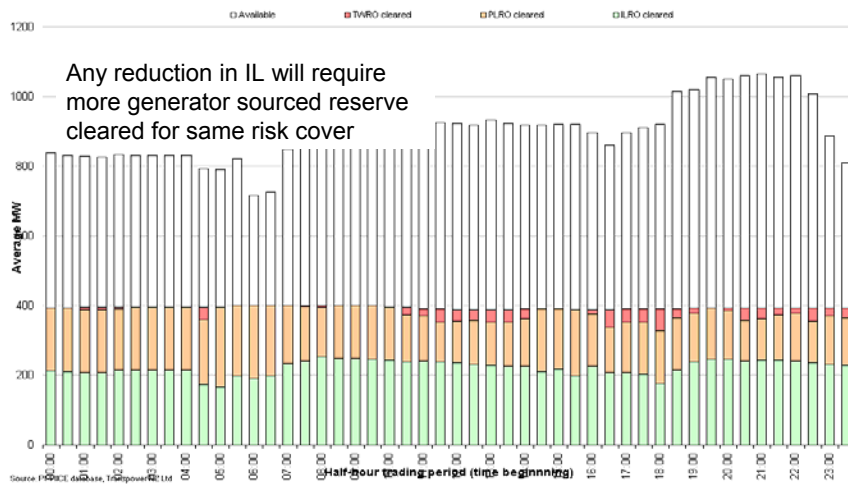
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North Island – load shifting

Sustained Instantaneous Reserve in the North Island for Saturday, 14 June 2008



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Hot water cuts

Good information available at

<http://www.electricitycommission.govt.nz/pdfs/opdev/secsupply/pdfsconsultation/Desktop-analysis.pdf>

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Rolling outages

- Unlikely to be required but preparation is underway
- Regulations drafted in 2006 not enacted.
<http://www.electricitycommission.govt.nz/consultation/rollingoutagesep06>
- Work being undertaken by ENA with input from SO and EC to develop plans.

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Questions and Discussion

SO Dry Year Planning 2008 web page at:

<http://www.systemoperator.co.nz/?id=6556>

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National Winter Group

- NWG
 - Ability to meet North Island Winter Peak
- Status Update as at 6 June
 - Includes Pole 1 and New Plymouth changes
 - On SO website now
- Premise
 - Dry year hydrology has not yet impacted on ability to meet peaks

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