Deferral of network investments by DSM - New Zealand experiences

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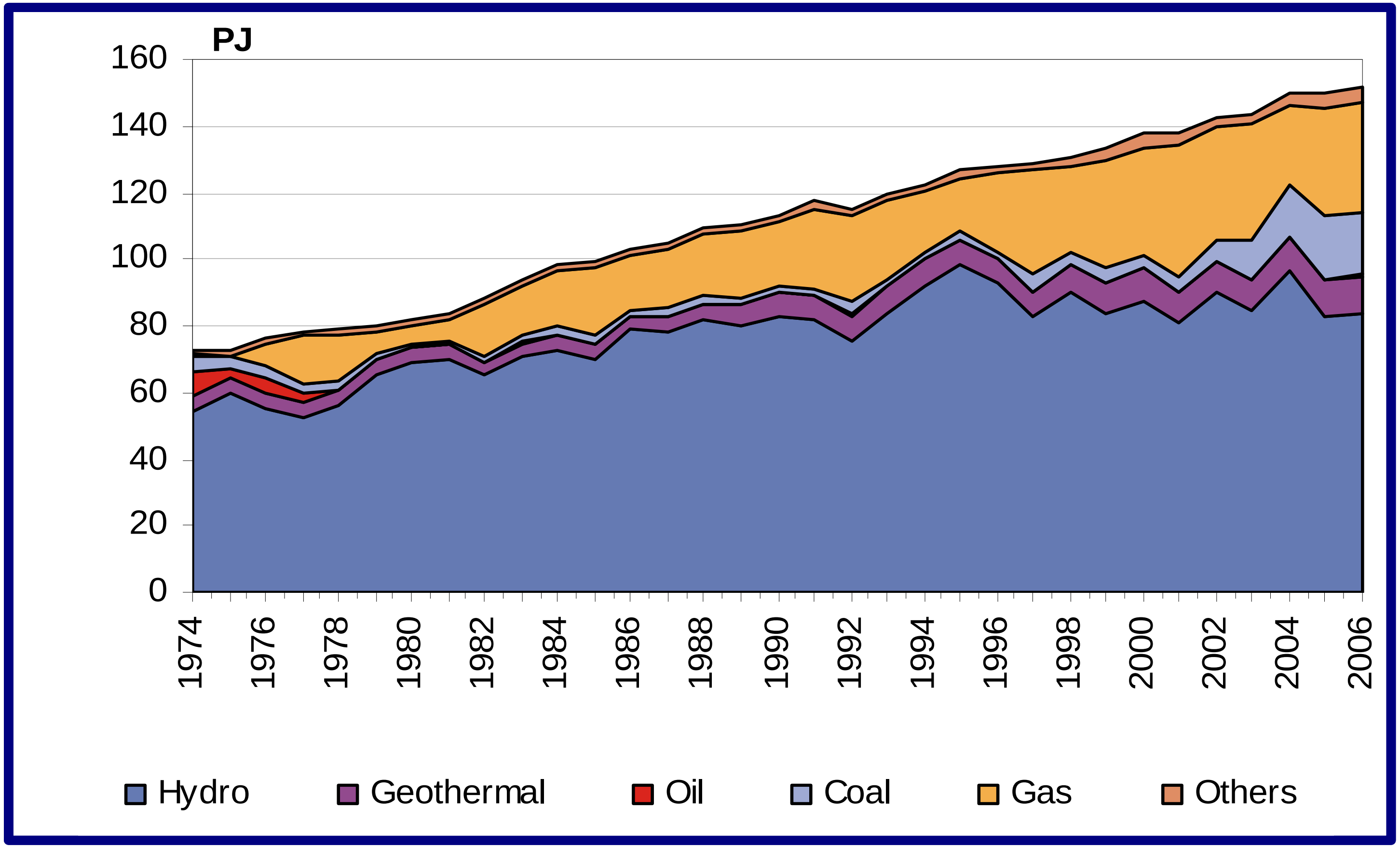
Overview

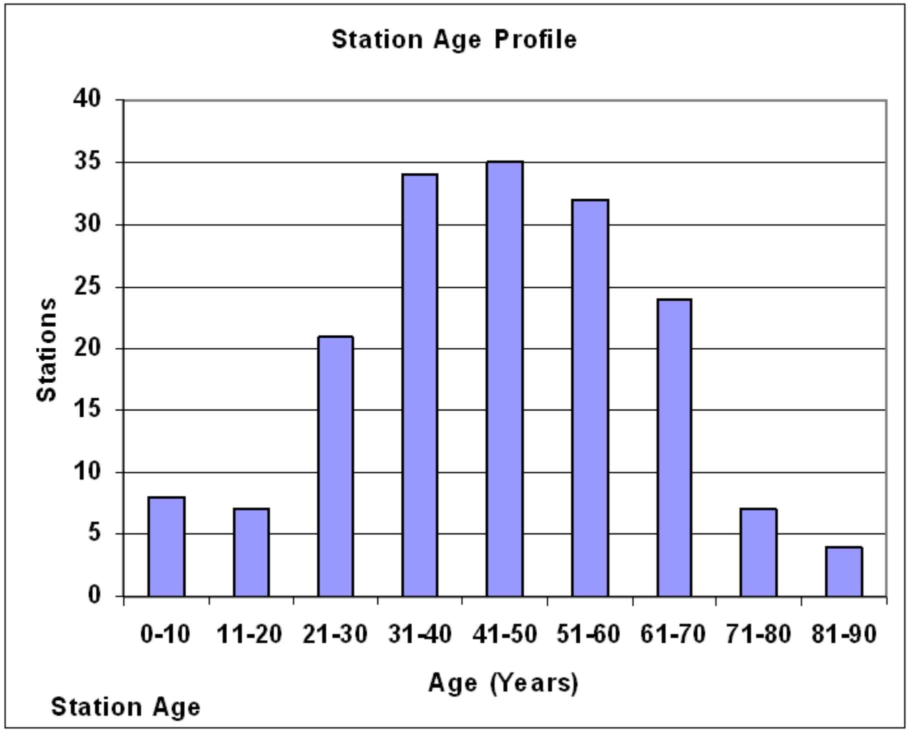
- NZ power system – some background
- Case 1 – Energy efficiency
- Case 2 – Load management, ripple control
- Case 3 – Orion, managing peak in distribution
- Case 4 – Transpower, South Island DSP Trial

Demand/generation growth



Transmission – the issues

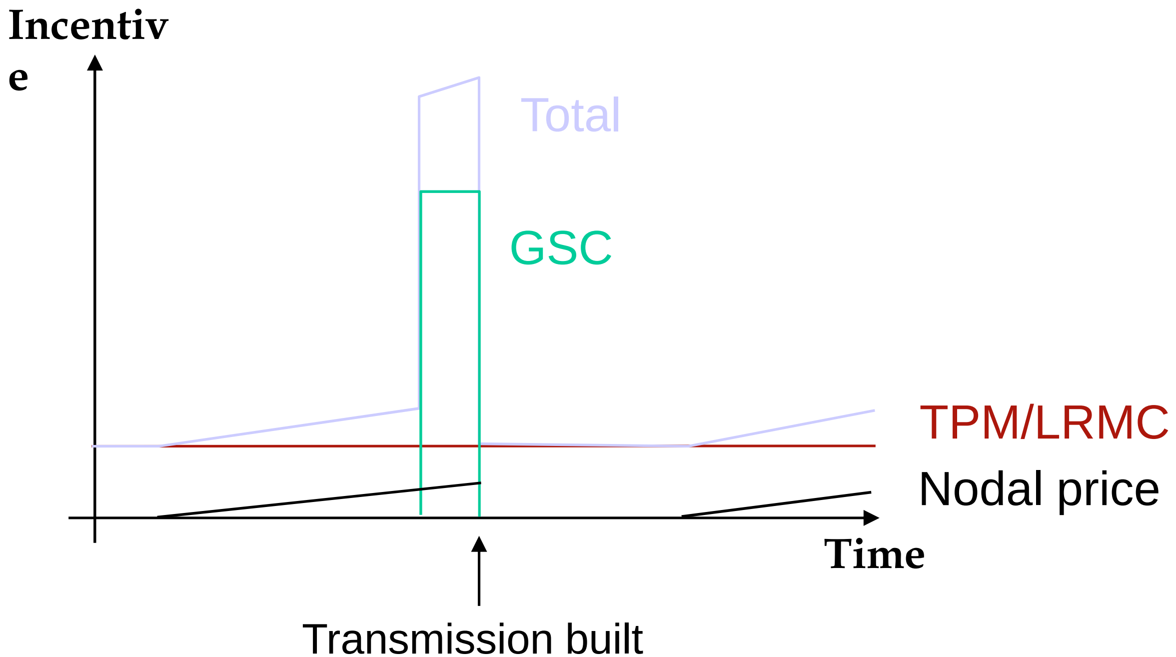
Aging assets – new investments needed, but nobody wants it nearby



DSM can help to mitigate risk of delays in transmission built or as a option to defer the need.

Transmission price signals

- 3 transmission signals may trigger DSM:
  - Anytime transmission price signal – “LRMC proxy”
  - Nodal price signal, when starting to congest
  - Grid support contract, when needed for reliability



Price signals – do the work?

- Transmission pricing methodology (TPM) works:
  - Specified as main driver for ripple control in NZ
  - Is the signal optimal?
    - Regional
    - Sunk costs
- Market price signals tend to come to late
  - Price separation appears when the problem is acute
  - Lack of long-term forward market (CfD between areas)
- Grid Support Contracts may work (yet to be seen)
  - See comments later…

Case 1 – Energy efficiency

Impacts from reducing NZ electricity demand through energy efficiency

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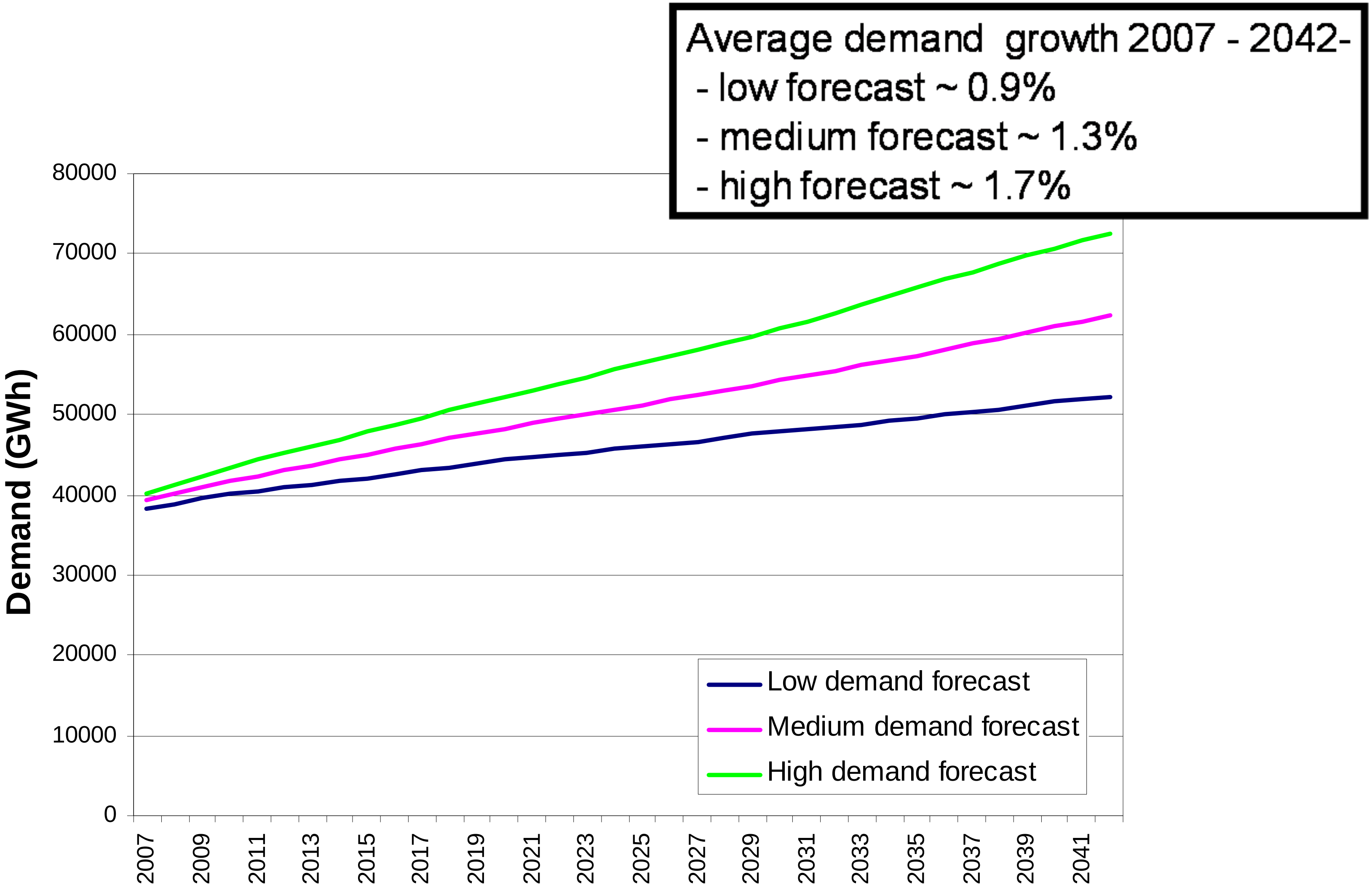
Future demand scenarios



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Avoided costs: generation, T&D, energy

($2007 million NPV 4% real discount rate)

	High to medium demand forecast	Medium to low demand forecast
T&D	583	387
Generation	5817	5139
Energy	2593	3285
Total	**8993**	**8811**

Based on total system costs 2007-2042

Economic potential to achieve reduction till 2025 exists

Case 2 – Load management

Load management by ripple control – now and in the future

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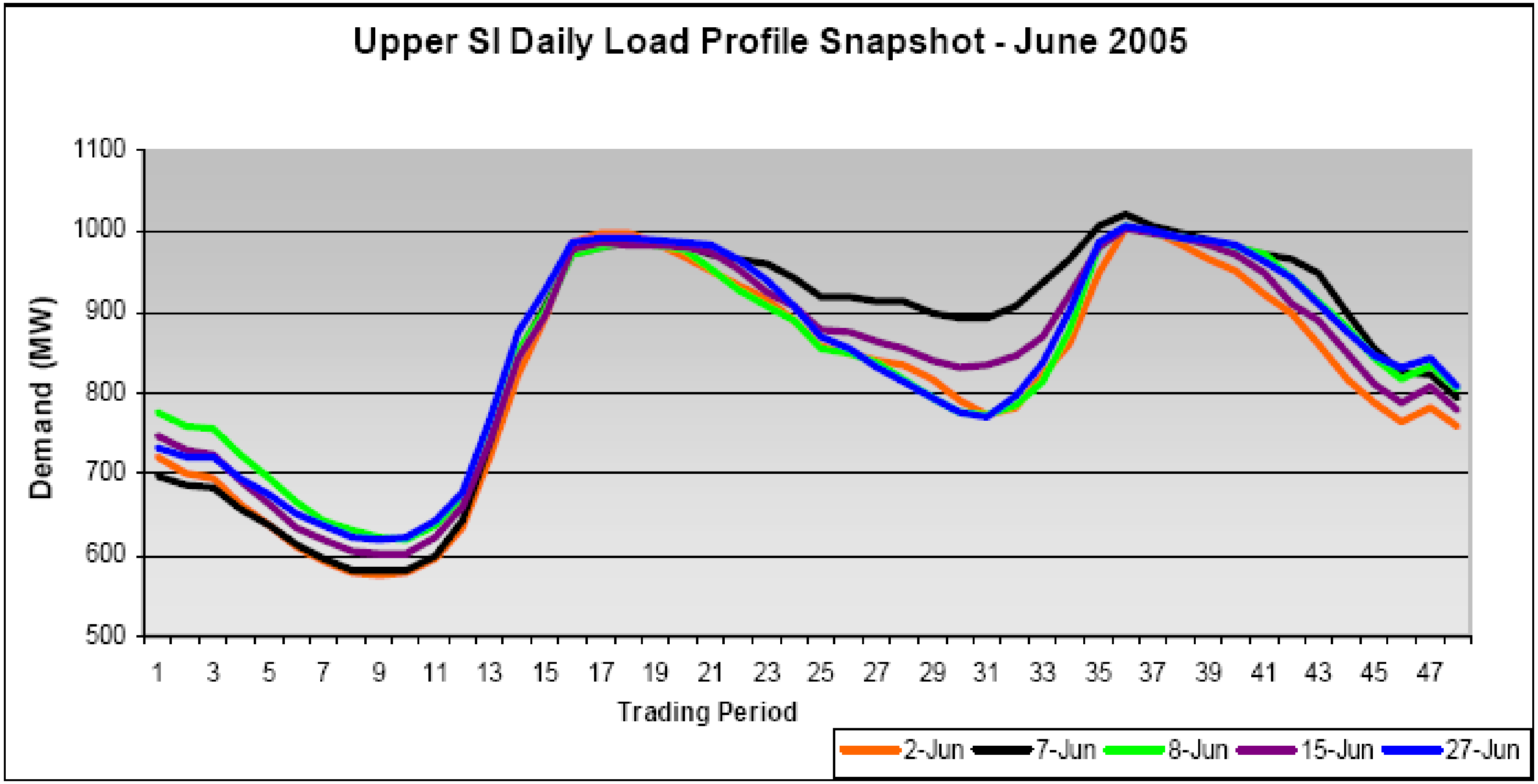
Ripple control

- Ripple controlled water heaters has been used for decades.
- Estimated ~880 MW controlled load (~13% of peak)
  - Up to 400 MW peaking capacity deferred ???
  - About 4 years of load growth
  - OCGT costs ~$1 million/MW or $70,000/MW per year
  - Generation savings equal to $28 million per year
  - Additional savings in T&D and energy costs
- Transmission pricing methodology specified as main driver behind use of ripple control by most distribution companies in New Zealand
- Risks: Lack of incentives to maintain + competition from other energy sources for future energy demand

Sample diurnal load profiles



New “old” technology taking over?

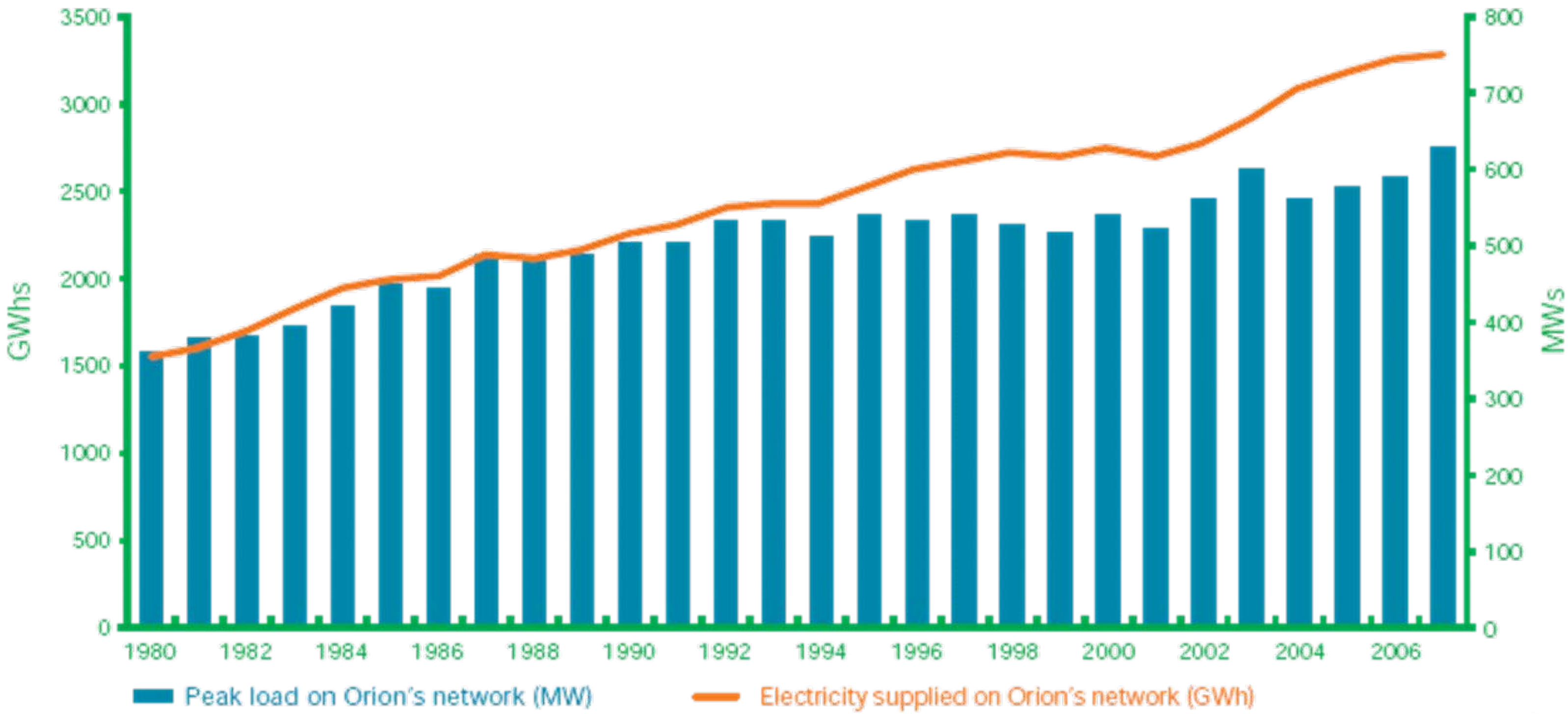
- Radio ripple control to be rolled out in New Zealand
  - Based on long-wave radio technology
- Has been used in Europe for years
- Highly reliable
  - Redundancy of all major parts
  - Quick (1 second to send signal)
- Lower costs alternative than building ripple injection plants
  - 3 masts can cover whole NZ with each of the major cities being covered from two masts
- Controlled areas can be targeted in great detail
  - Send signal to individual receivers, groups of receivers, or all

Case 3 – Load management/DG

ORION – Lowering peak demand growth in the distribution network

Breaking peak vs. energy trend

- Orion is the distribution company covering Christchurch, NZ's third largest city
- It has been working on DSM since early 1990s



How did they do it?

Pricing:

- **Households - Day / Night tariff**
  - Day 21.30c/kWh
  - Night (9PM-7AM) 8.44c/kWh
- **Households - Controlled tariff**
  - 24 hour uncontrolled (one meter) 19.47 c/kWh
  - Economy 24 (one meter) 16.54 c/kWh
- **Commercial/industrial**
  - Large capacity component (consumers try to minimise own peaks)

Load control:

- **Aggressive use of ripple control (households on controlled tariffs)**
- **Also controlled industrial loads (300 customers using ¼ of the load)**

Generation:

- **DG - Mainly local back-up generation**
- **Fuel Switching**
  - Cogeneration, used for heating larger buildings
  - Gas instead of electric heating

Case 4 – Load management

Demand Side Participation and transmission network deferral – Transpower's Upper South Island trial

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Project purpose

- Transpower has to take non-transmission options into account whenever proposing upgrades to the grid.

- For that purpose Transpower is designing a Grid Support Contract product to:
  - identify (EOI/RFI);
  - evaluate (RFP); and
  - contract

  with provides of non-transmission options (generation or demand side)

- The South Island Demand Side Participation Trial project was designed to gain some real experience of DSP (generation side fully known) and to try a “final draft” of the Grid Support Contract product in practice.

Setup

- Fear that the project could be needed soon in the Upper South Island.
- Designed and approved in a hurry, early 2007
- Two stages:
  - 2007 Winter Pilot
  - 2008 Winter Trial
- Little time available for preparing 2007 stage

2007 Winter Pilot - Results

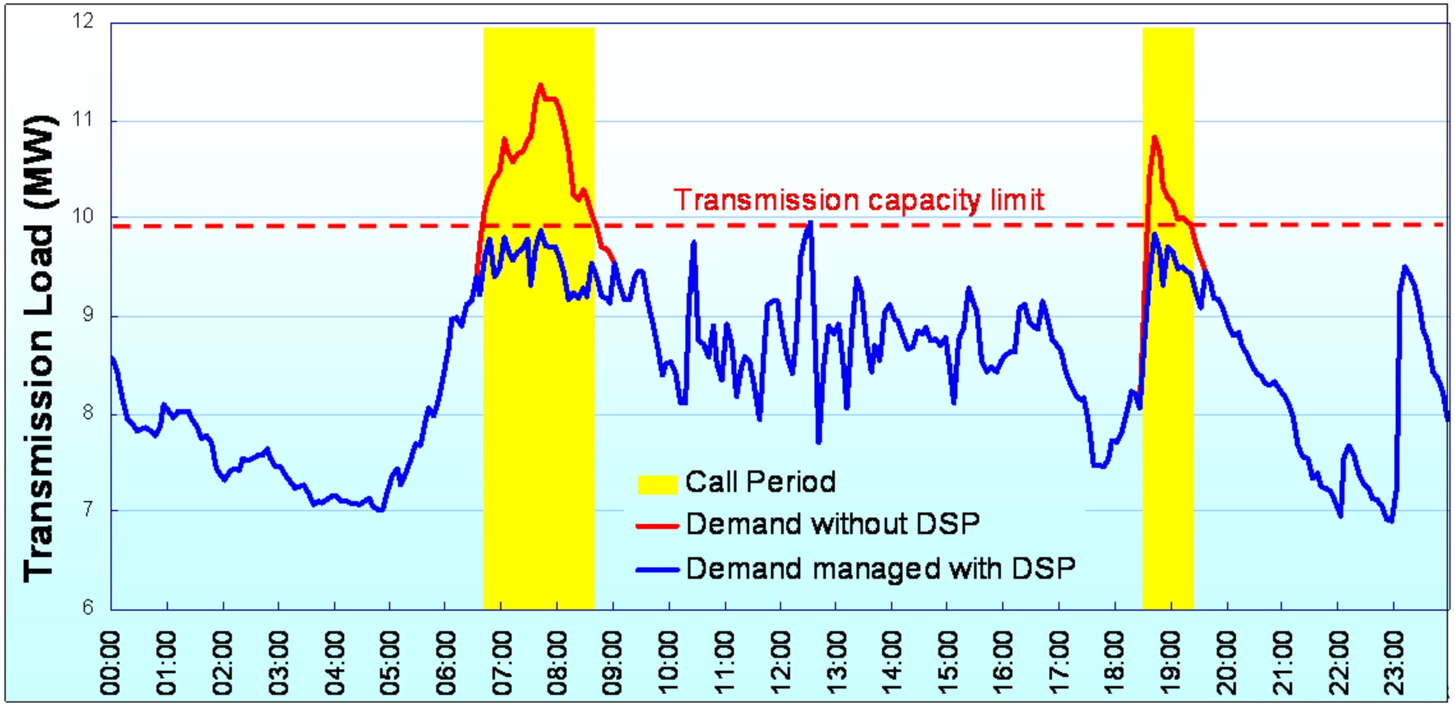
- Contracted with 14.2 MW from 16 different sources
- Sources called 7-8 times during the winter 2007
- Reliability by Source:

	Generation	Industrial	Coolstore	Hydro	Total
MW contracted	3.5	7.0	3.3	0.4	14.2
Number of sources	5	5	4	2	16
Response	88%	72%	47%	41%	68%
Number of calls	34	38	32	16	120
Zero responses	1	3	6	4	14

- Low reliability due to strict “success” criteria and little time for preparation

2008 Winter Trial - Overview

- RFP responses came in March 2008
- Finalise commercial terms in April / May. Likely to contract with 30+ MW
- Will use the Grid Support Contract structure
- Trial period will be June through August
- Calls will be system capacity threshold driven



GSC's – some conclusions

- Can be used for:
  - Planned "economic" deferrals
  - Unplanned deferrals:
    - Demand forecasts wrong
    - Delays in transmission built
- Using it for planned deferrals risky
  - It can only use it once
- Upper South Island no longer at risk
  - Latest demand forecast changed perception of the need
- Need on the North Island this winter?
  - HVDC pole 1 partly out
  - 300 MW New Plymouth power station out
  - Dry - largest North Island reservoir (Taupo) at minimum

Questions?