Macro economic issues arising from energy constraints

New Zealand case study
Natural New Zealand – 70% Renewable Electricity Supply
Stratagen

Customer Interests
• Fair Price
• Reliability
• Quality
• Freedom to choose

Industry Interests
• Profits
• Risk management
• Growth

Government Interests
• Public Good
• Infrastructure investment
• Security
• Economic efficiency
• Protection of employment
• Sustainable development

Efficient

Market
Macro economic issues arising from supply constraints

- New Zealand’s electricity outlook
  - Energy constraints
  - Transmission constraints
  - Other significant factors

- Implications for the national economy

- The role of demand response
Energy constraints - key issues

- Reducing supply of primary energy
- Increasing demand
- Reduced security and higher prices
- Increased consenting and compliance process
- Carbon emission legislation, emissions trading and levies
- Increased Government intervention and regulation
- Increased uncertainty and risk for investors
  - Electricity suppliers
  - Industrial and commercial consumers
Gas – proven and probable production

NZIER demand estimate (limited petro.)

NZIER demand estimate (excluding petro.)

PJ per annum


Kapuni
TAWN
McKee
Mangahewa
Rimu/Kauri
Kaimiro/Ngatoro
Maui
Pohokura
Kupe

Stratagen
One view of New Zealand's future electricity generation

Source: NZIER
Electricity demand growth

Past and future load growth to 2025

2005-2025 growth rate ramping down from 2.3% to 1.7%

7% correction for "lost" off grid generation

Straight red line is 820 GWh pa increase

MED projection of total generation ~ 480 GWh pa

Historical growth to 2004

To meet load growth we need ~4000 MW of new generation
and we need to retire 2200 MW of old thermal plant

We need an average of 310 MW of new generation every year

840 GWh pa growth  Actual and projected generation  MED projection
Electricity spot-price forecast
(Mean hydro inflows, rolling annual average Haywards price, c/kwh)
New Zealand electricity system features

**National Parameters**
- Consumption 40 000 GWhs
- Generation Capacity 8500MW
- Peal Demand 6,400 MW

**Generation / retail**
(65% government owned)
- 63% hydro
- 29% thermal
- 5.5% geothermal
- 2.5% wind

**Transmission**
100% government owned

**Integrated System operator/ grid owner**

**Distribution**
- 35 line companies
- Community and private ownership
- 4 major line companies

**North Island**
64% of national demand
- 36% of national demand
- 67% of hydro capacity
- 41% of total NZ capacity

**South Island**

![Map of New Zealand](image-url)
New Zealand electricity system features

Auckland
CBD cable failure – economic embarrassment
Summer voltage stability issues – stifle economic development
Winter transmission constraints – high price spikes
Dry year price issues

Result reduced economic confidence

Solution proposed
New 400KV double circuit transmission

Risks
Consenting
Protest
Land access
New Zealand electricity system features

Bay of Plenty
Transmission constraints – high price spikes
Result industry faces price uncertainty

Solution applied
Transmission enhancement
Load management (inter-trip)
Improved security management

Long term solution
More transmission lines

Risks
Consenting
Protest
Land access
New Zealand electricity system features

Upper South Island

Winter transmission constraints – high price spikes
Load curtailment through voluntary measures and by-back scheme
Dry year price issues

Result reduced economic confidence and uncertainty

Solution proposed
Increased voltage support and more transmission

Risks
Consenting
Protest
Land access
New Zealand electricity system features

Christchurch

Transmission constraints forecast to become significant post 2013
In the meantime some potential voltage instability
Very successful load management programme
Potential loss of investment to other regions

Solution proposed
Increased voltage support and more transmission

Risks
Consenting
Protest
Land access
New Zealand electricity system features

Southland Region

Supply and demand in balance
Strong effect of Comalco smelter
Economic development curtailed
Dry year price issues

Result reduced economic development

Solution proposed
Increased voltage support

Risks
Potential closure of the smelter
Implications for the national economy – the bleak view

- Reducing investor confidence leading to:
  - Existing businesses relocating
  - New businesses locating elsewhere

- New Zealand remains a commodity exporter rather than becoming an added value economy

- Knowledge and experience drain accelerates

- Higher costs and risks associated with primary energy exploration leading to difficulties attracting supply-side investment

- Eventual Government investment in major infrastructure and generation projects
Implications for the national economy – the bright view

- New Zealand maintains its clean green image developing fair, efficient and sustainable use of its resources
- Development of a knowledge and experience base in efficient energy use, demand response and efficient systems management
- Development of macro demand management techniques:
  - Optimum location of new industries
  - Holistic approach to resource management
  - Efficient infrastructure investment
  - Emissions trading expertise and opportunities
- Demand response fully utilised to provide efficient use of infrastructure
- Energy efficiency fully utilised to provide sustainable resource use
- New efficient technologies can be introduce incrementally
Role of demand response

- It is certain that developing major supply side projects will become increasingly difficult.
- The a key option is to increase efficiency and manage demand.
- The only question is when will we do this:
Summary

New Zealand’s energy infrastructure is getting old and serious investment is required if projected growth rates of energy demand occur.

- Our transmission lines are reaching full capacity in many regions
- Many of our distribution networks are in need of refurbishment and upgrade.
- We are uncertain where the fuel for our power stations will come from and where the power stations will be located.

Given this uncertainty it is prudent to consider demand-side management as a means of managing supply security risk and providing additional ‘free’ capacity.

Under the direction of the GPS and to promote the achievement of NEECS goals the role of DSM must be fully explored. It is clear that for DSM to emerge as a credible solution there is a need for a leader and facilitator of DSM opportunities.
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