


# End-Use Energy Options for a Reliable Electricity Supply



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# New Zealand's electricity market fails at retail level



- Auckland blackout: EECA campaign for consumers to help prevent total blackout
- Winter 2001: Minister begged consumers to save 10% for 10 weeks.
- Demand side management (DSM) came too late to stop \$60m per week loss to the national economy in Auckland, and \$300m loss to NGC in winter 2001
- This is command and control, not efficient price discovery that balances demand with supply.

Missing: retail participation in the electricity market



Consumers and energy service companies are price takers


No opportunity for retail side to contest activities of wholesale side

# Reliability of New Zealand's electricity supply is at risk at all levels



- **Energy shortages:** all agree these will occur soon in most dry years. Post-Maui gas fields will be much less able than Maui to increase supply in dry years.
- **Underinvestment in transmission:** investment requirements \$1.8 billion next decade; Transpower's customers reluctant to invest; may need to be levied
- **Distribution systems:** "need renewal", costing around \$1.5 billion next decade
- **Reliability statistics** improved after lines companies invested spare capital into their systems in 1999, but have flattened off since

# DSM and small-scale generation are the most cost-effective ways to:




- Improve reliability before or during a shortage
- mitigate market power of generators
- defer investments through the entire chain of supply
- improve environmental outcomes from electricity supply and consumption
- BUT benefits go to TOO MANY interests groups; some always free-ride on those who invest at retail level

# Distributed Energy Resources (DER) to improve reliability include:



- **Targeted energy efficiency (EE):** focus on constrained times and locations. Examples: weatherisation and insulation for winter peak demand, efficient HVAC for CBD summer peaks
- **Alternative fuel** (wood, LPG) for heating in dry years
- **Peak load response (PLR)**, to shift load from peak times: requires real-time information and TOU meters; works best with ex ante pricing and volatile spot prices
- **Distributed generation (DG)** improves diversity of generation resources and robustness of whole system. May need power conditioning and redesign of some distribution elements (no different from some loads!)

# New Zealand examples of DERs ready to roll but undercapitalised

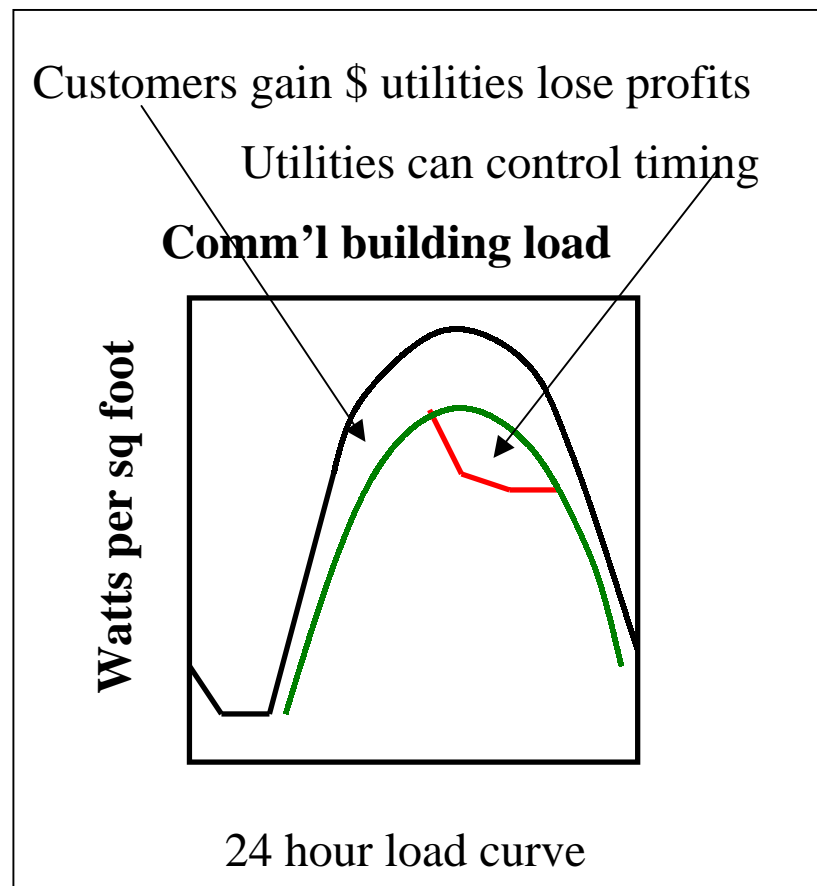


- Energy efficiency: efficient low pollution wood burners.
- Alternative Fuel: coppice eucalypt fuelwood
- Peak load response:
  - Demand exchange (trading in real time)
  - Energyintellect meters (active)
  - Smart appliances (passive or active): e.g water heaters that self-control when voltage drops
- Renewable energy
  - Locally manufactured wind turbines: Windflow 500
  - Solar water heaters

# Targeted energy efficiency gives peak as well as energy savings

## Examples

- insulation, draught stopping for winter peaks, where networks are constrained
- efficient lighting and HVAC for summer peaks, where networks are constrained
- Example: actual commercial building in Albany NY:
  - 20% energy savings (green)
  - 15% peak load shift (red)





# U.S. estimates of energy efficiency potential

- In U.S., energy efficiency programmes throughout U.S. saved 29,000 MW capacity from 1980-1995 at cost of 2-3c(US)/kWh (out of around 700,000 MW)
- Programmes cut in half after restructuring began in 1996
- EPRI: low cost energy efficiency could reduce demand by 15%
- ACEEE: energy efficiency could displace half demand growth over next 15 yr
- 51 Energy Service Companies (ESCOs) completed \$2.5 billion projects 1990-2000
- Project revenues were growing 24%/yr; growth reduced to 9%/yr after 1996

# Peak load response a vitally important pro-competitive option



- “ELCON strongly believes that it is imperative that price-responsive customer load be allowed to enter wholesale spot markets to restrain pricing volatility. This is what competitive markets were intended to do in the first place.”

- Electricity Consumers Resource Council Submission to FERC, April 2001

# PRL must be not a requirement but an option: consumers choose



- PRL by only a few large customers reduces cost of electricity supply to all customers
- McKinsey White Paper: 20% of benefit of PRL comes from direct cost reductions; 80% of benefit accrues to other customers by reduction of wholesale spot prices
- Retail tariffs offer two “products” - kWh and risk management. Tariffs that allow consumers to manage price risk should give lower power bills than guaranteed-price tariffs.

# Price responsive load: a self-fulfilling prophecy




- Question to Lee Wilson, following his assertion at the conference that only coal can provide flexibility post-Maui:
- Have you investigated potential for householders to be paid to use dry fuelwood in existing wood burners (no capital cost!) to provide energy in dry years?
- Answer: No.
- Question: Why not?
- Answer: because we investigate what we think will happen.

# Distributed generation - benefits and potential



- New renewable energy adds diversity to electricity generation sources, makes whole system more robust
- Location in potentially constrained areas helps the lights to stay on
- Modular nature allows mass production and makes financing easier. Like PCs not mainframe computers.
- Standby generators and even wind turbines can be moved to areas where most needed
- DG could penetrate 10-20% of the U.S. electricity market in 10 years

# New Zealand's electricity market fails to accommodate DERs



**“We have no appetite for risk!” (ECNZ, about 1997, in answer to challenge that risks should be placed with those best able to manage them)**

**“Electricity demand is quite inelastic” (A generator-retailer informally at recent governance hearings, in answer to challenge that load should be responsive to price)**

# Wholesale market designed for inappropriate aims



## Actual (ideological)

- Economic efficiency
- Reducing political input
- Lower power prices at wholesale level
- Full competition for small as well as large consumers and suppliers

## Appropriate (practical)

- Economic and energy eff.
- Confining political input
- Lower power bills at retail and wholesale levels
- Competition for large market players, protection for small consumers and suppliers

# NZ electricity market design is unique (original designer, ECNZ)



- Design and administration not by a publicly accountable regulator but by private contract between companies.
- Divergence between Government Policy Statement and market's Guiding Principles
- Market design never progressed beyond the first task, the wholesale market.
- Any required public purpose was to be provided by Government, generally purchased.
- Example: in Energy Saver Fund, Government purchased "saved kWh" at lowest possible price.



# Balance of interest groups in NZ's electricity market



- Original design was 50-50 voting between generators and purchasers (retailers and major electricity users)
- Then the generators purchased the retailers! These companies now control 75% of votes on market rules.
- More important balance is between
  - wholesale market suppliers and wholesale consumers
  - retail consumers and suppliers of retail energy services.
- Retail energy service issues are off the agenda today

# Retail perspective on pricing is very different from market participants'



## Wholesale participants:

- wholesale prices should be “perfectly efficient”
- retail price hikes needed to enable new generation
- Transpower may need to levy its customers to enable “necessary” investment

## Retail participants

- if prices reflect “costs” perfectly, risks are shifted to customers
- All retailers hike prices; these amount to levies to fund supply side
- Transpower pricing favours incumbent generators above DGs

# Retail business risks are very different from wholesale businesses'



## Wholesale businesses

- regulatory risk
- unpredictable consumer demand
- profits are too small to fund new investment
- finance companies want long term contracts
- power companies want margin above WACC

## Suppliers, retail services

- wholesale sector dictates prices and capacity timing
- retail sector = price takers
- return to surplus capacity will depress the volatility that underpins retail participation in market
- incumbents have access to cheap capital

# End-user perspective on reliability is very different from supply-side view

## ■ Supply side perspective

- For typical distribution customer: <4 interrupt./yr, <2 hr total
- 95% interruptions are due to faults or outages are on transmission or distribution
- 80% of those interruptions are on distribution lines

(Budhraj, ICEPAG 2000)

## ■ Customer perspective


- 95% of disruptions are from sags, harmonics, interruptions < 2 sec
- 10-15 times/yr, voltage drops below 70%
- 30% of production equipment sensitive to power quality problems

# Fair market for retail energy services



- Equal access to market for wholesale and retail players
- Retail prices do not signal real costs
- Ex ante market needed, to enable customers who so choose to plan load reductions and be paid for them
- “Stout” transmission system as advocated by wholesale participants depresses spot prices favouring generators at expense of DERs
- Retail price hikes of 10% cost consumers \$300m/year; a much smaller real levy would fund a lot of DERs

# How can we get there from here?



“There” means using DERs to achieve lower electricity costs

# NZ electricity governance from USA perspective



- *"If industry decision-making is not inherently superior to that of a body having the responsibility, capability and authority to support the public interest, then the whole theory of the Applicant's design crumbles. This is a radical conclusion, fully justified by the record. It requires a correspondingly radical reorientation of oversight and decision processes for this sector."*
- Hogan, in final Transpower submission to ComCom on governance

# Can planning do better than market?



- Market design debate exposes bitter differences between and amongst market players and excluded parties
- In planned system this debate does not go away but goes behind closed doors
- If Rulebook does not pass audit after two years, will become Crown EGB; debate go behind closed doors!!
- DERs work equally in planned or market systems (Laun, answer to question at conference)
- Integrated resource planning can be replaced by integrated resource trading (Laun)



# Government should:



- negotiate objectives for electricity governance that give high priority to DERs
- assemble known energy supply and demand resource data for “Portfolio analysis” to enable all businesses to compare supply options with DERs
- More controversially:
  - Legislate to enable electricity levy
  - Discipline retailers or split their ownership from generation

# Governance Board should:



- Set objective: link retail markets to wholesale ones so retail participants can be paid for responding to wholesale prices
  - Set up Retail Issues working party
  - ensure retail issues addressed by other working parties
- Ensure DER representatives have resources and expert advice to participate effectively
- levy market participants to fund this (or levy all consumers)

# Parliamentary Commissioner, Auditor General, should:



## PCE:

- take strategic view of environmental outcomes from electricity sector: use portfolio analysis
- assess whether governance is helping DERs realise their potential to reduce environmental impacts of electricity

## AG:

- consider whether EGB members appropriately advised
- assess whether internationally accepted regulatory objectives for electricity are being addressed in NZ
- ensure robust processes for retail sector interests to work to level the electricity market playing field

# Companies: culture change needed



- Generator-retailers: learn to love consumers who can respond to spot prices
- Transpower: positively encourage distributed generation and don't shy from legitimate commercial risk
- Lines companies: culture change can start here:
  - much of benefit of DERs is in local network cost savings
  - Asset management plans should present costs and benefits of DERs alongside network investment. Info discl. regulations already require this, but the requirement needs to be rigorously applied

# Consumers: culture change needed



- Both major electricity users and Grey Power continue to advocate “lowest possible power prices”
  - That is like “fly now, pay later”
  - Consumers ignore time-dependent costs at their peril
- Many advocate return to power planning, BUT
  - supply-side planning thrives on closed door policy
  - costs would soar, reliability would fall
- Independent regulator needed to take leadership of the culture changes needed

# Conclusion



- The old dichotomy “supply side” vs “demand side” is less relevant for NZ today.
- More important dichotomy is : **“wholesale players” vs “retail customers + energy service providers”**
- Retail participants: learn much from K. Dobinson:
  - “Levy us but give us what we want!”
  - Remove barriers to change
  - Don’t give us “welfare on wheels!”
  - Don’t give subsidies but enable market opportunities to make good business from serving all market segments

## Some sources:

- Best overall coverage of theme of this paper: “Efficient Reliability” : [www.naruc.org/5.7g.pdf](http://www.naruc.org/5.7g.pdf)
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- Most NZ information comes from submissions to Commerce Commission on Electricity Governance and lines regulation; also Transpower’s Asset Management Plan
- Prof. Hogan (consultant to Transpower), NZ market compared to California’s: submission, <http://www.comcom.govt.nz/adjudication/documents/draftsubs/Transpower%201.pdf> ,
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- Divergence, government policy statement from guiding principles: Governance transcript 12 June; search on “for divergence”. Also 25 June, search on “Nominally”. Also try searching on GPS, GP, Guiding Principles, Government Policy Statement” in other transcripts.
- NZ websites: [www.sef.org.nz](http://www.sef.org.nz) gives many links; see also [www.demandresponse.co.nz](http://www.demandresponse.co.nz), [www.metering.co.nz](http://www.metering.co.nz),