Pricing in the New Zealand electricity market and its economic impact

6 March 2006

Preface (added December 2006)
•This document was prepared by MED and does not represent government policy
•Some of the information contained in these slides might now be dated

Questions to be addressed

1. Should electricity prices reflect marginal costs?

2. Does marginal cost pricing mean that generators make ‘large’ profits while prices rise for businesses and other consumers?

3. Would it be better for economic growth if electricity prices were lowered?

4. What are the options for reducing electricity prices?

5. What are the economic effects of those options?

A preview of our assessment

1. Should electricity prices reflect marginal costs?
   Yes, to avoid shortages and subsidies and encourage efficient use of energy
   (only prices for incremental consumption need reflect marginal costs, but it is difficult to separate incremental prices from overall prices)

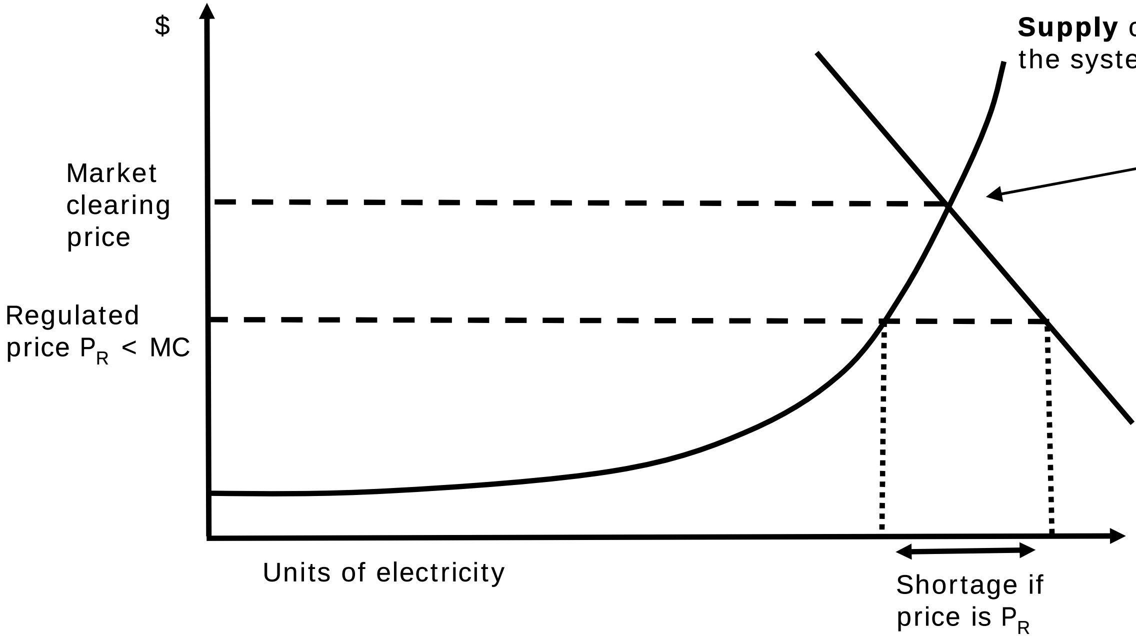
2. Does marginal cost pricing mean that generators make ‘large’ profits while prices rise for businesses and other consumers?
   Yes, when costs are rising and for generators with low variable costs. No when costs are falling

3. Would it be better for economic growth if electricity prices were lowered?
   Possibly. It depends on energy intensity and value added in affected sectors

4. What are the options for reducing electricity prices?
   There are three ways this could be done

5. What are the economic effects of those options?
   The most sensible option mainly helps residential users

Relevance of system marginal cost



Supply curve tracks marginal cost of output by the system as a whole

Price converges to long run marginal cost in all competitive sectors (see attached notes on electricity pricing).

Demand is downward sloping, not vertical.

It is effectively vertical in today's market, but only because (a) there is no demand side bidding and (b) the market is a short-run clearing mechanism.

Over longer-run, buyers do adjust consumption in response to prices.

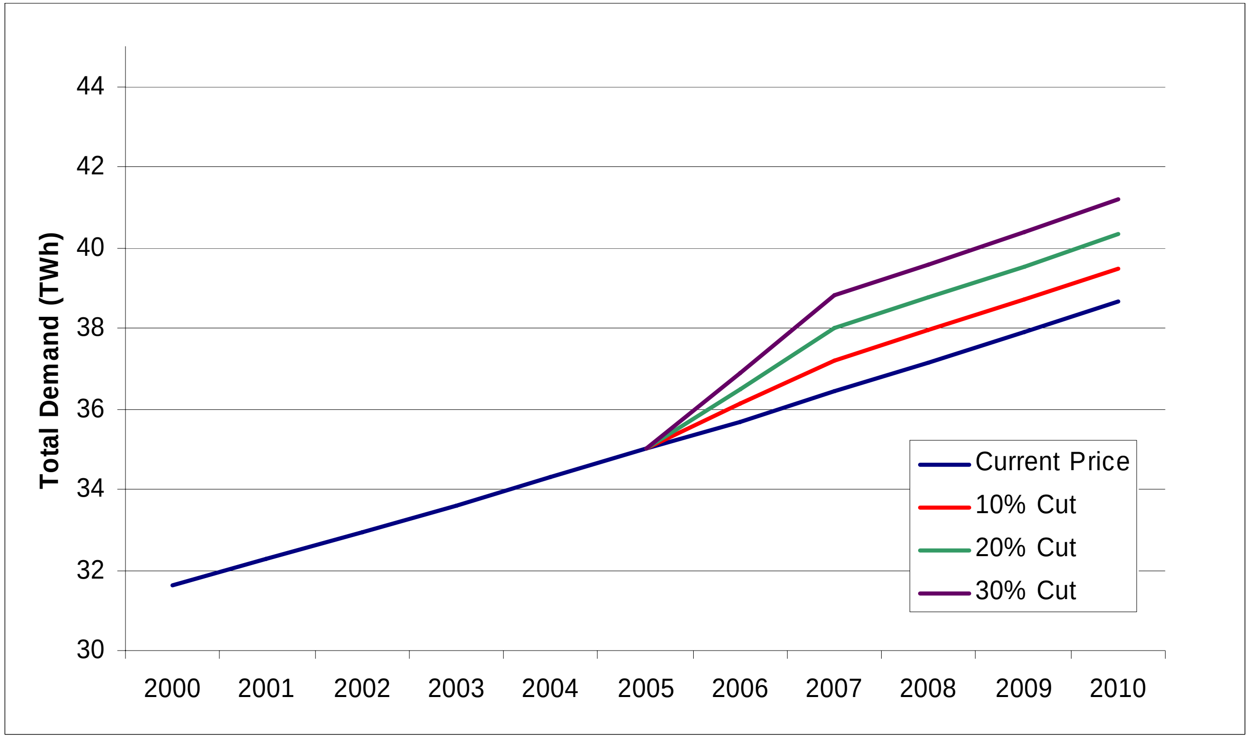
Some industrial users do this already (e.g. Comalco)

Even some residential users would make short-run adjustments if that was feasible (e.g. if they had real time metering).

Main consequences of capping price at P_R

1. Increased demand over time, so need to build and subsidise production of additional power to maintain secure supply (subsidy required because price is less than cost of that power). Next slide shows estimate of new capacity need.
2. Less innovation in supply (e.g. ocean-based systems) and demand (e.g. energy efficiency and conservation)

Demand impact of sustained price cuts

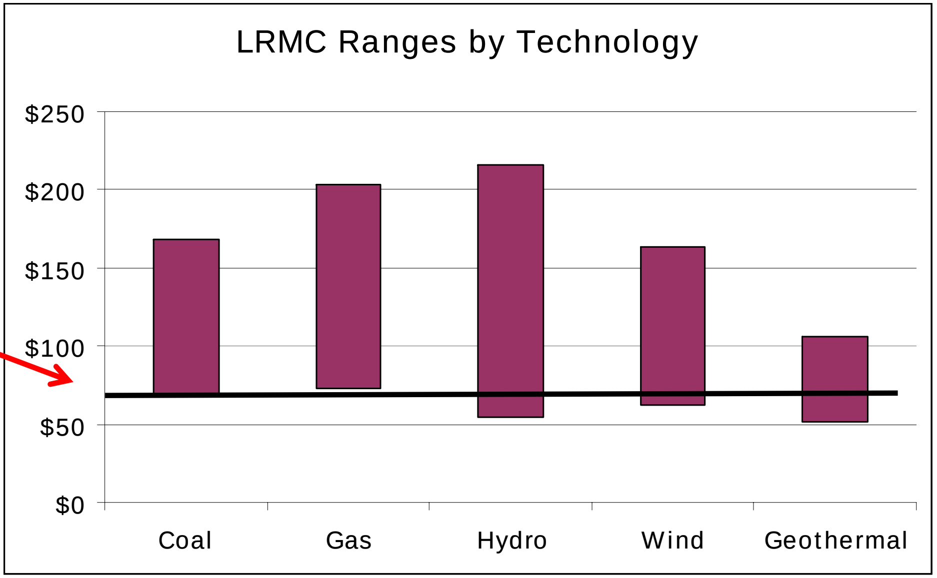


Each 10% price cut could

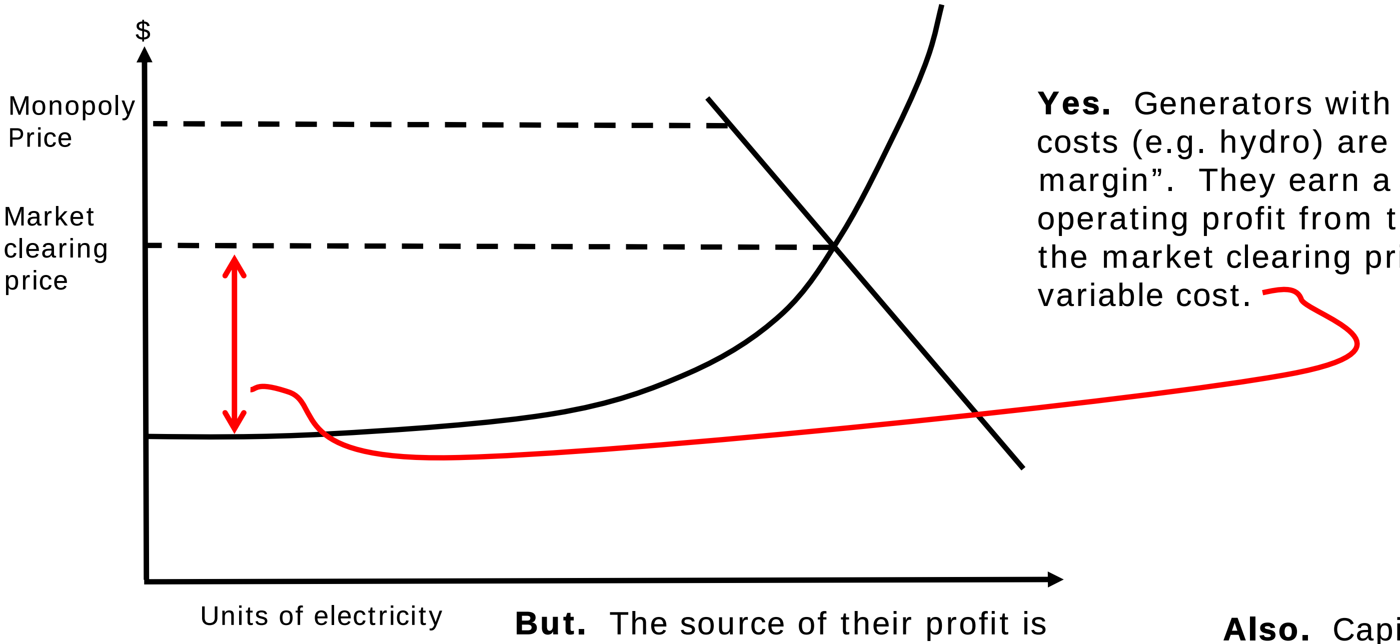
- boost demand by 2.3% (combined price + income effect; Price elasticity 0.2; Income elasticity 0.8)
- require 150MW of extra capacity (i.e. beyond existing need) over 2-3 years
- capital cost of this is around $185m (based on $1300/kW for CCGT)
- 30% price cut has about 3 times this effect

Other electricity sector impacts from holding P < marginal cost

- Less demand side innovation
  - Energy efficiency/conservation value will decline along with the perceived cost of not conserving
- Commercial case for investment is weaker
  - Returns need to be above $70/MWh for most technologies
- Combination of greater demand and less investment mean we would probably need to subsidise new generation



Does marginal cost pricing transfer wealth from end-users to generators?



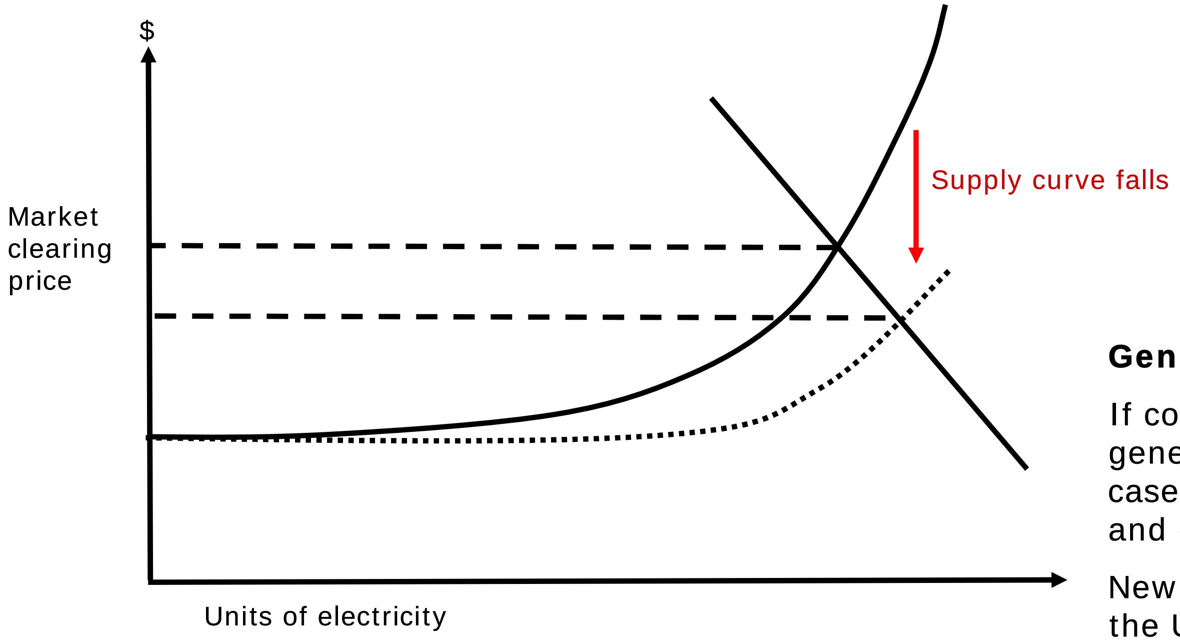
Yes. Generators with low marginal costs (e.g. hydro) are not "on the margin". They earn a significant operating profit from the gap between the market clearing price and their variable cost.

But. The source of their profit is unusually low variable cost, not market power. They are not setting a monopoly price. A useful analogy is a farmer with unusually productive land: he has low production costs but still sells at the market price.

Other comparators are coal and steel, both of which are produced in NZ and sold here at prices set by the cost of imports.

Also. Capital costs need to be recovered, particularly for high capital cost, low variable cost plant (e.g. hydro), so the margin over variable cost is not all profit.

Marginal cost pricing is a 2-edged sword



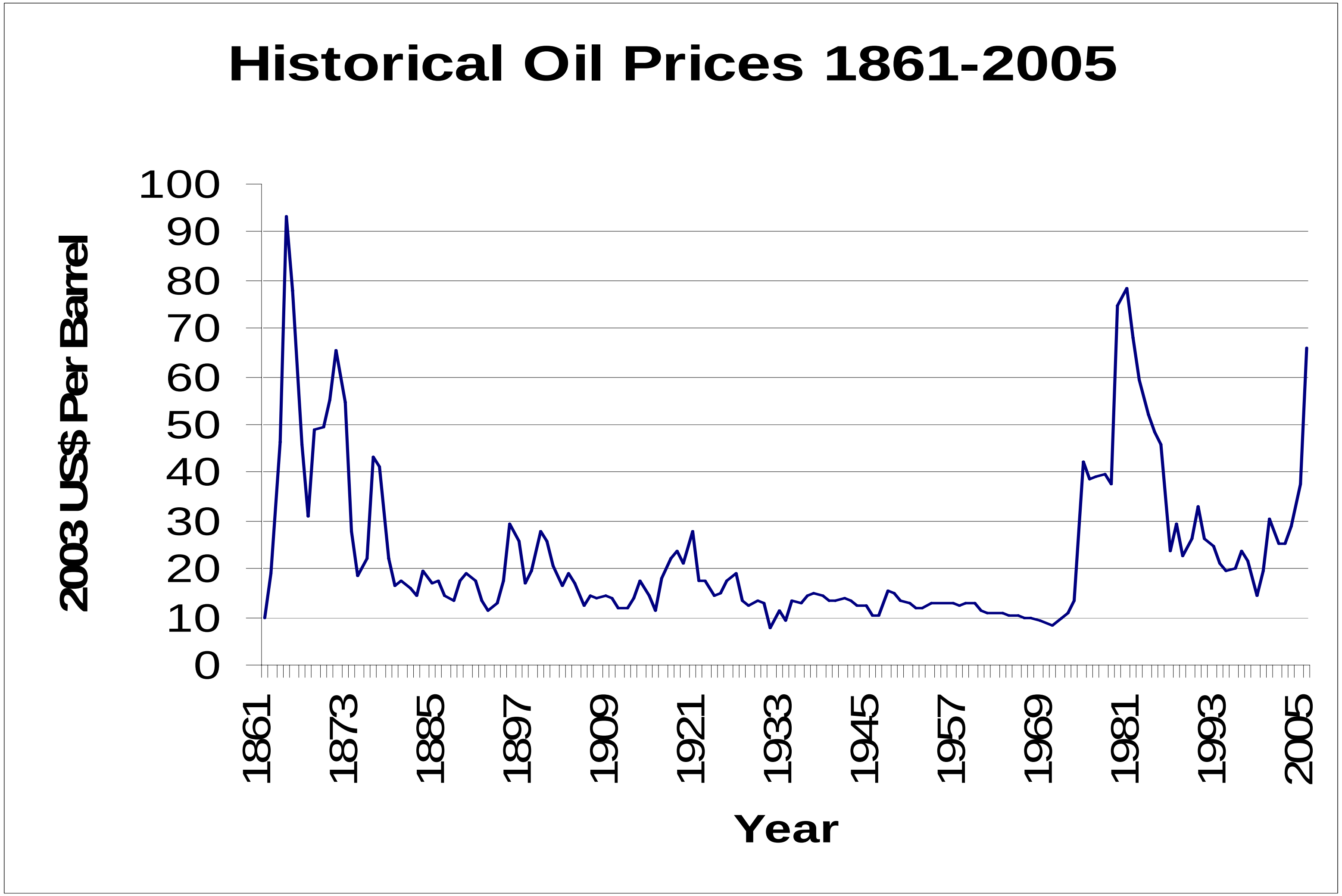
Generators can also lose, a lot.

If costs fall over time, existing marginal generators can be undercut, in which case their assets are partially "stranded" and can become worthless.

New gas technologies had this effect in the USA and the UK.

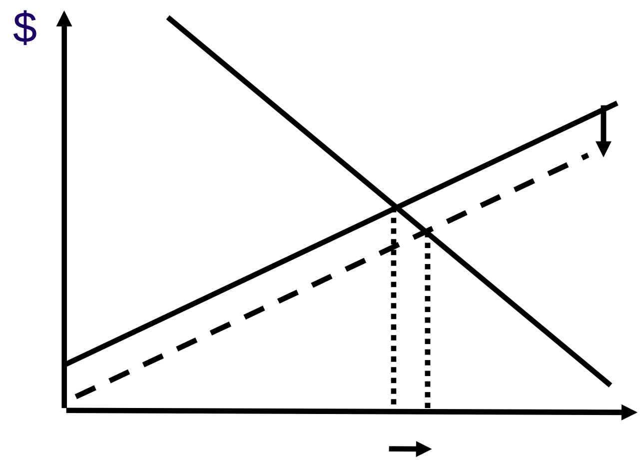
It could also happen here. For example, if a large new gas deposit was brought into production after some generators had committed to LNG, those generators would have stranded assets.

Key benchmark prices do not always rise



Would it be better for growth if power prices were lowered?

- Output would increase in sectors that are electricity intensive & price sensitive
  - e.g. industrial processors
- Resources would flow towards those sectors, cutting output elsewhere (we are approximately fully employed)
- To increase GDP, the value of output gained would need to exceed the value of output lost and the cost of extra electricity supply
  - We can not say with confidence whether that would occur or not.
  - It depends on the electrical intensity of different sectors and the value they add.



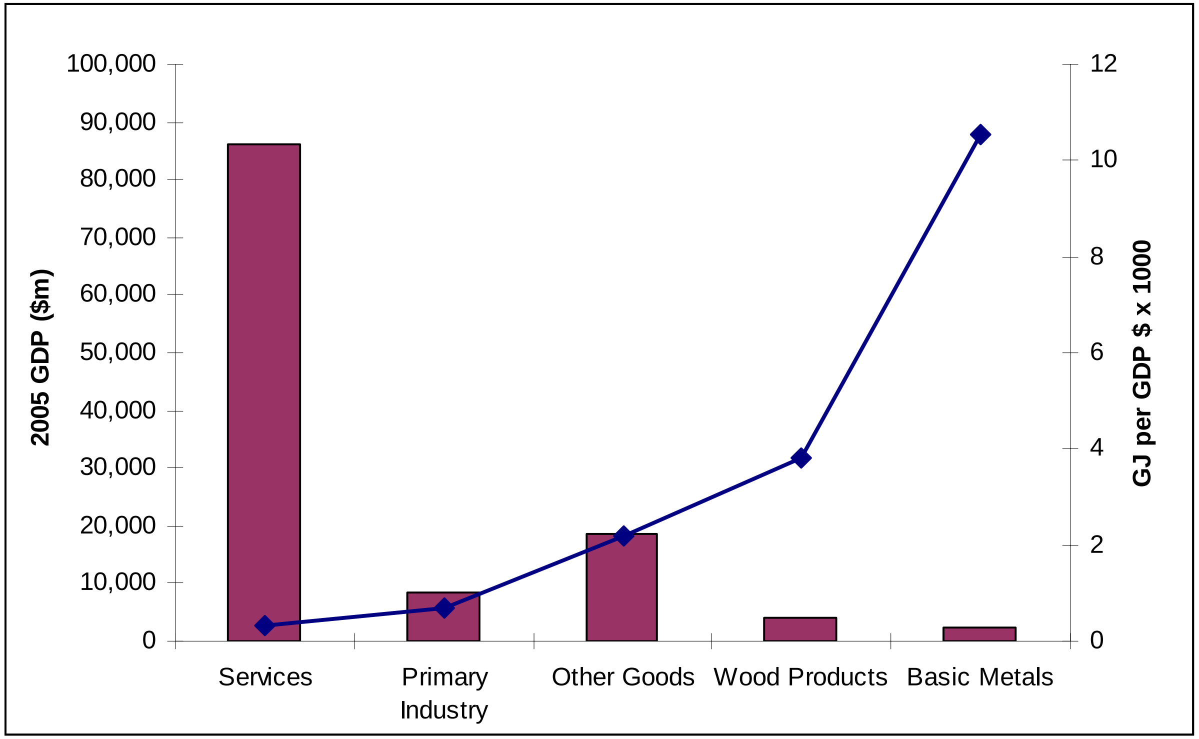
- A simple aggregate demand analysis (like this diagram), would predict some output expansion
- It ignores capacity constraints and does not show how output changes vary across sectors
- What matters is the value of output, not its volume

Electrical intensity varies a lot

Chart shows:

- electricity used to produce $1000 of GDP in several major sectors of the economy (on right scale);

- contribution to GDP by sector (on left scale).



What are the options for reducing electricity prices?

- There are three broad options:

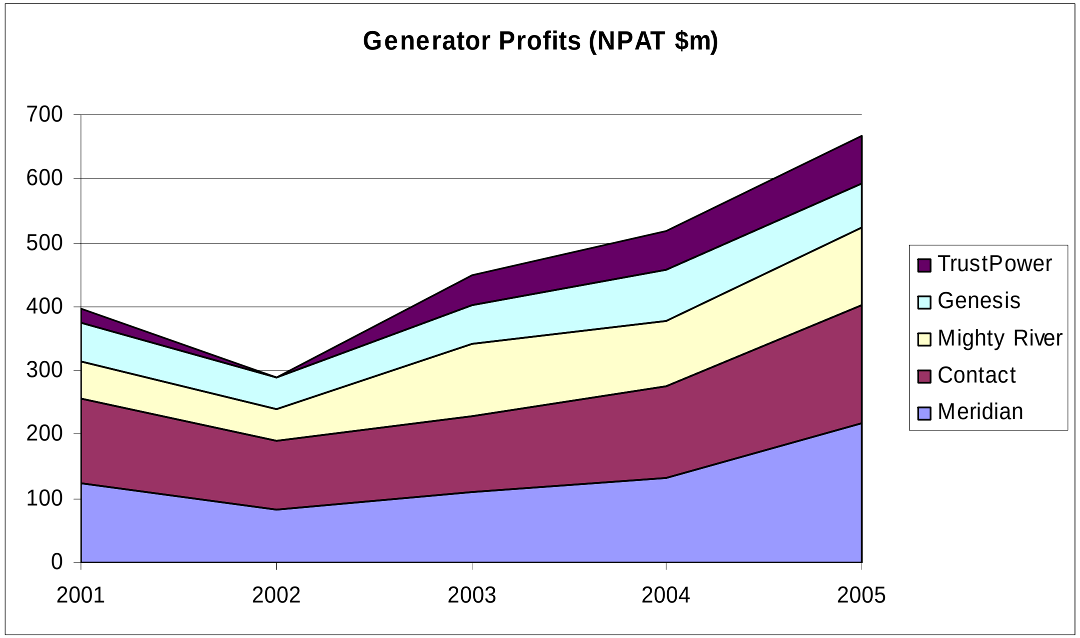
    1. Direct consumer rebates

    2. Progressive pricing

    3. Average cost pricing

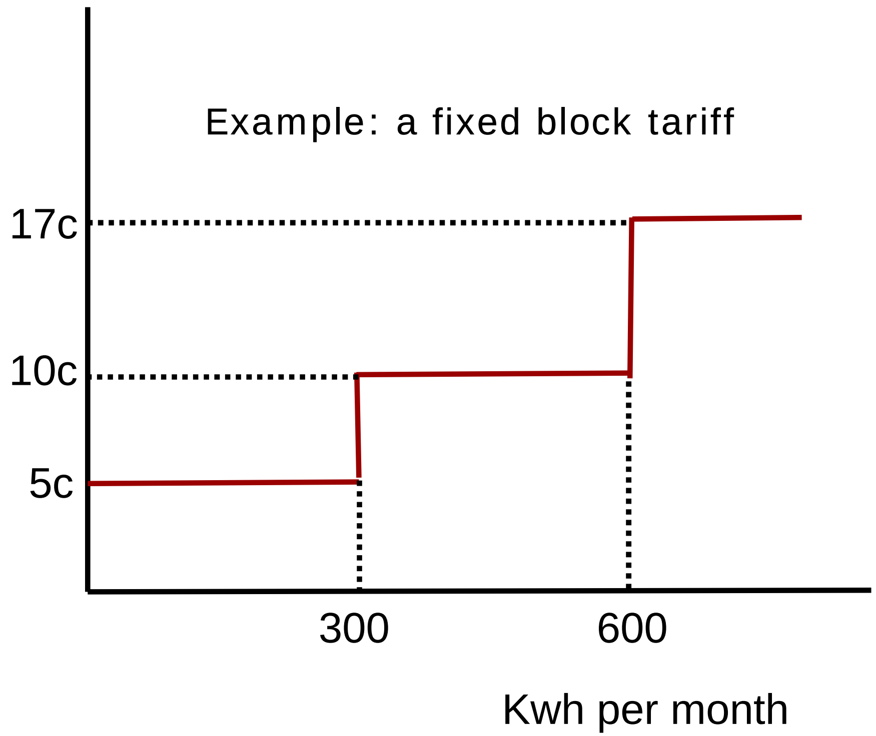
Direct consumer rebates

- Generators have been making substantial profits
- Some of this money could be rebated back to end-users
  - A universal "electricity dividend" for example
- Financing options:
  - In the 05 year, Crown earned $500m from these 5 firms
    - $300m tax + $200m dividends (SOEs only)
  - This pool could be augmented with a windfall tax
    - Though that may undermine investor confidence and be difficult to design (separate work has been done on this)
  - Resource rentals (e.g. royalties on gas) could also be adjusted to help stabilise prices
    - e.g. the UK makes quite frequent adjustments



Progressive pricing

- Rearrange retail pricing so that
  - total costs are just covered
  - users still face marginal cost
- This approach preserves the price signal for marginal use
- At the same time, it regulates total revenue down to total cost
- So the marginal and average conditions are both satisfied



Fixed or proportional blocks?

- A key design issue for progressive pricing is whether the price blocks are of a fixed size, or proportional to one's usage

- If all users get the same small rebate (fixed blocks), larger users get very little benefit relative to their "pain"
  - But there will be no demand surge
  - Indeed, we may get more conservation as people react to the quantity aspect of block tariffs

- If block size is proportional to usage then
  - The effective price of all power is reduced, so demand will rise
  - The largest users will get the largest rebates

- So the scheme could work reasonably well for residential users, but it would be very costly (in terms of demand growth) to make a material difference to business users.

Implementing progressive pricing

- Very difficult to make this change on stand-alone basis
  - In principle, we could require all retailers to offer some cheap power
    - similar to the way we conduct the “low fixed tariff” policy, but it would be compulsory for all customers
  - But the financial impact of that would vary a lot across firms
    - Those with more retail customers (TrustPower) and thermal power plant would be hurt most
  - Realistically, one would need to regulate the generation sector (and all retail prices) to make progressive pricing work on a sustainable basis
    - However this is not compatible with competitive market arrangements
    - It would be complex and difficult to administer, and create incentives for gaming (e.g. dual meters) and lobbying (e.g. over block size)

Average cost pricing

- A regulator could just cut prices to average cost
  - And tender out construction of all new plant
- The economy would adjust as follows
  - Demand would increase
    - Additional new plant (economic & environmental costs)
  - Electricity intensive industries would expand
    - But this would be at expense of other sectors
      - New Zealand's overall energy intensity (energy use per $ of GDP) has fallen in recent years,
      - But only because of the shift of economic activity from the industrial sector to the commercial sector
      - The commercial sector earns more GDP per unit of energy

What are the economic effects of these options?

- Lump sum rebates are the most economically sensible
  - They preserve incentives to install new capacity and to use electricity wisely
  - Options that do this are
    - Direct rebates (recycling taxes & SOE profit)
    - Progressive pricing with small fixed price block size
  - Direct rebates are the easiest of these options

- Other methods (e.g. proportional rebates, average cost pricing) are less attractive
  - The main initial beneficiaries would be larger users
    - Flow-on benefits would be shared between their domestic suppliers and their (largely) overseas shareholders
    - GDP impacts would be minor and transitory
  - Risks would include
    - More demand and weaker incentives for new capacity investment
    - Expanded need for central procurement of plant
    - NZ economy depending increasingly on things that need a lot of electricity to produce value