



Energy markets & energy management: Ways that Demand Response and Energy Efficiency might, but currently largely aren't, integrated into Australian NEM

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Markets a means... to what destination?

The energy trilemma - *Choose any two?*

Balancing the 'Energy Trilemma'

Energy Security

The effective management of primary energy supply from domestic and external sources, the reliability of energy infrastructure, and the ability of energy providers to meet current and future demand.

Energy Equity

Accessibility and affordability of energy supply across the population.

Environmental Sustainability

Encompasses the achievement of supply and demand-side energy efficiencies and the development of energy supply from renewable and other low-carbon sources.



ENERGY
SECURITY

"To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –

- *price, quality, safety, reliability, and security of supply of electricity; and*
- *the reliability, safety and security of the national electricity system."*

National Electricity Law (Schedule to the National Electricity (South Australia) Act 1996), s.7



ENERGY
EQUITY

(World Energy
Council, 2016)

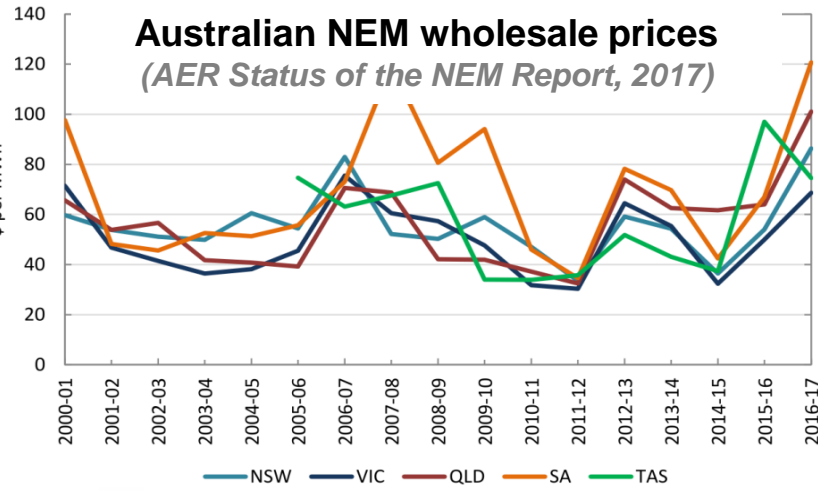
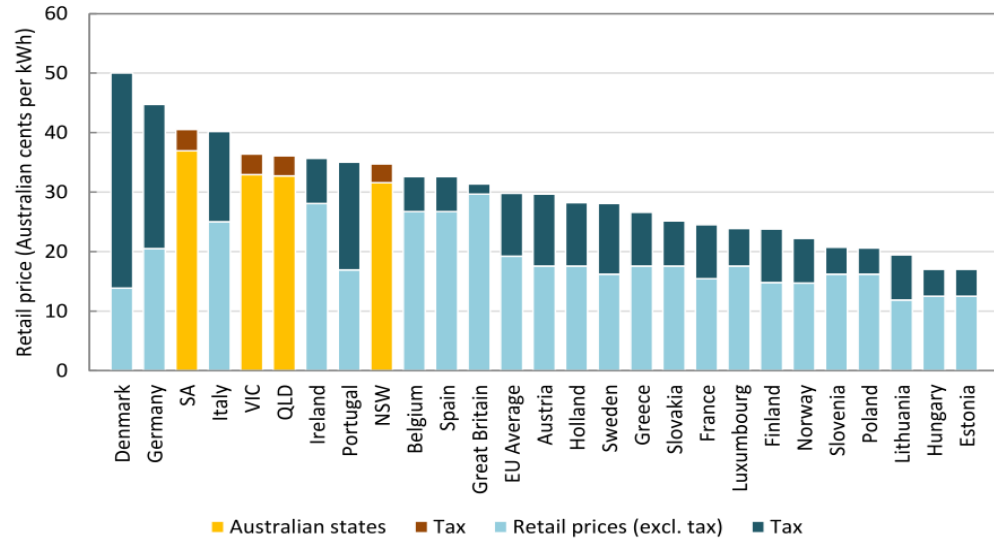


ENVIRONMENTAL
SUSTAINABILITY

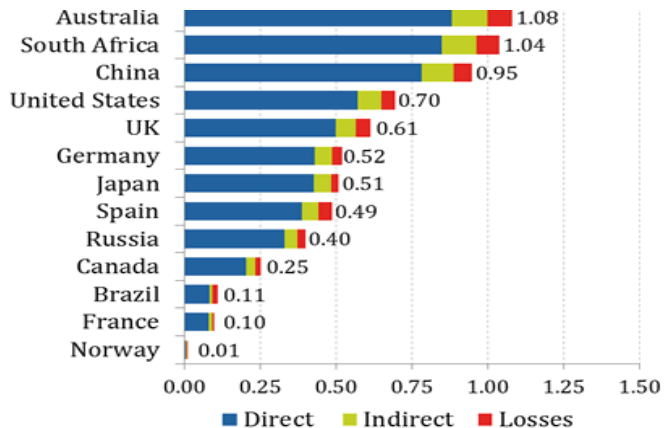


Might get none...currently high NEM wholesale & retail prices, emissions c.f. other jurisdictions

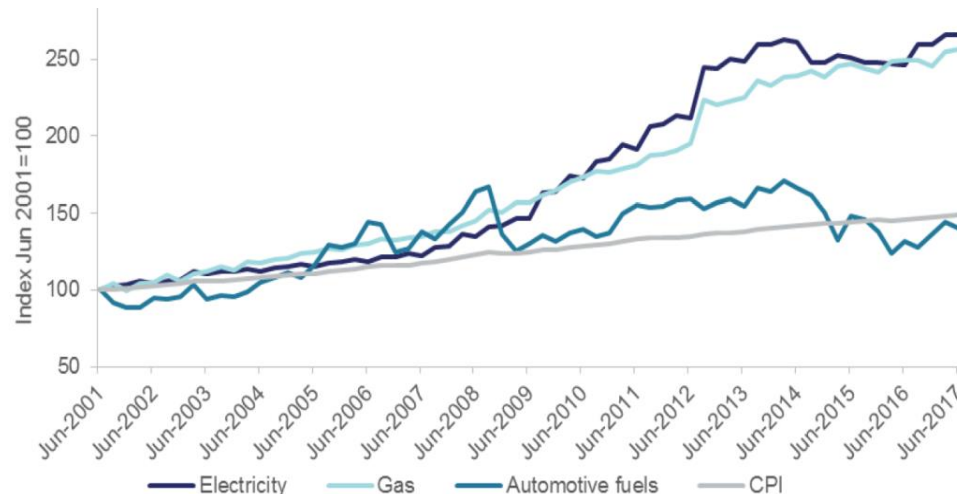
International retail electricity price comparison (ACCC Retail Price Competition Inquiry, 2017)



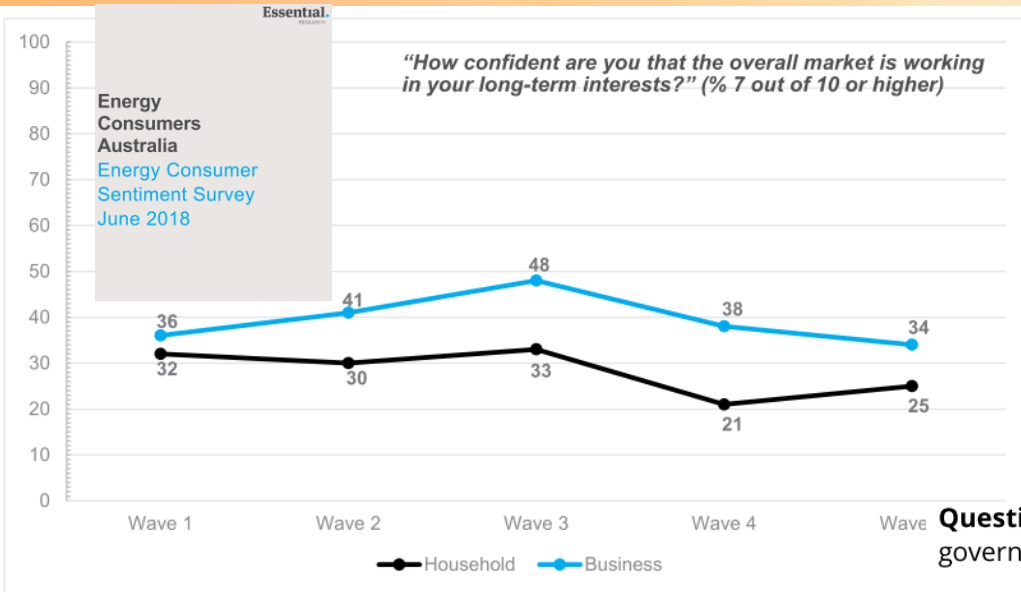
Electricity emissions intensity comparison (shrink that footprint)



Australian residential energy prices index (Australian Energy Statistics Update 2017)



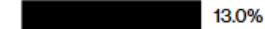
User views on the NEM



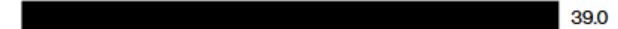
Cheap Power Trumps Climate Concerns

Poll asks what should be the top priority for Australia's energy policy

Lowering blackout risks



Cutting emissions

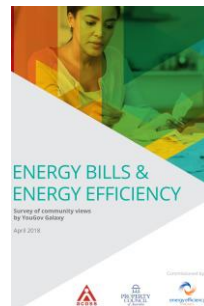


Lower power bills



Fairfax-Ipsos poll

Question: Would you support or oppose the following actions that governments might consider?



Invest in energy efficiency

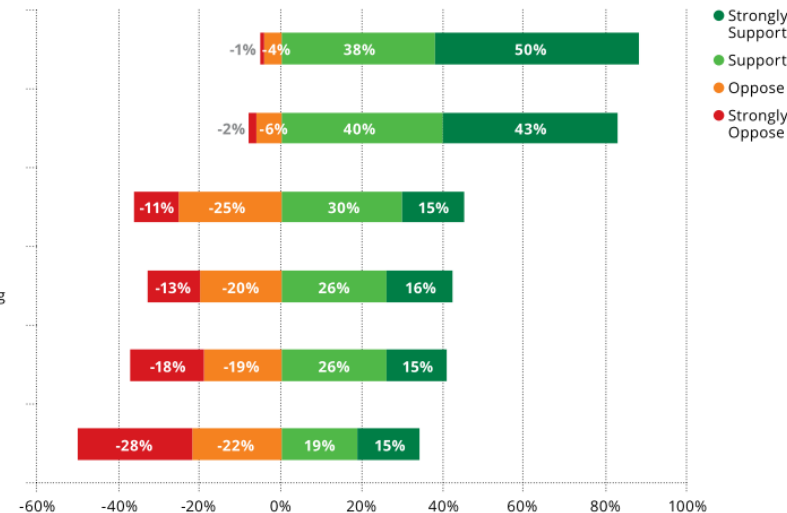
Regulate electricity prices

Increase the reliability standard for the grid

Intervene to stop coal-fired generators closing

Build / subsidise new coal-fired generators

Reduce incentives for renewable energy and energy storage



Energy users – a changing industry context

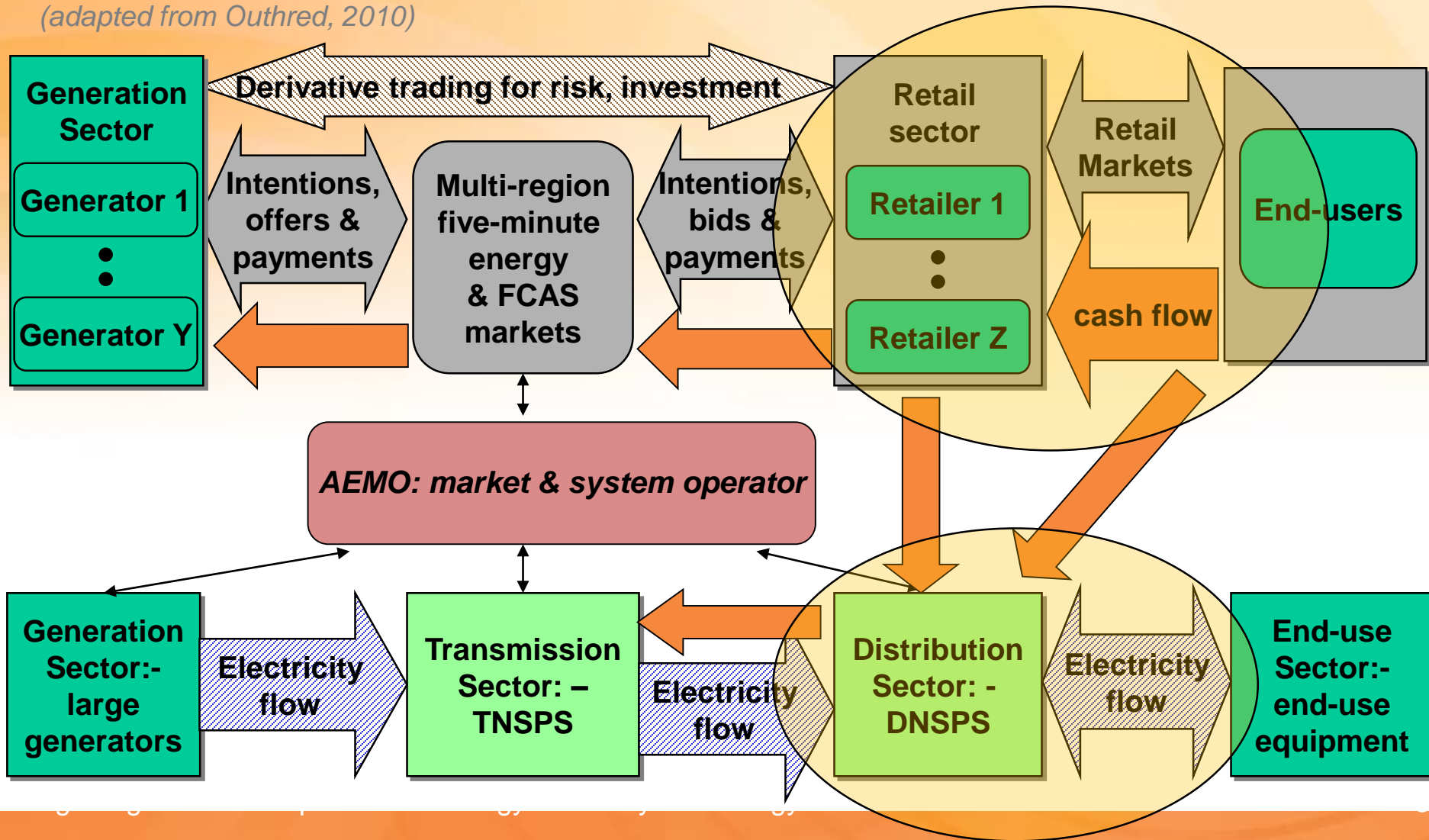
- From clients
 - Early tailored industrial or commercial (lighting) applications
- ..to citizens
 - Electricity as an essential public good – rural electrification
- ..to consumers
 - The vertically integrated utility of growing size and scope
- ..to customers
 - Electricity industry ‘reform’, liberalisation, deregulation, restructuring
- ..to perhaps partners, competitors, or even ‘deserters’?
 - Demand Response, Self-generation, Energy Storage...

Now all of the above – how do we design appropriate interface?

(MacGill & Smith, Consumers or prosumers, customers or competitors?—Some Australian perspectives on possible energy users of the future., EEEP, 2017)

NEM regulatory-commercial end-user interface

(adapted from Outhred, 2010)



Q: What is wrong with the NEM retail market?

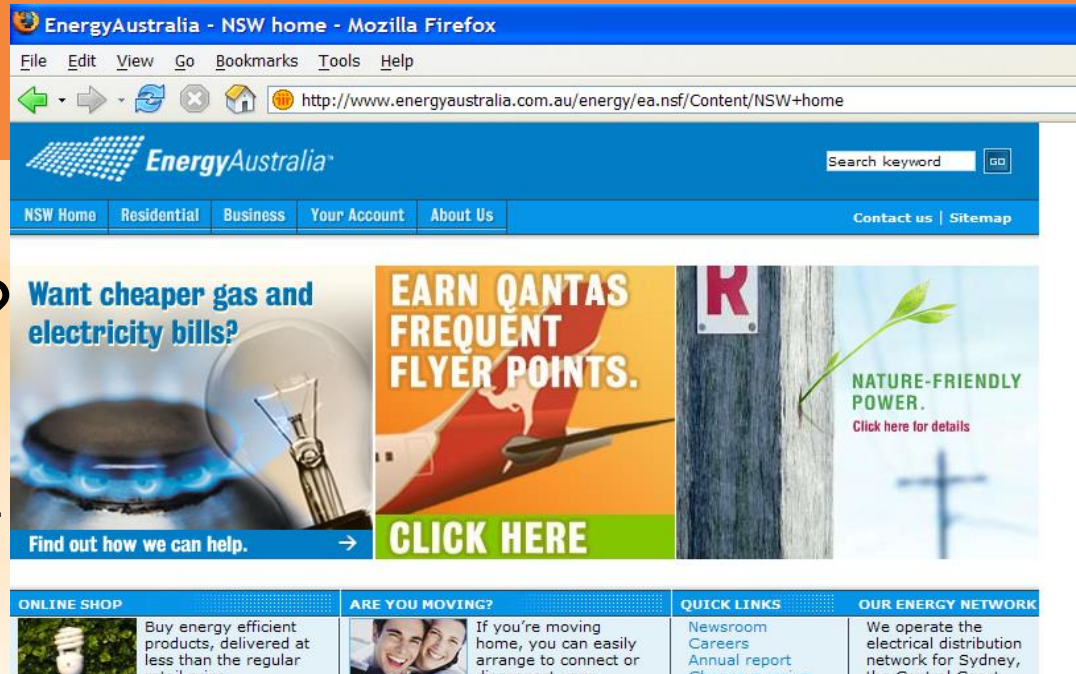
A: it isn't actually a market

“A market is any place where the sellers of a particular good or service can meet with the buyers of that good and service where there is a potential for a transaction to take place”

- In NEM retail markets
 - Do consumers ‘meet’ with sellers?
 - Poor end-user engagement, inefficient levels of DSP and EE
 - Does the market sell the good or service desired?
 - Energy users want to buy energy ‘services’, not kWh ‘goods’

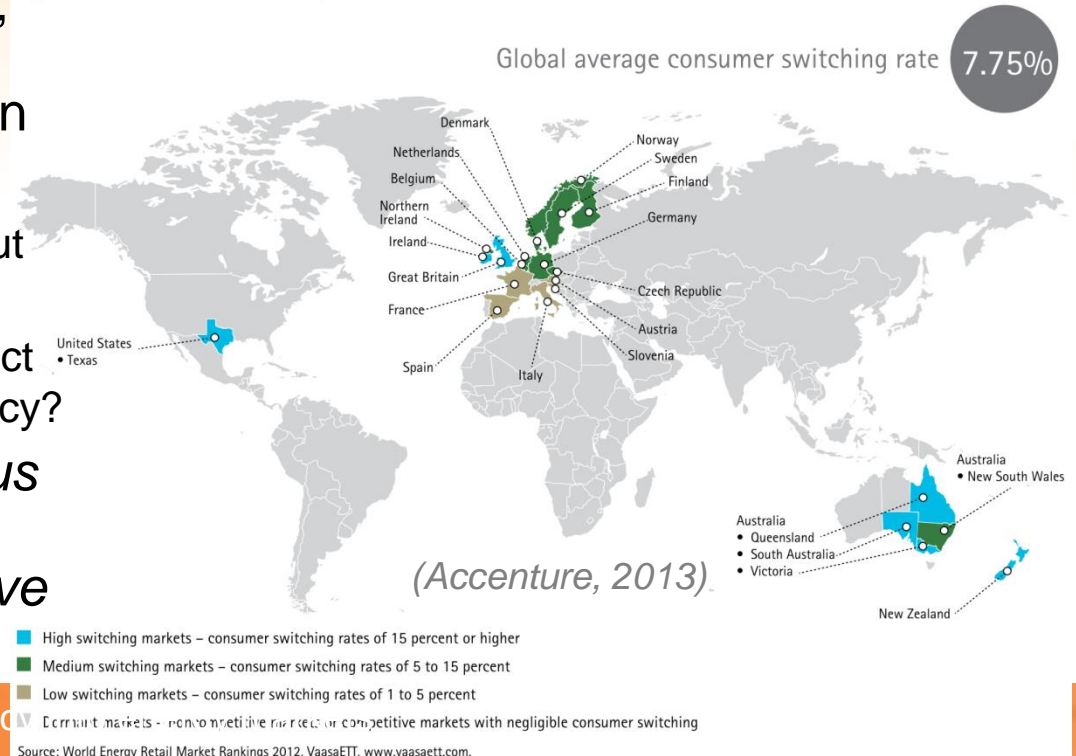
The **key** market design question: *A market for ‘goods’ or for ‘services’?*

- Can sometimes establish effective markets that improve economic efficiency through greater competition
 - Commodities market can feature high price competition.. *If done right*
 - Can have competition b/n differentiated goods and services, but poses additional complexities for both buyers, sellers as *Competition now based on perceived quality, fitness for purpose, price*
- However, a possible price for convenience of commodity mkts
 - “.. commodity policy relies .. on two premises – cornucopianism and individualism... experience with power liberalisation has under-scored the existence of vital public values that are neither .. including the value of reducing energy use ...” (Byrne + Munn, 2003)
- A vast & growing gulf between establishing electricity as traded commodity + ‘end’ consumer objective of energy services



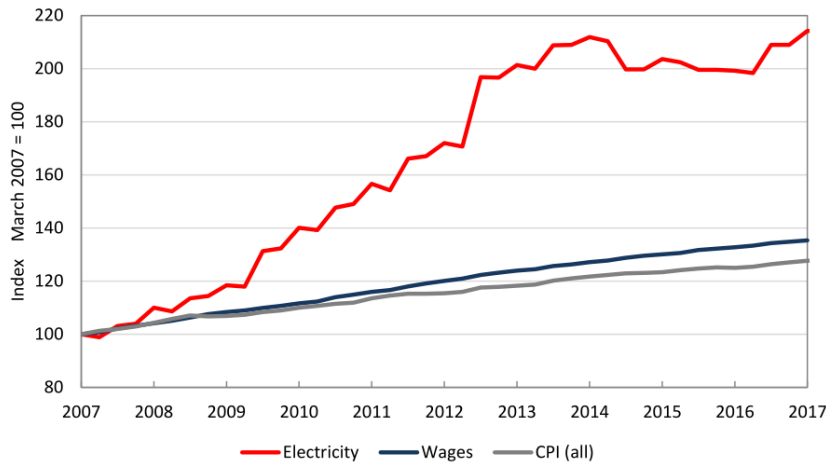
Do we have a 'real' retail electricity market?

- Little focus on energy services
 - "... an important reason there is effective competition in Victoria is .. because the provision of energy is viewed as a homogenous, low engagement service" (AEMC, 2008)
- An oligopoly of large 'gentailers'
- Current measures of competition miss key issues
 - Yes, NEM high switching rates – but real customer choice or just churn?
 - Yes, NEM price spreads – but reflect competition, stickiness, or govt policy?
- *Thankfully, a welcome new focus on customer engagement and DSP by policy makers, innovative businesses and end-users*



Retail competition failing on its own terms

Figure 1.3: CPI for electricity compared with other sectors and wage growth



This year's review found that while competition in the retail energy market continues to evolve, it is currently not delivering the expected benefits to consumers. After a period of stable or improving customer satisfaction, levels of residential and small business consumer confidence and satisfaction with retail energy market have declined significantly over the last year. In particular:

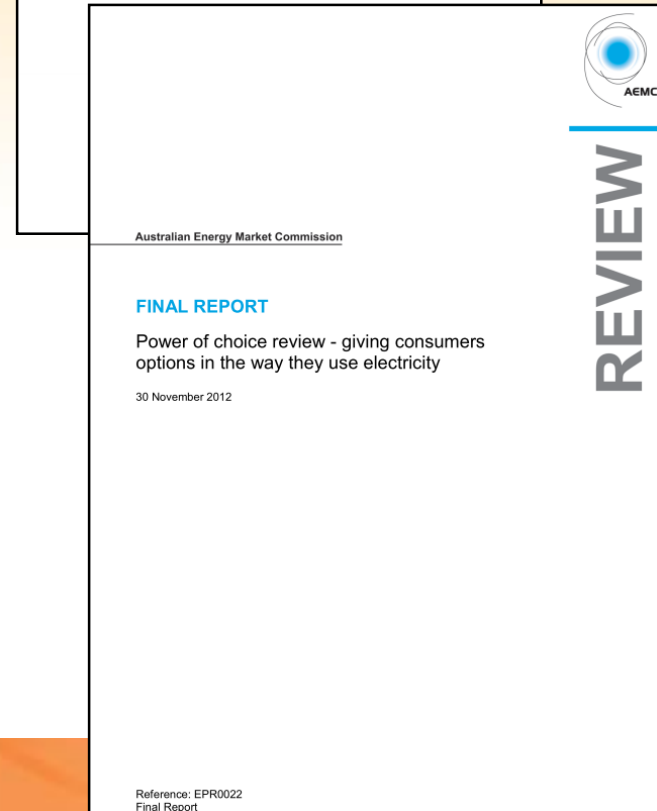
- consumers have generally experienced substantial increases in retail energy prices. These price increases have been driven largely by increasing wholesale costs. Network costs are also a significant component of retail prices, and retailers have not actively engaged in the network pricing process on behalf of consumers.
- retail energy offers, particularly the discounting behaviour, are confusing for consumers. Consumers tend to only get a better deal if they leave or threaten to leave a retailer.

This has led to concerns over energy affordability, and increased interest in the sector from Governments and other regulatory bodies. With retailers being slow to innovate on tariff, pricing and products, consumers have also taken matters into their own hands, with increased investment in distributed energy resources, such as solar PV systems and batteries.



What of DSP?

- “DSP provides a tool for consumers to actively participate in the market, by offering a suite of options for them to manage their electricity consumption and, in turn, their electricity expenditure. It includes actions such as energy efficiency, peak demand shifting, changing consumption patterns, and consumers generating their own electricity.” (AEMC)
- In practice, a complex concept in the electricity industry
 - from paying your bills to being paid for service provision

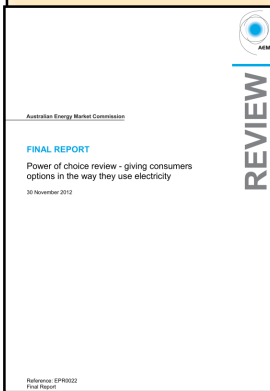


Facilitating greater consumer engagement – demand-side participation *in principle*

Efficient markets are characterised by effective participation of both the supply and demand side. The supply side of the market provides a product or service at a price, and the demand side (ie consumers) responds to the price/value of the product or service being offered.

While there is some evidence of uptake of DSP in the NEM over recent years, the efficiency of the electricity market can be improved by more active participation by the demand side. This will require changes to some aspects of how the supply side of the electricity market operates and interacts with consumers.

The Power of choice review has identified opportunities for consumers to make more informed choices about the way they use electricity. Consumers require tools - information, education, and technology, and flexible pricing options - to make efficient consumption decisions. Recommendations presented in this report will support these conditions and enable consumers to have more control of their electricity expenditure.



Is NEM failing on broader DSP too? Some progress... and less successful efforts to date

In light of the absence of any regulatory barriers in the Rules to the uptake of demand side participation, the Commission has not made a rule to implement the proposed demand response mechanism. The Commission acknowledges that demand response can be of benefit where it is an efficient form of market response to price signals. However, the proposed mechanism is costly and adds little benefit to consumers, because the benefits of demand side participation can, and already are, accessible under current arrangements. While the Commission acknowledges that there may currently be commercial reasons that complicate access to demand response for some consumers, implementing a market wide mechanism in the Rules, at considerable cost to all consumers, is not the appropriate vehicle to address these reasons. Nor would it encourage an efficient level of demand response.

Demand response can and already is happening in the NEM. There are no barriers to the continued proliferation of demand response that is currently underway.



Australian
Energy
Market
Commission

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New rules for cost-reflective network prices

27 November 2014

The National Electricity Rules will be changed from 1 December 2014 to require regulated network companies to structure their prices to better reflect the consumption choices of individual consumers.


Under these changes, network prices will reflect the costs of providing the electricity to consumers with different patterns of consumption.

The new rules follow extensive consultation over the past year, and take into account submissions received when the draft rules were released in August.

AEMC Chairman John Pierce said the prices we pay for electricity would actively respond to the different ways people choose to use it under these new rules.

"These changes put consumers at the centre of future decision-making about energy," he said.

"By having prices that reflect the costs of different patterns of consumption, we are giving consumers clearer choices as we develop a more efficient, incentive-based network regulation framework.



Australian Energy Market Commission

RULE CHANGE

FINAL RULE DETERMINATION
National Electricity Amendment (Demand Response Mechanism and Ancillary Services Unbundling) Rule 2016

Rule Proposals(s)
COAG Energy Council
24 November 2016

What might real pricing look like?

- NEM wholesale market has prices for energy, services
 - Locational and temporally varying and uncertain spot and future prices for energy, ancillary and network services
 - Although limited locational pricing, opaque derivatives, market power and inefficient by design because don't include env. externalities*
- Predetermined retail electricity tariffs for energy
 - Not a price in 'economic efficiency' sense of term, and not selling what the energy user wants; energy services
 - major reform of interface b/n supply + demand sides of electricity sector and NSPs required before genuine 'price discovery' can occur*
- Possible 'pricing' paths forward for end-user engagement
 - Bring end-users to wholesale market, network services
 - aggregate users to participate in wholesale, ancillary, derivative mkts*
 - Bring wholesale market, ancillary and network services to energy users
 - real-time pricing (with futures hedging), value-reflective network tariffs*

What might a real mkt look like? *A focus on*

- Consumer energy services rather than ‘commodity’ kWh/MWh prices
- Consumers’ long-term interests, including need for energy transition
- Facilitation for energy users to participate in a wide range of services
 - “A key assumption behind this review is that consumers will always make the best decision from their viewpoint, based on the prices they face, the technology and equipment they have access to, the information they have ...” (AEMC, 2011)
 - NEM a highly complex ‘designer’ market with network infrastructure, regulated monopolies, major asymmetries between supply + demand. *“expecting energy consumers to optimise their level of DSP without any support from third-parties and specific DSP schemes is **preposterous**... The EEC recommends that the AEMC focus on DSP schemes, barriers to third-parties driving DSP”* (EEC, 2011)

Supporting new players with innovative business, community and other models for efficiently delivering end-user energy services, coordinated end-user participation in wider market services

From where will these Energy Service Providers come?



Open Source Tools

CEEM's researchers believe in the value of open source modelling in the Energy and Environmental research space. In this regard, we have developed a series of open source tools which are listed below. For a list of some of our under development tools you can refer CEEM's [Github page](#).

NEMOSIS - NEM Open Source Information Service:

Open-source access to Australian National Electricity Market data.

Links: [Github](#)

NEMO - National Electricity Market Optimiser Tool:

NEMO, the National Electricity Market Optimiser, is a chronological dispatch model for testing and optimising different portfolios of conventional and renewable electricity generation technologies. It has been developed since 2011 and is maintained by Ben Elliston through his PhD at CEEM. NEMO is available under a free software license (GPL version 3) and requires no proprietary software to run, making it particularly accessible to the governments of developing countries, academic researchers and students. The model is available for others to inspect and to validate results.

Links: [Github](#), [OzLabs](#)

TDA - Tariff Design and Analysis Tool:

We have developed a modelling tool to assist stakeholders wishing to contribute to network tariff design in the Australian National Electricity Market. It is an open source modelling tool to assist stakeholders in assessing the implications of different possible network tariff designs, and hence facilitate broader engagement in the relevant rule making and regulatory processes in the NEM. Our tool takes public energy consumption data from over 5000 households in NSW, and allows users test a wide range of existing, proposed and possible tariffs structures to see their impacts on network revenue and household bills. Demographic survey data of the households allows you to explore the impacts of these tariffs on particular household types – for example, families with young children. The tool can also show how well different tariffs align these household bills with a households' contribution to network peak demand. The tool and data are open source – you can check, validate and add your own data sets; test existing or even design your own tariffs, and validate and even modify the underlying algorithms.

Links: [Project page](#), [Github](#), [Researchgate](#)

Local Solar Sharing Scheme Model:

Intended for modelling embedded networks, local solar and peer to peer electricity networks. This software was developed by Naomi Stringer, Luke Marshall and Rob Passey at CEEM. A working build with a simple user interface for OSX can be found [here](#).

Links: [Github](#)

NemLite - Open Source model of NEM Dispatch Engine:

Intended to replicate the performance of the National Electricity Market Dispatch Engine (NEMDE).

Links: [Github](#)

.. and on

Open data

+

Open tools

+

Open policy,
regulatory &
mkt design
processes



Centre for Energy and
Environmental Markets

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SYDNEY • AUSTRALIA

Thank you... and *questions*

Many of our publications are available at:

www.ceem.unsw.edu.au