Centre for Energy and Environmental Markets

UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY • AUSTRALIA



Lessons from Australian National Electricity Market: How much liberalisation is possible, how much regulation is needed?

Iain MacGill

Associate Professor, School of Electrical Engineering and Telecommunications
Joint Director (Engineering), CEEM

Inaugural CEE Conference

ZHAW - Zurich

13 September 2017

The lessons up front

- How much liberalisation is possible?

  almost certainly more than is wise

- How much regulation is needed?

  seemingly e*ver more*

Has the Australian NEM undergone?

- Restructuring
- Reform
- Privatisation
- Deregulation
- The introduction of competition

- *Liberalisation?*

..or all of the above?

Following are the elements of full-scale market reform:

1. ***Obliging electricity enterprises to operate according to commercial principles.*** These principles require that enterprises pay taxes and market-based interest rates, earn commercially competitive returns on equity capital, and have the autonomy to manage their own budgets, borrowing, procurement, and labor employment.

2. ***Restructuring of the electric power supply chain to enable the introduction of competition.*** This involves breaking up ("unbundling") the incumbent power utility into multiple generators and distributors of power that trade with each other in a competitive wholesale power market.

3. ***Development of economic regulation of the power market that is applied transparently by an agency that operates autonomously.*** In the wholesale market, the focus of regulation is to prevent anticompetitive abuses of market power and to ensure appropriate investment in new supply capacity. In the retail market, the focus of regulation should be on balancing the interests of suppliers with the interests of their captive customers.

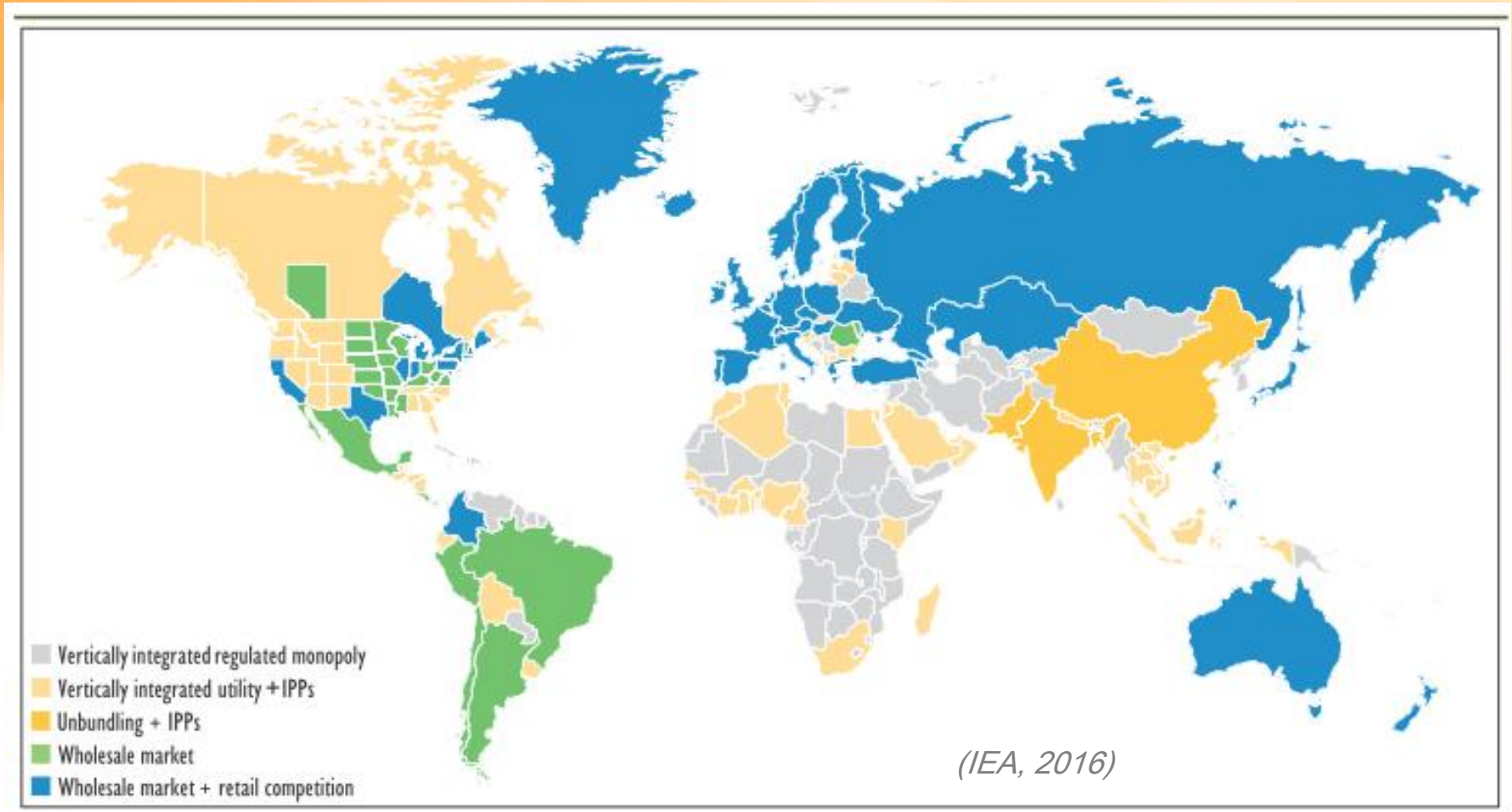
4. ***Privatization of the unbundled electricity generators and distributors under dispersed ownership,*** generally in developing countries to bring in financial resources and technical and managerial expertise that will rectify the prevailing low standard of electricity supply by state-owned power utilities. Privatization is also necessary in those countries that intend to develop competitive power markets, because competition is unlikely to develop properly between entities that are under common ownership—whether state or private.

5. ***Development of competition in the generation and supply segments by development of power exchanges.*** Competition in the network segments (transmission, distribution, and system control) is not feasible because these functions are natural monopolies.

6. ***Focusing government's role on policy formation and execution.*** This role is performed with least conflict of interest when government also ceases to be the major owner, investor and controller of the entities that constitute the power supply chain, particularly in wholesale generation and retail supply of electricity.

(World Bank 2006)

Australia far from alone in restructuring



(IEA, 2016)

.. However, some relevant aspects

- Energy only market design
  - 5/30 minute zonal pricing, no day ahead market, no physical bilateral contracting
  - High regional variable renewable penetrations
  - High regional hydro penetrations
- A range of renewable policy support mechanisms from different level jurisdictions
  - green certificate, feed-in tariffs, tenders
- World leading retail competition
  - .. and the world's highest per-capita residential PV penetration
- *Growing resource adequacy, market power, renewable integration concerns*

The NEM – a single near-national market

Wholesale value of electricity traded

$11.7 billion

40,000 kilometres of transmission lines

National maximum summer operational demand

32,859 MW

National maximum winter operational demand

31,977 MW

Number of metered customers

9.6 million

Installed capacity

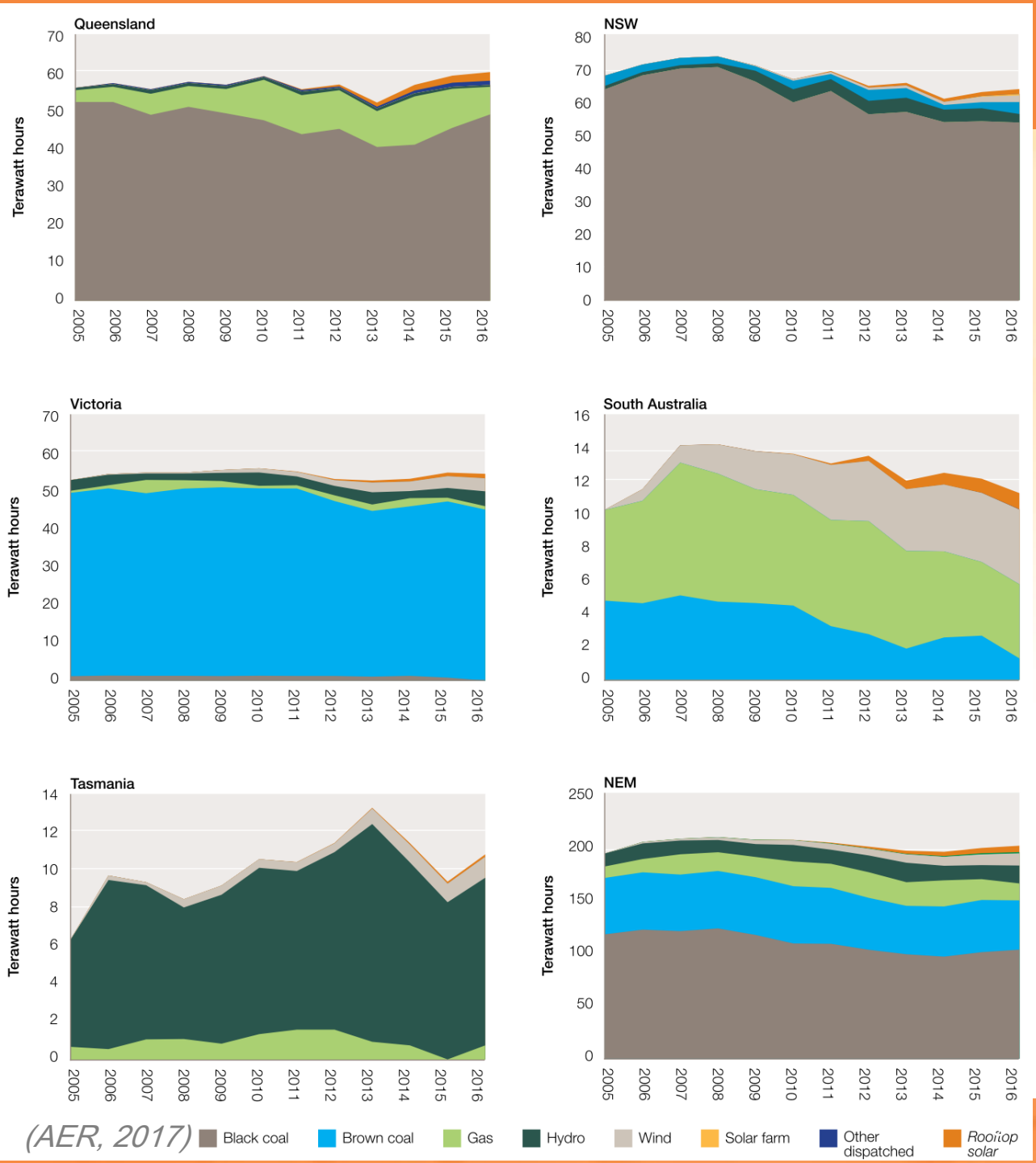
47,148 MW

NEM emissions

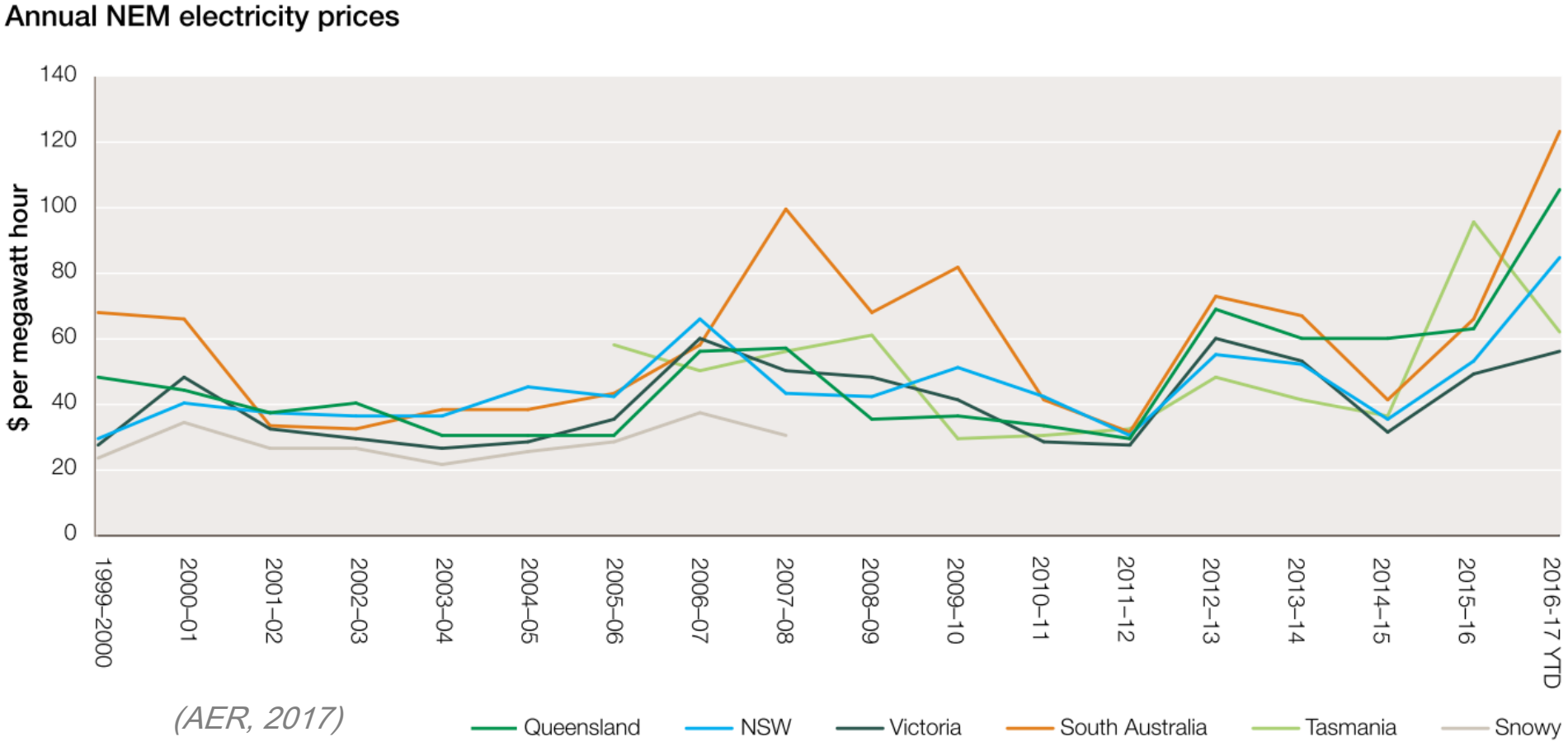
162 Mt CO_2-e

(Finkel Review, 2017)

Significant regional variations

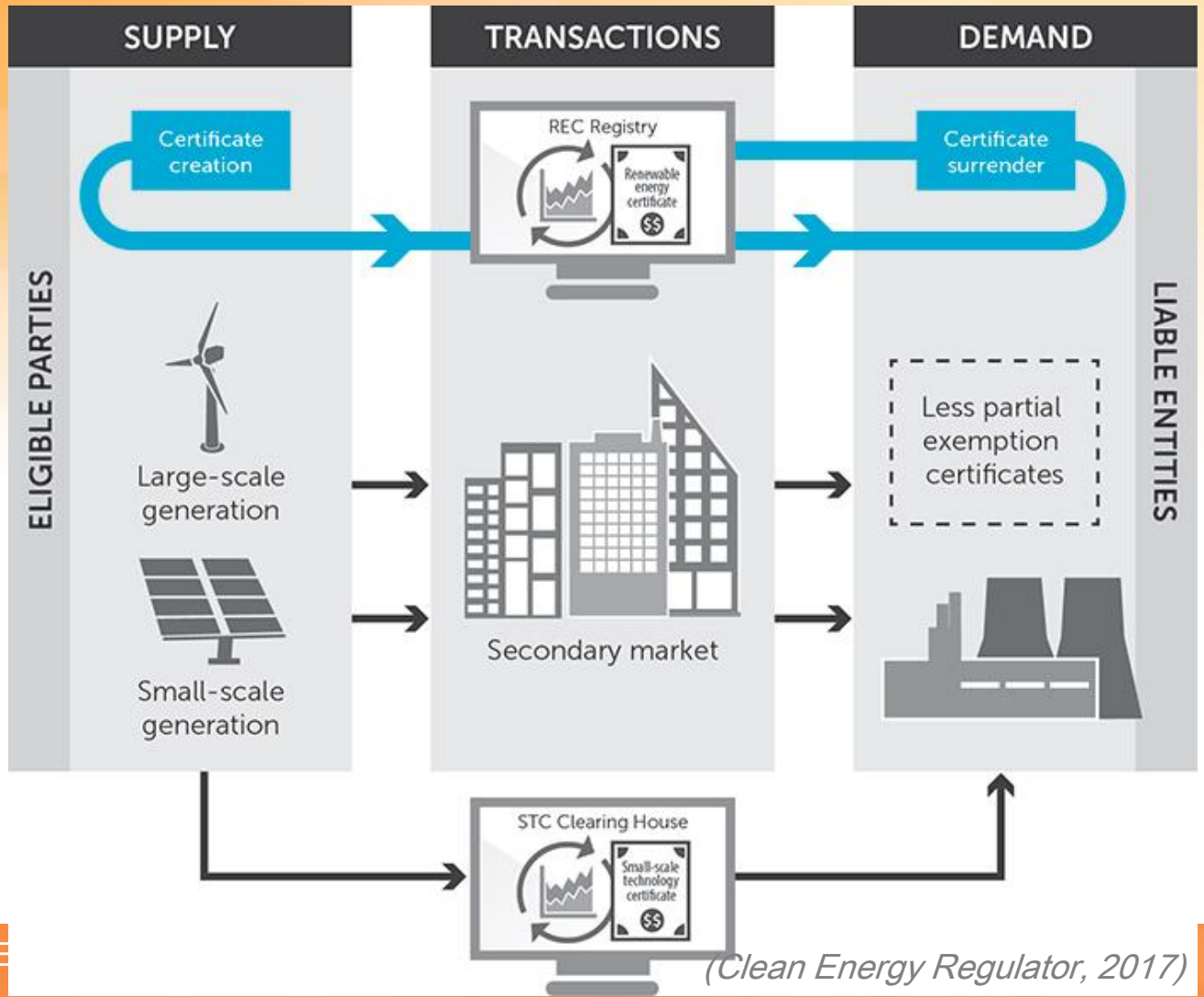


Wholesale prices



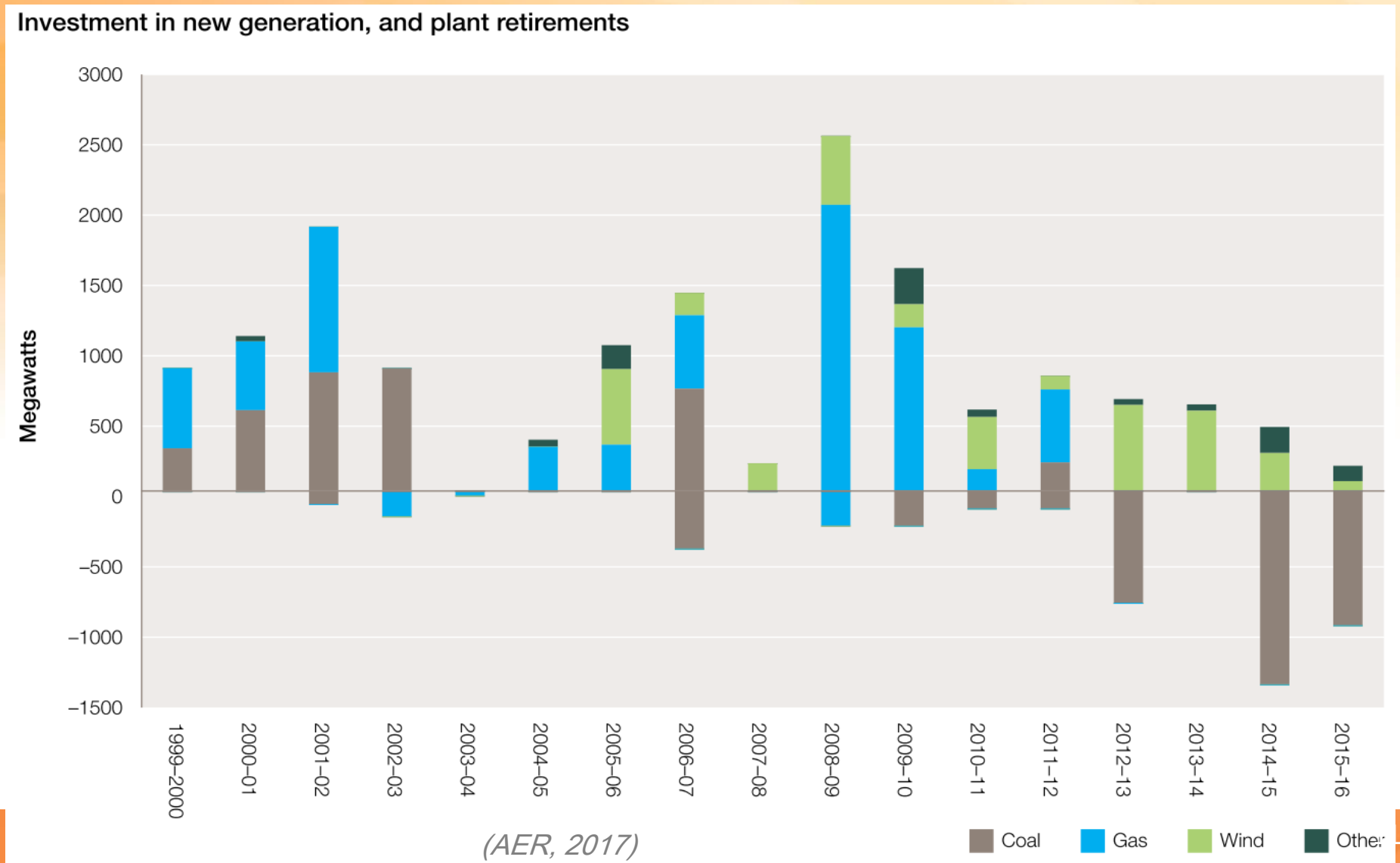
(AER, 2017)

The Australian Renewable Energy Target



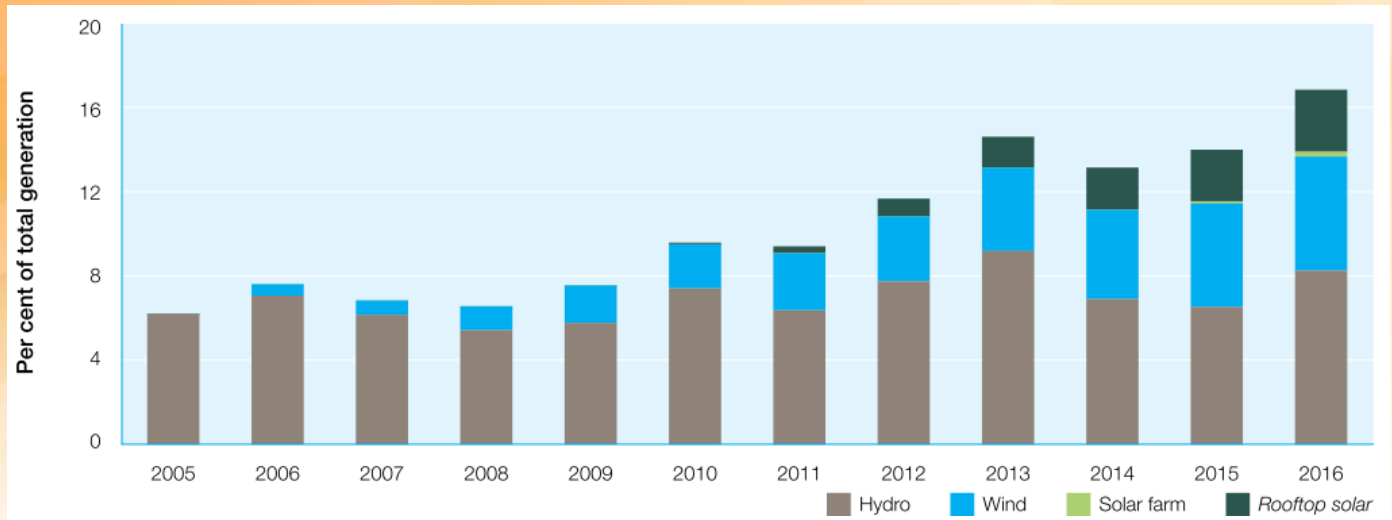
(Clean Energy Regulator, 2017)

Market driven investment, and divestment

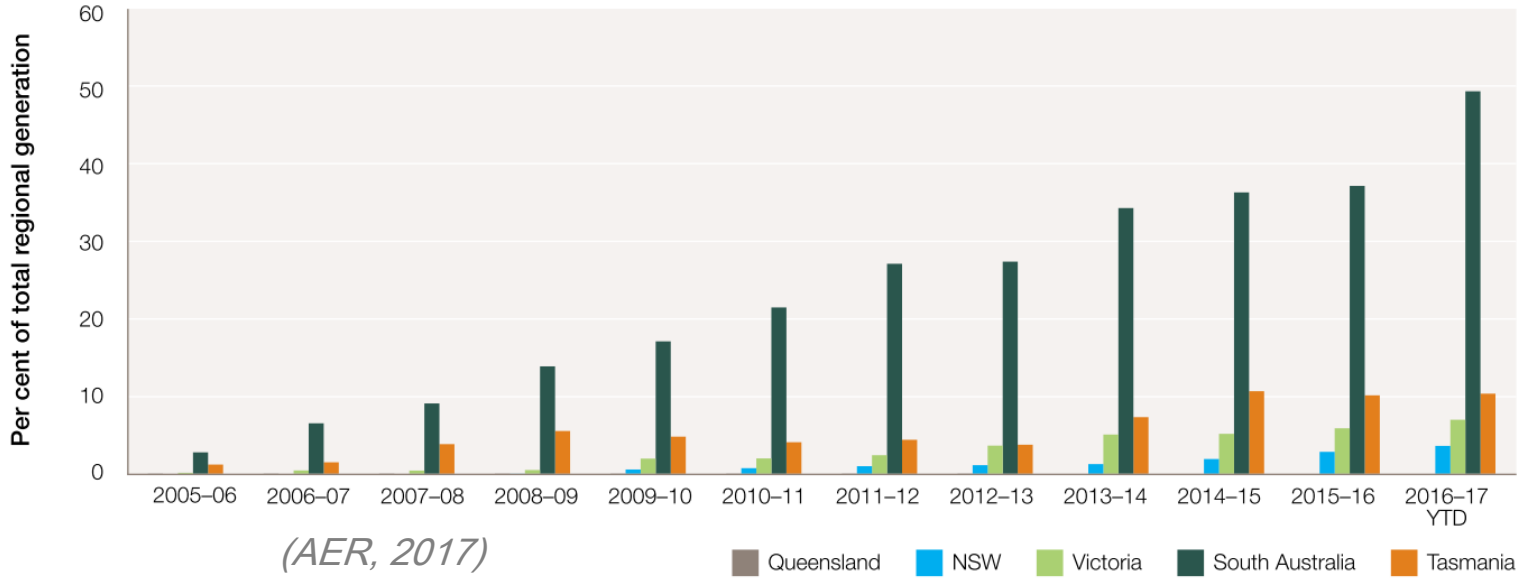


(AER, 2017)

Renewables generation, penetrations



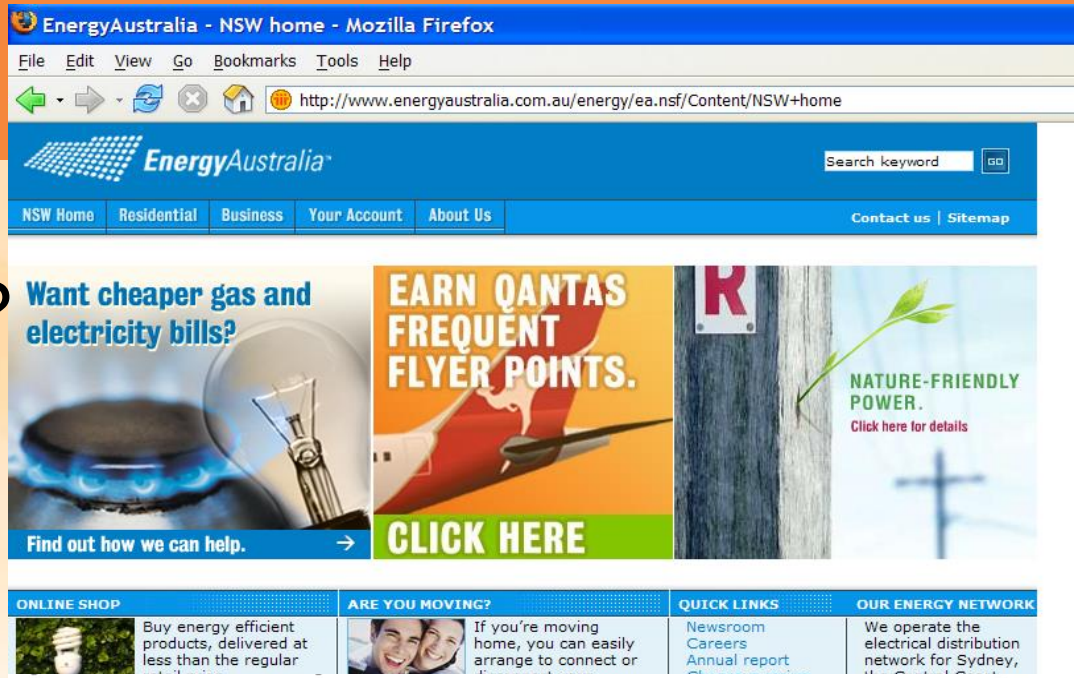
Wind generation share of total generation, by region

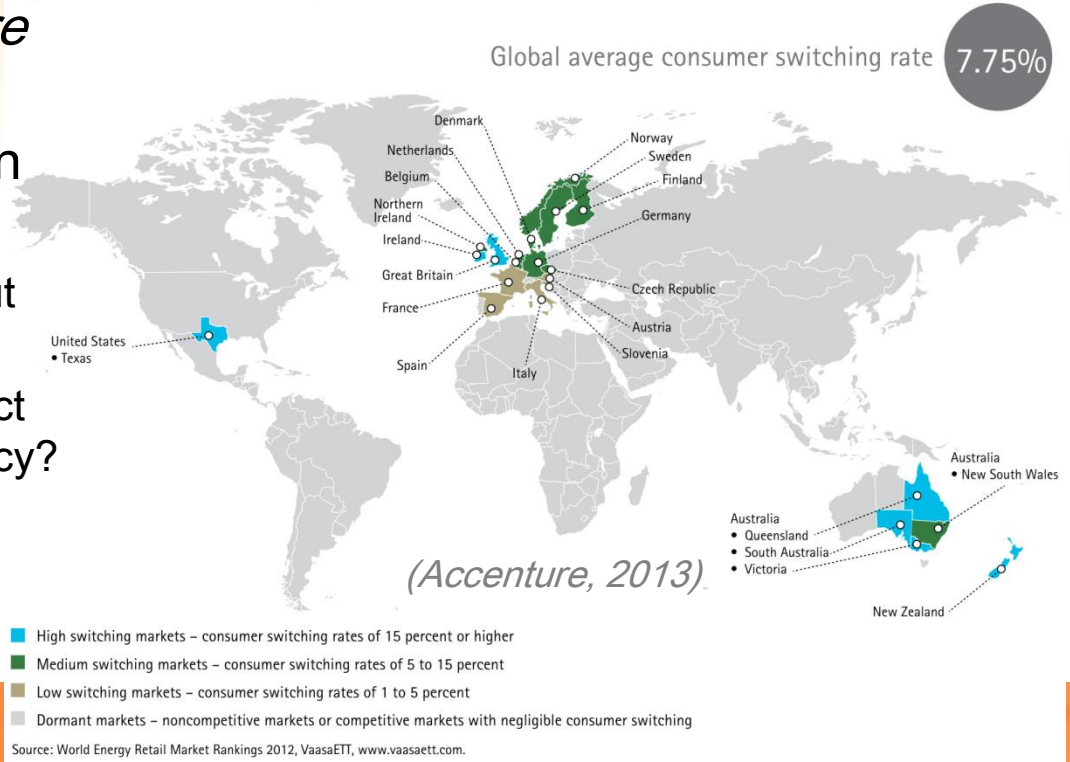


(AER, 2017)

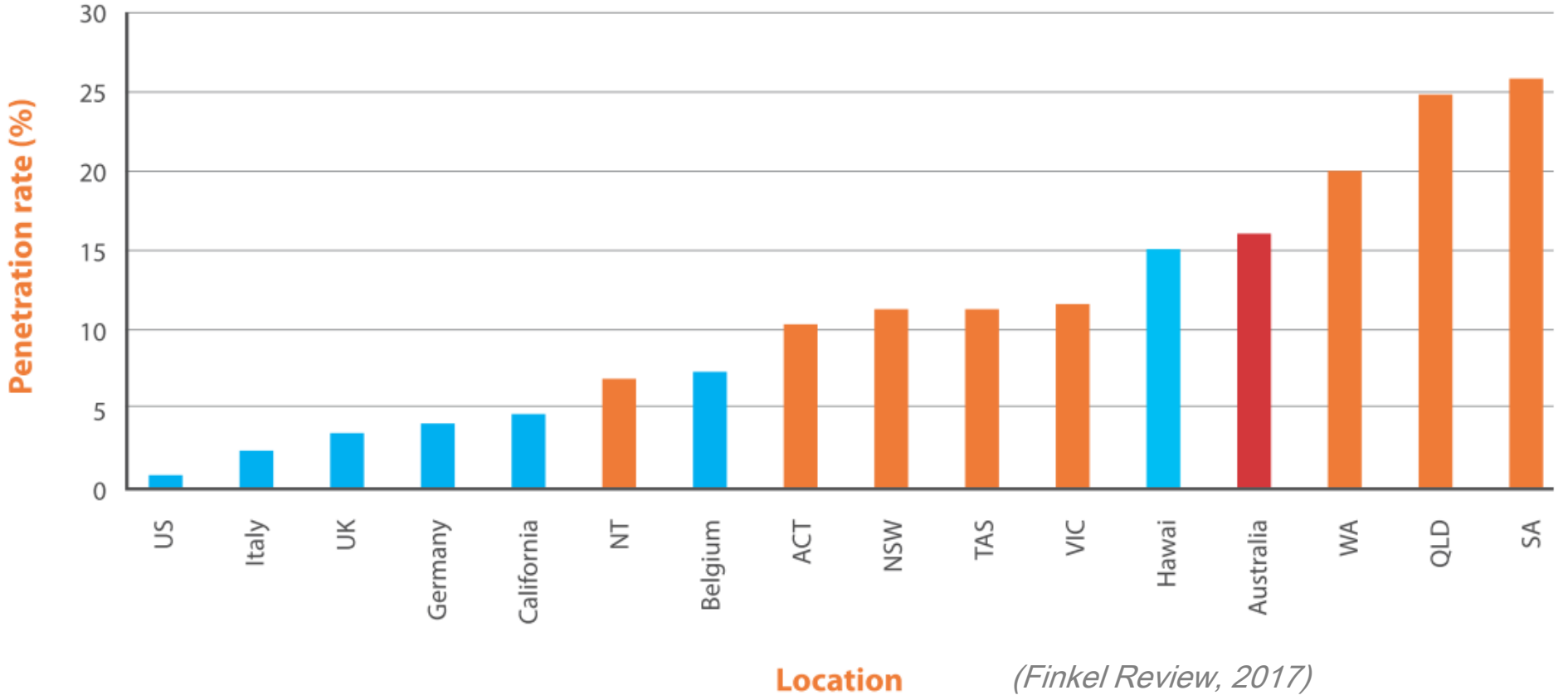
Do we have a 'real' retail electricity market?

- 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)*
- *Although now seeing some more innovative offerings*
- 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?
- *Although welcome new focus on customer engagement and demand side participation*





Household PV



(Finkel Review, 2017)

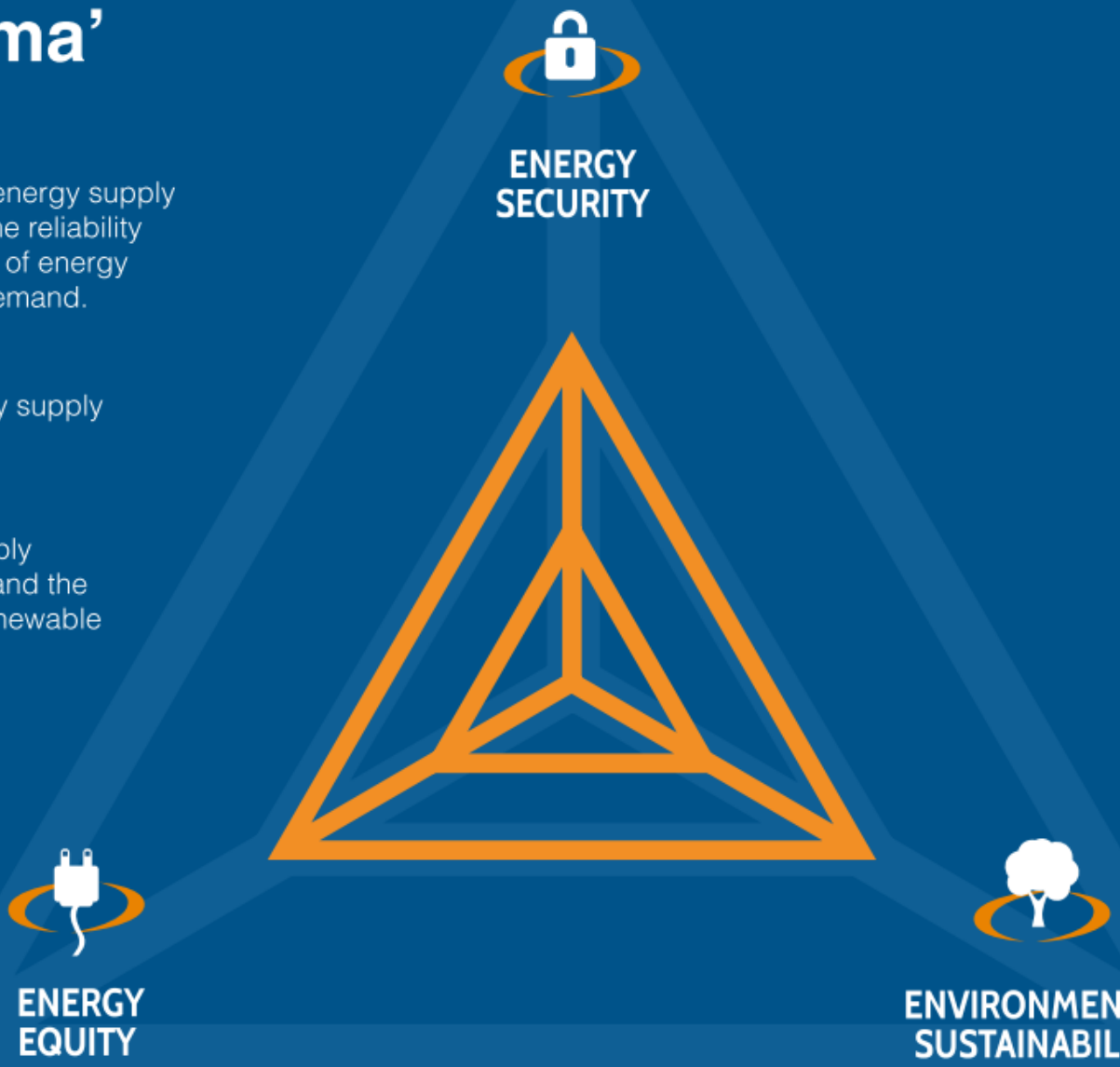
Where next?

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.



Choose any two? …. *You may get none*

"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

Tasmania's basslink failure

The Apple Isle is using a fleet of diesel gennies and cloud seeding to try and make it rain, but will this state run out of power?

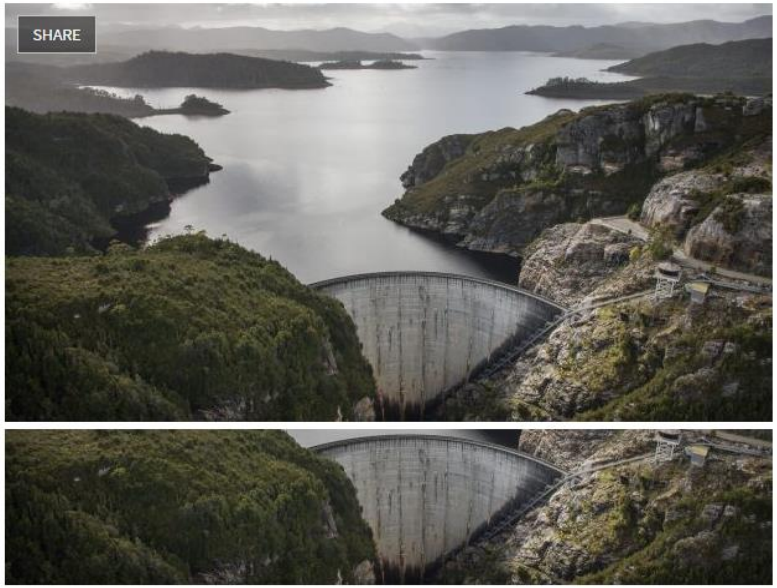
Adam Morton

Show comments

SHARE TWEET MORE

What if an entire state in one of the world's wealthiest countries was to run out of electricity?

It's a question Tasmanians have been pondering – initially with humour, but increasingly with eyebrows arched – since late last year.



A dam bust? Gordon Dam on Lake Gordon in Tasmania's south-west in better times. Photo: Peter Mathew

If there had been any rain, it might have been described as a perfect storm. On December 20, Basslink – the $800 million, 290-kilometre submarine cable connecting Tasmania with Victoria and in recent times provided up to 40 per cent of its electricity – stopped working. Nobody knows why.

The failure came just as the island was more reliant on Basslink than ever. Its power plants are overwhelmingly hydro-electric, and 2015 was its driest spring on record. The water flowing into dams was less than half the amount in any year for at least three decades.

SA blackout – Was it wind?

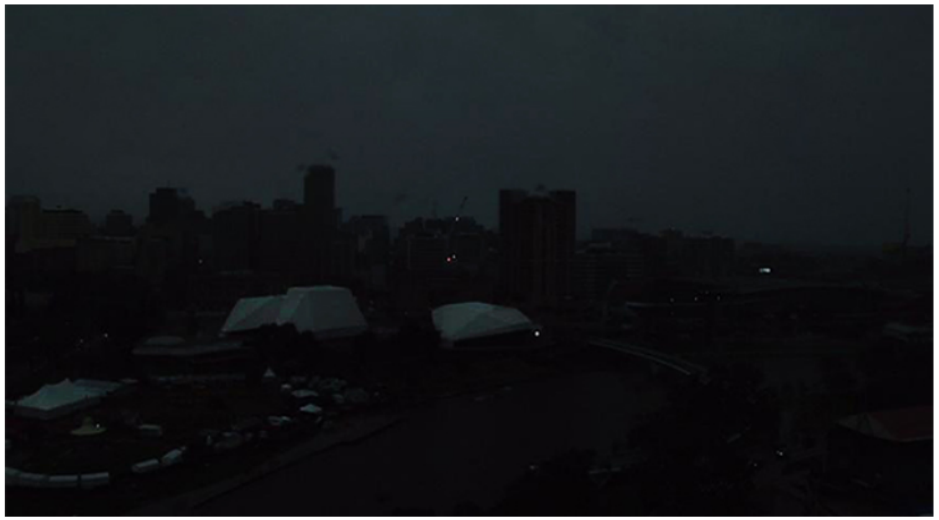
- A complex question
- *Electricity industry run to remain secure, major failures almost always involve multiple factors*

How the South Australia blackout occurred: what the data tells us

29

By Bruce Mountain on 29 September 2016

Print



The Adelaide CBD as seen on 7 News Adelaide's sky cam at about 7pm Wednesday. *Yahoo7*

When catastrophic failures occur, people quickly demand explanations and start to point fingers. It takes time to get to the right explanations and point fingers in the right direction. Forensic reviews, done thoroughly, often point to underlying risks which made catastrophic failures more likely.

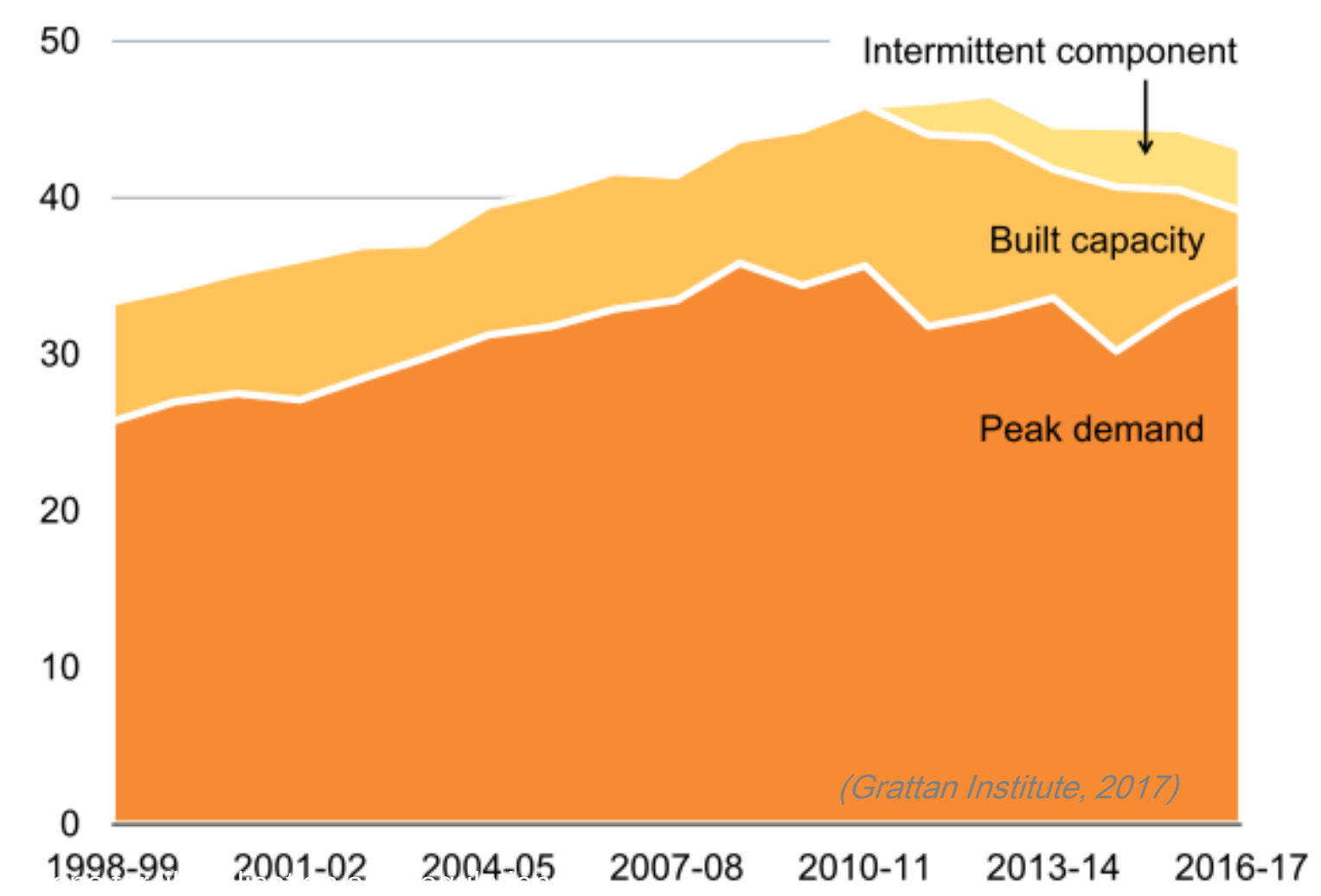
So, what can we say about the extraordinary "system black" in South Australia 20 hours (at the time of writing this) after it occurred, and after about 75% of demand has since been restored.

At the five minute trading interval starting at 16h20 NEM time (so 15h50 in Adelaide), the system was humming along as normal. The spot price was $60 per MWh, peak demand was 1686 MW of which 535MW was being met from imported power from Victoria (430 MW on Heywood and 105 MW on Murraylink).

Torrens Island was the only South Australian fossil plant producing (from two of its four "B" units, but all four of its "B" units were synchronised. The remainder of the supply was coming from wind farms of which 659 MW in the Northern region and 384 MW in the South East.

If I understand it from the limited information currently available, at around 15h40 Adelaide time, lightning and severe wind knocked out the main transmission lines bringing power from the North, and so dropping about 40% of South Australia's supply.

Resource adequacy tightening



Market operator concerns

AEMO's advice:

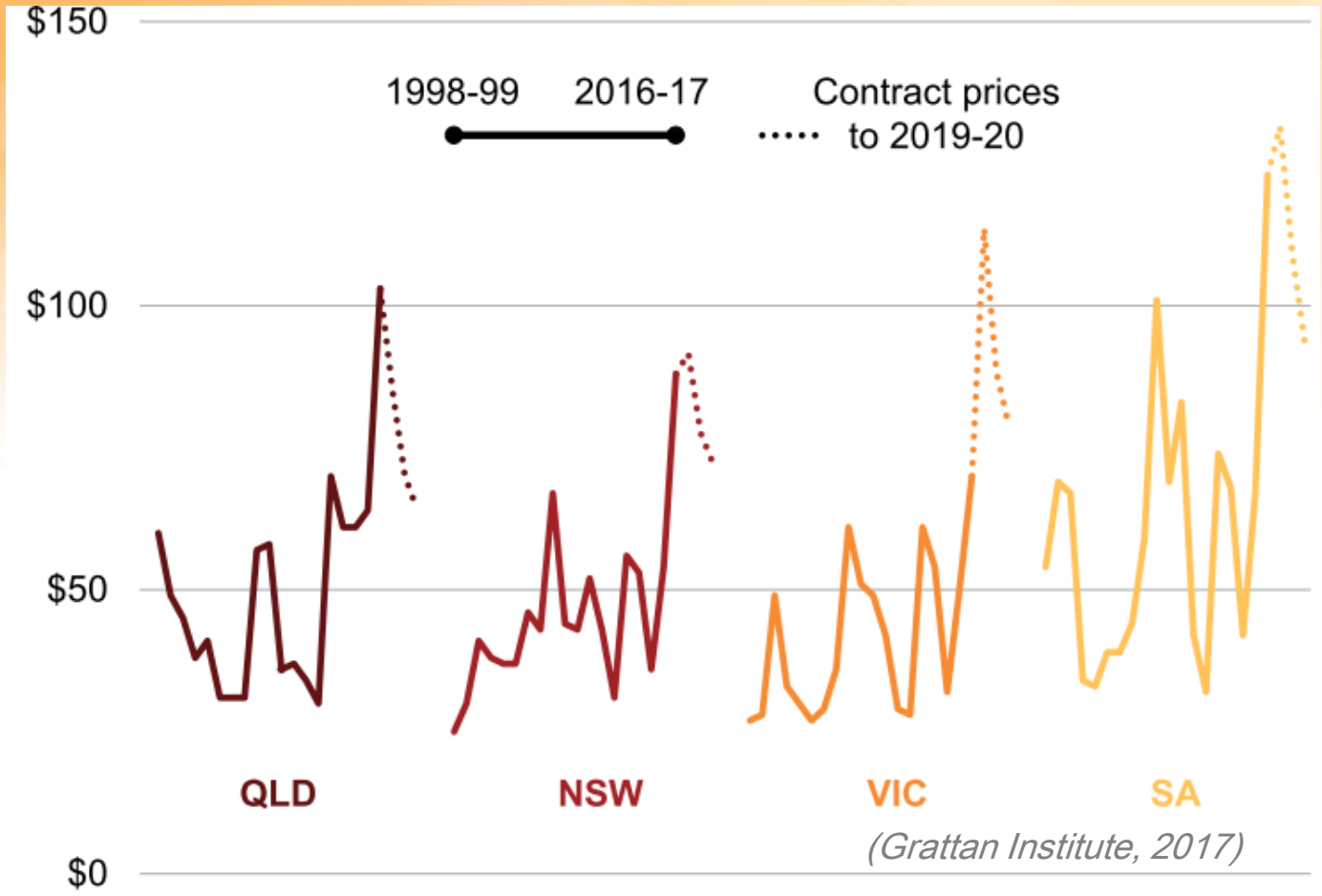
(AEMO, 2017)

The NEM is not delivering enough investment in flexible dispatchable resources to maintain the defined target level of supply reliability, as the transition from traditional generation to variable energy resources proceeds. This was vividly illustrated by the load-shedding events of February 2017 and by the Finkel Review analysis. Most stakeholders see changes to market rules as the most economically efficient way to remedy this deficiency. AEMO forecasts of NEM demand and published investment plans confirm the urgency of this task and short-term measures will be necessary until a long-term solution is agreed and becomes fully effective.

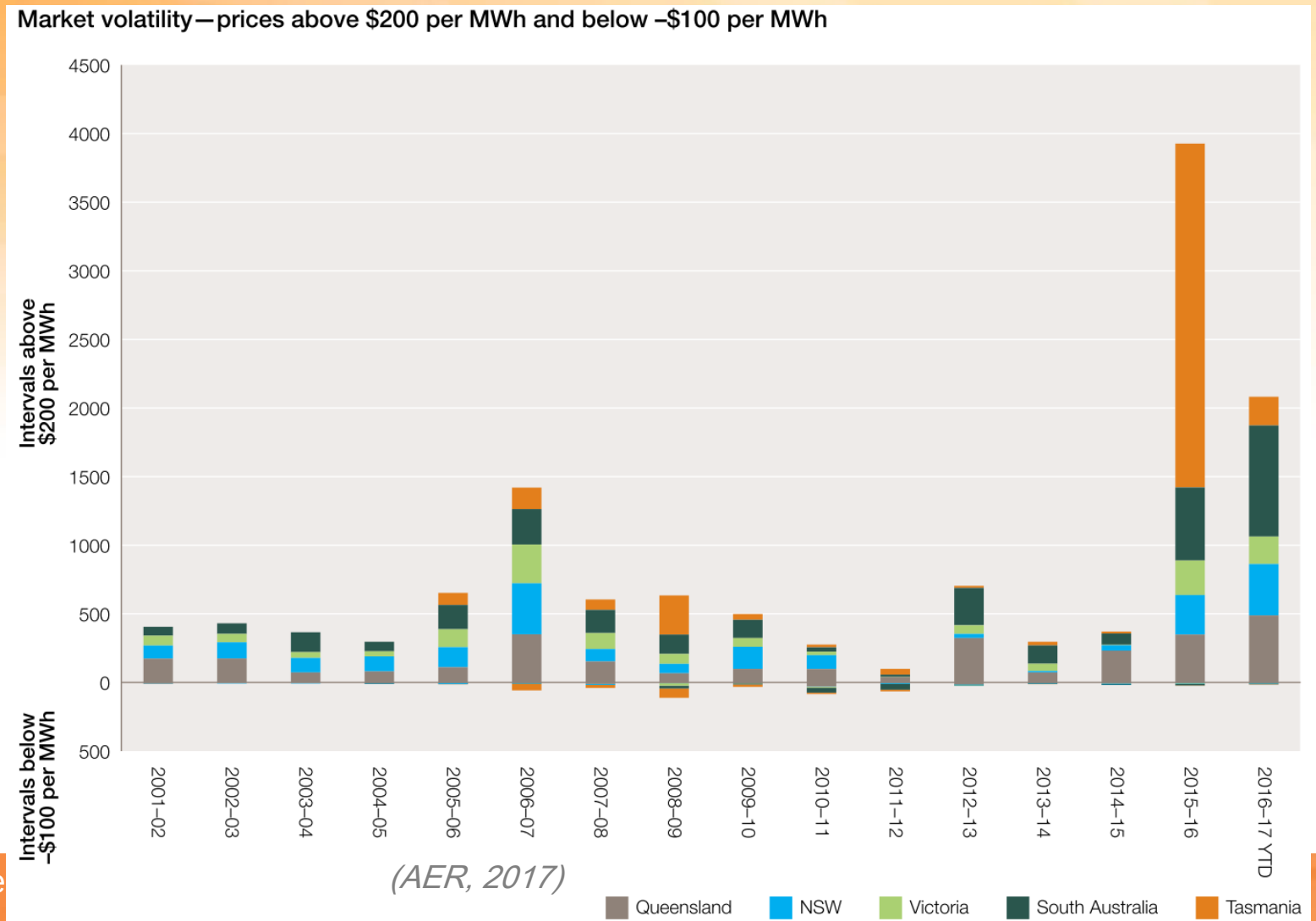
AEMO's recommendations:

- **Prior to summer 2017-18:** A strategic reserve of around 1,000 megawatts (MW) of flexible dispatchable energy resources is required to maintain supply reliability in South Australia and Victoria over next summer. AEMO is already acting to deliver this under our summer readiness plan.
- **Up to 2021-22:** Progressively decreasing levels of strategic reserve will be required over the next four summers, provided there is no unforeseen major loss of existing resources. New mechanisms to deliver these reserves must be identified and in place in time for 2018-19.
- **Liddell Power Station retirement:** Prior to the retirement of Liddell (announced by AGL to occur in 2022), around 1,000 MW of new investment is expected to be required to preserve reliability of supply in New South Wales (NSW) and Victoria at the NEM standard. Mechanisms should be established in the NEM design to address this, and similar requirements, for the long term.

Market prices

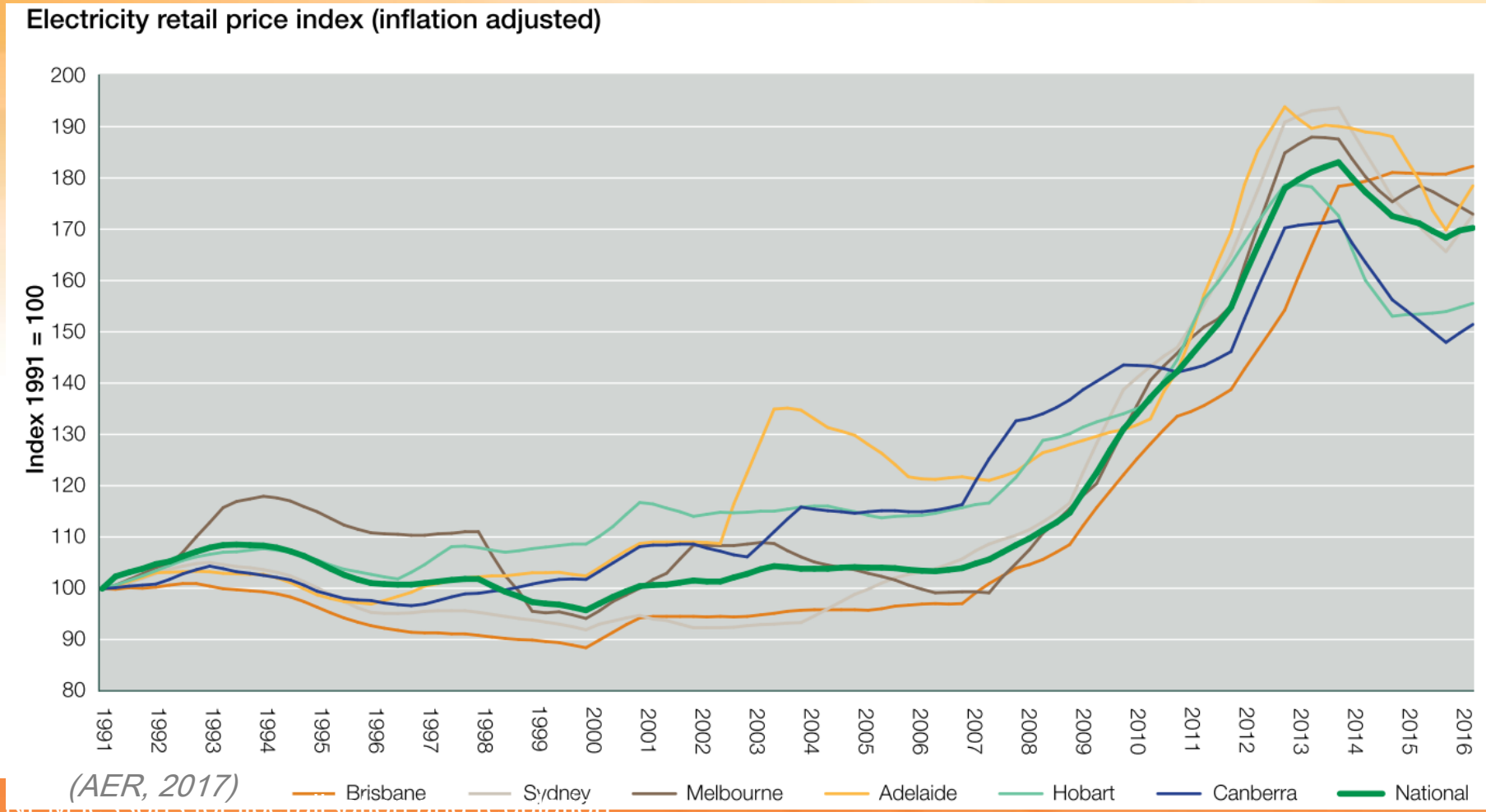


… and volatility



(AER, 2017)

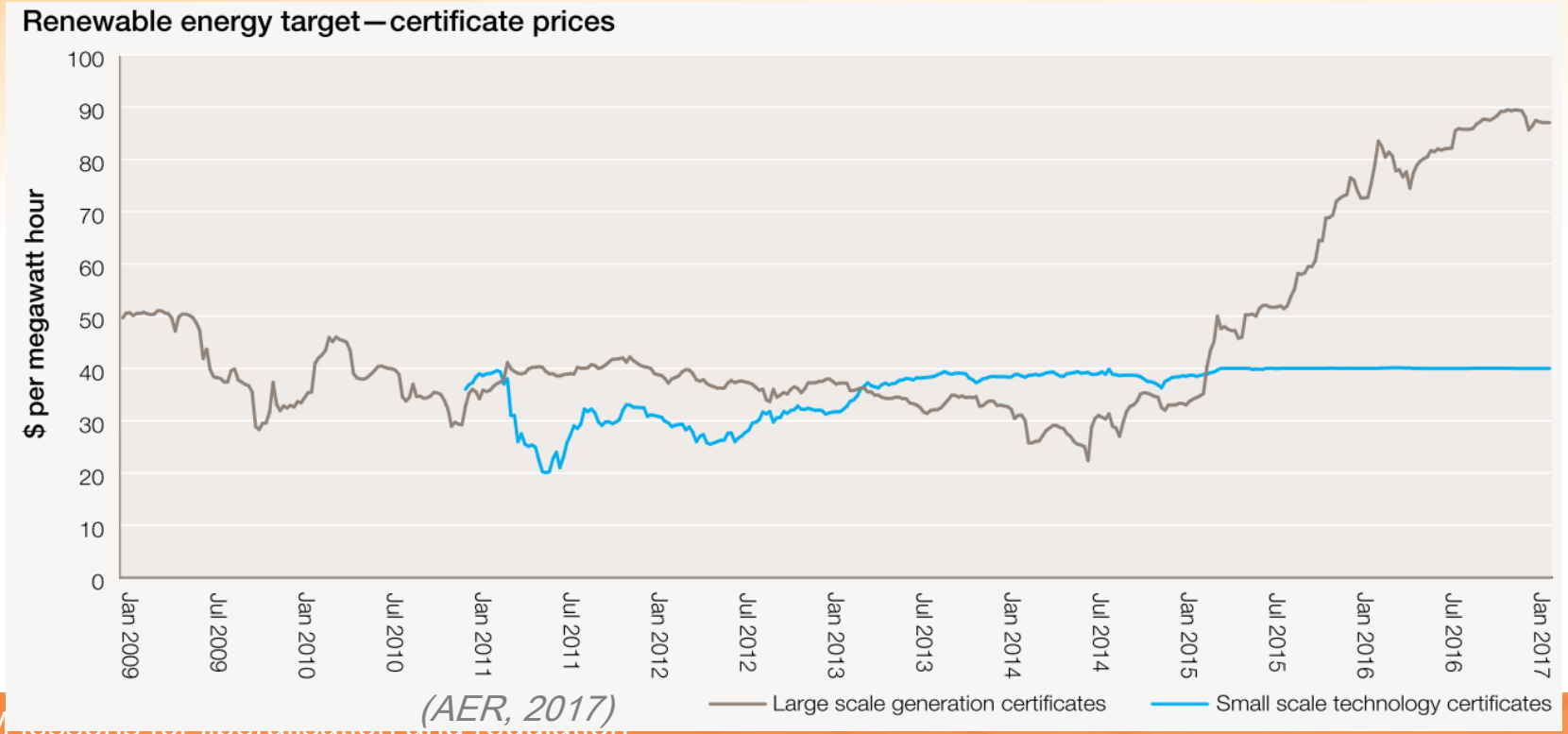
Retail pricing – does this look like success?



(AER, 2017)

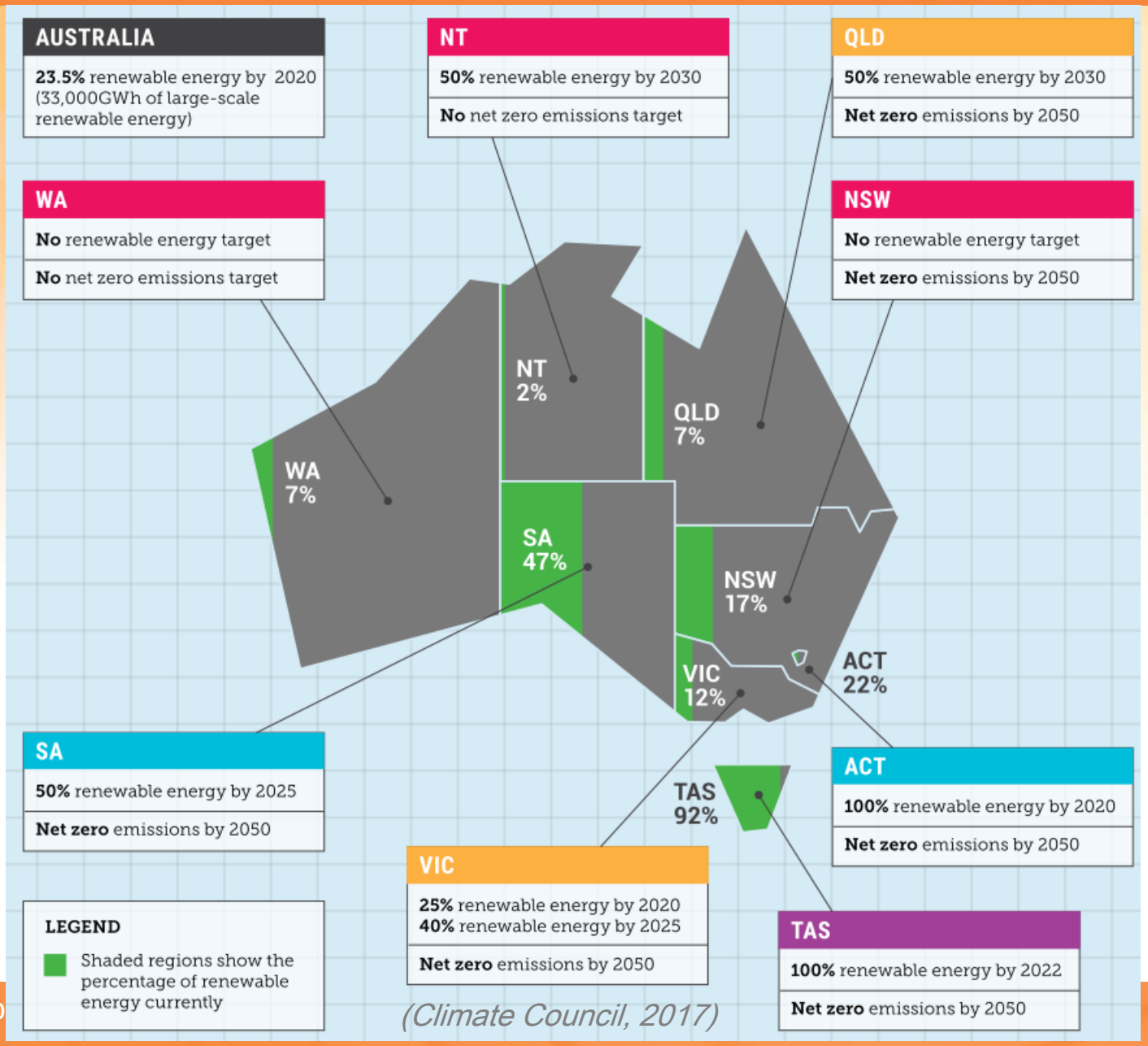
RET – inadequate target, high costs

- Estimated 23% renewables penetration by 2020, then falling to 2030



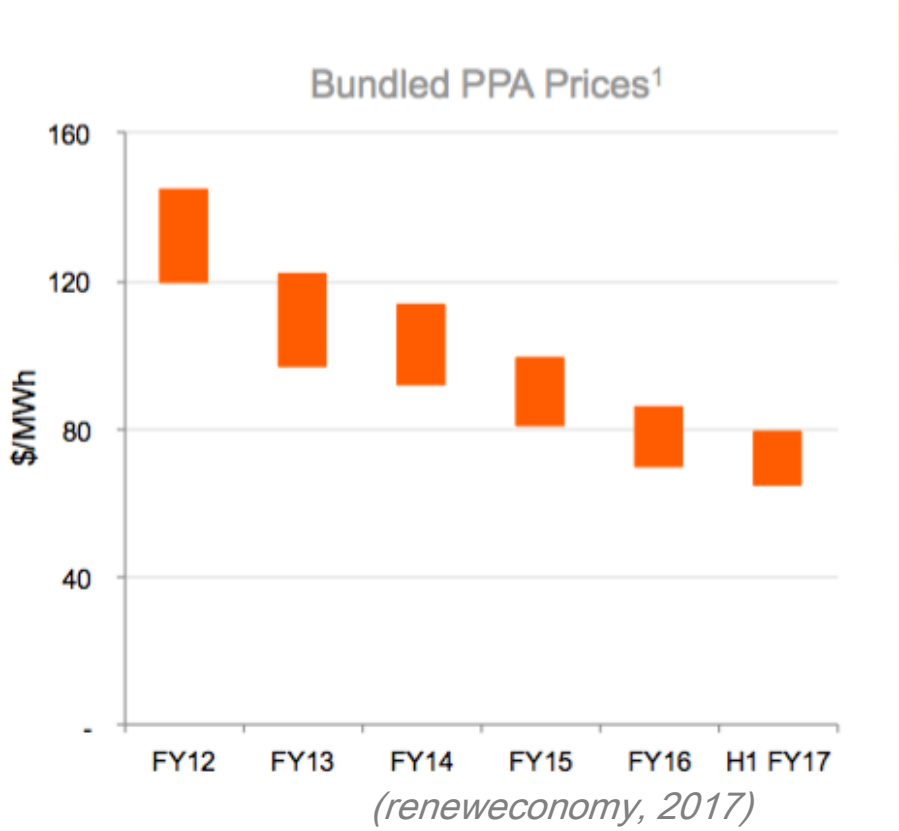
(AER, 2017)

State targets



(Climate Council, 2017)

… and associated tenders

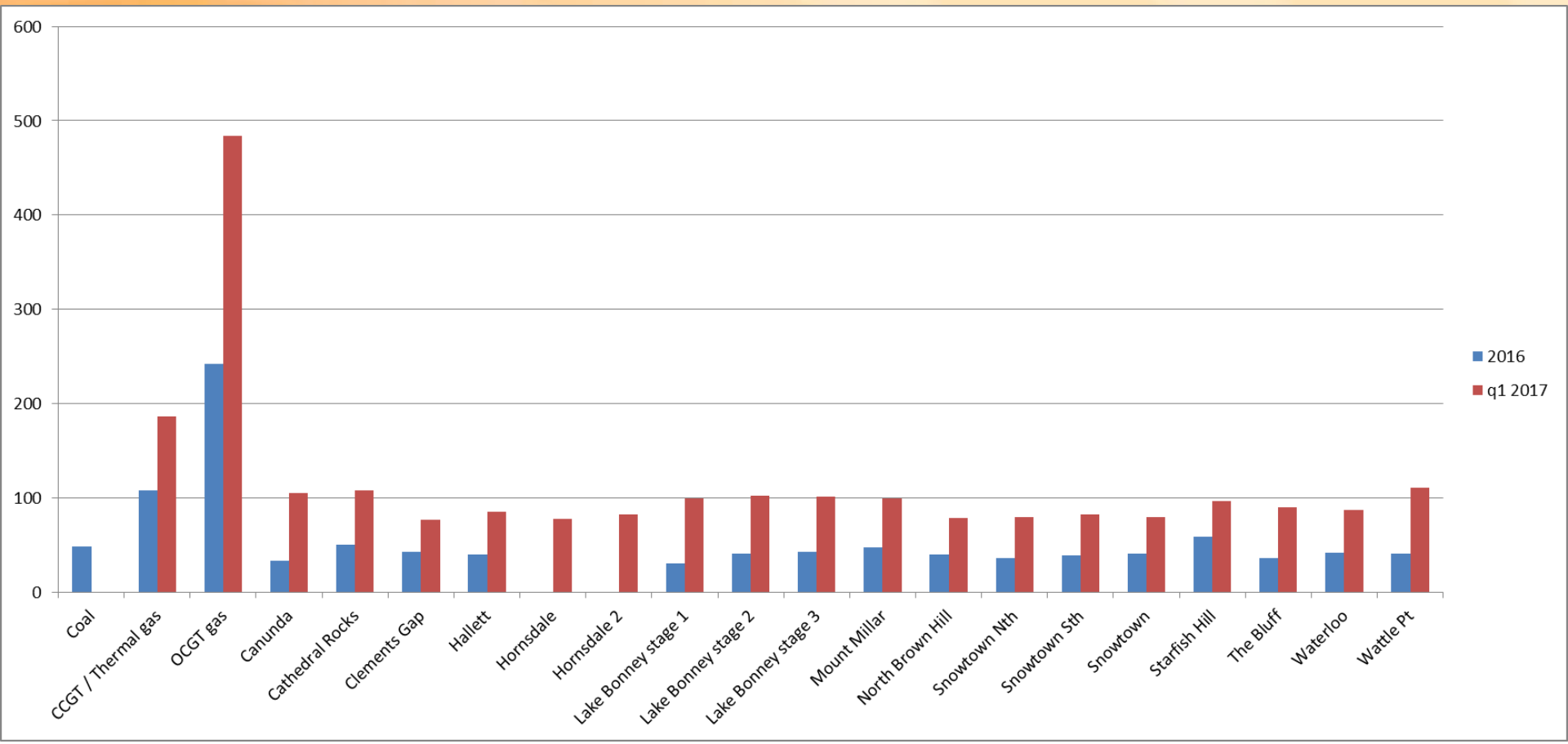


(reneweconomy, 2017)

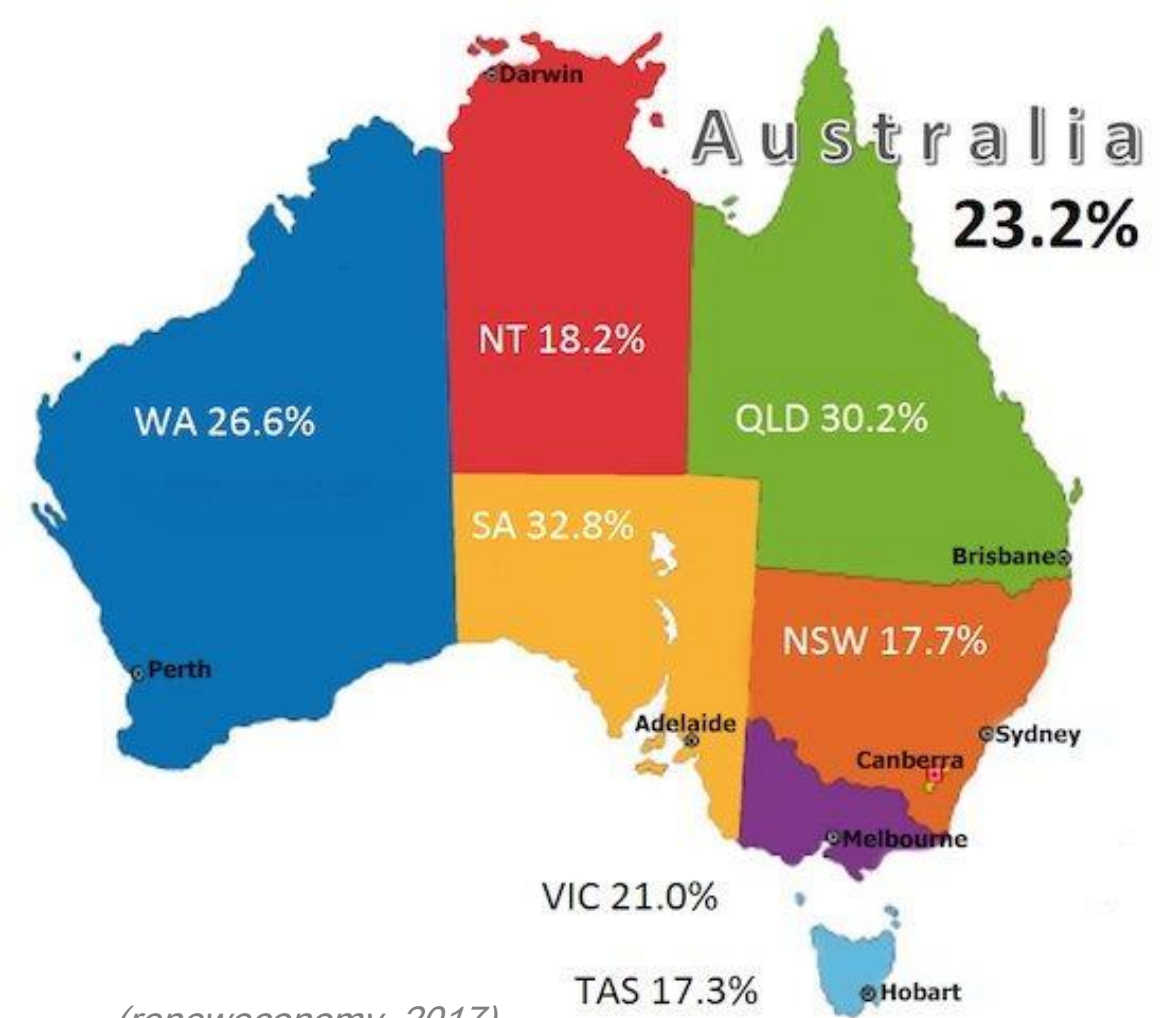
Project name	Size (MW)	Fixed feed-in tariff price for renewable electricity over 20 years
20MW Solar Auction 2012		
Royalla Solar Farm (Figure 8)	20	$186/MWh
20MW Solar Auction 2013		
Mugga Lane Solar Farm	13	$178/MWh
Williamsdale Solar Farm	10	$186/MWh
200MW Wind Auction 2014		
Coonooer Bridge Wind Farm	19.4	$82/MWh
Hornsdale Wind Farm (Stage 1)	100	$92/MWh
Ararat Wind Farm	80.5	$87/MWh
200MW Wind Auction 2015		
Hornsdale Wind Farm (Stage 2)	100	$77/MWh
Sapphire Wind Farm	100	$89/MWh
Next generation solar and wind (plus storage) 2016		
Hornsdale Wind Farm (Stage 3)	109	$73/MWh
Crookwell 2 Wind Farm	91	$87/MWh

(Climate Council, 2017)

RET or tenders - focus on cost or value?



Australian households



(reneweconomy, 2017)

Where next?

"The best way to predict your future is to create it!"

Abraham Lincoln

"It depends…"

Centre for Energy and Environmental Markets

UNSW
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • AUSTRALIA

Thank you… and *questions*

Many of our publications are available at:
www.ceem.unsw.edu.au