National Electricity Market 101

December 2016

SOUTH AUSTRALIA

Government of South Australia

Department of State Development

Background

- In 1991, the Commonwealth, States and Territories agreed to establish a National Electricity Market (NEM) to encourage the efficient development of the electricity industry. At the time, the electricity industry was characterised by excess generation capacity, inappropriate plant mix and inflexibility of fuel use.

- The reforms associated with establishing the NEM required that the previously vertically integrated businesses be disaggregated into the respective components, transmission, distribution, generation and retail. The NEM provides for competition amongst retailers and generators and allows interstate generators to trade across borders.

- The NEM commenced operation in December 1998 and includes Victoria, New South Wales, Queensland, the ACT South Australia and Tasmania joined once the Basslink interconnector was built.

Key Features of NEM

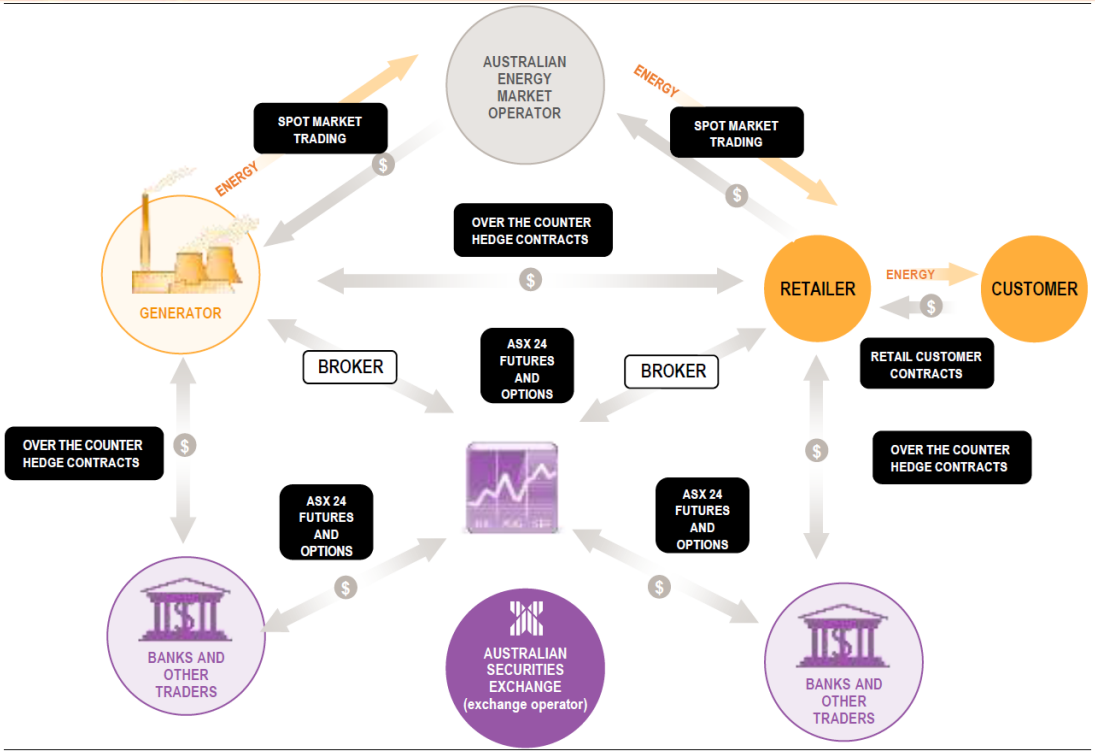
- Unlike other industries, electricity cannot be stored economically. Therefore supply must meet demand at every point in time.

- NEM is an "energy only gross pool" where generators only receive revenue when dispatched, as compared with markets with capacity payments for being available. Commitment decisions are a commercial decision for generators, with generators able to submit price offers to the Australian Energy Market Operator (AEMO) for parts of their capacity.

- While maintaining a secure system, AEMO dispatches generators to meet demand on the basis of supply curve created from generator bids, from lowest to highest bid, incorporating the losses associated with transporting the energy. All generators receive the price of the marginal generator dispatched.

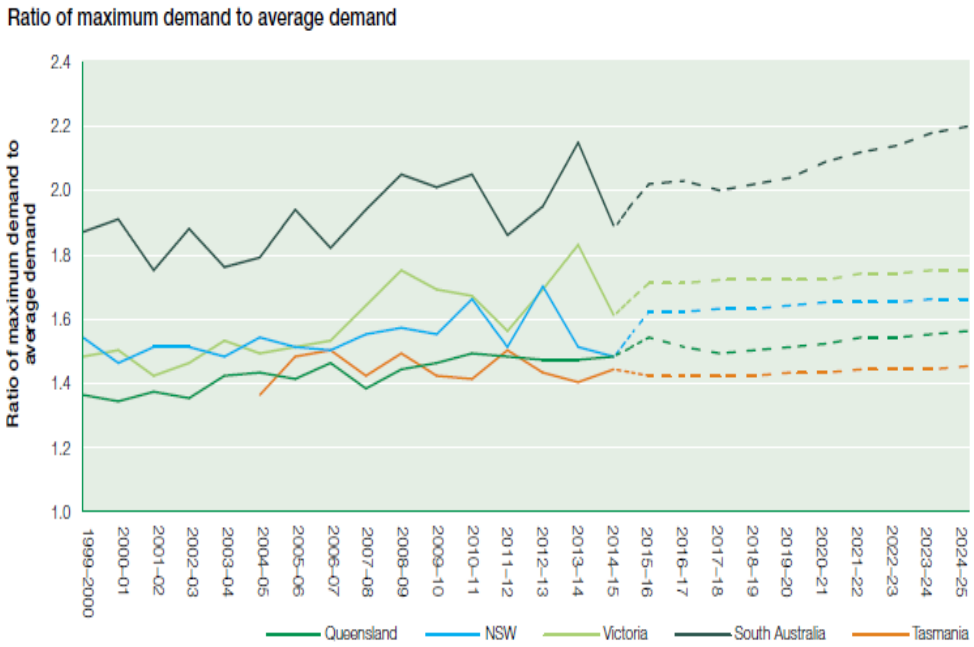
- Peaking generators need to recover greater than marginal cost to provide a return on capital.

Physical and financial markets exist

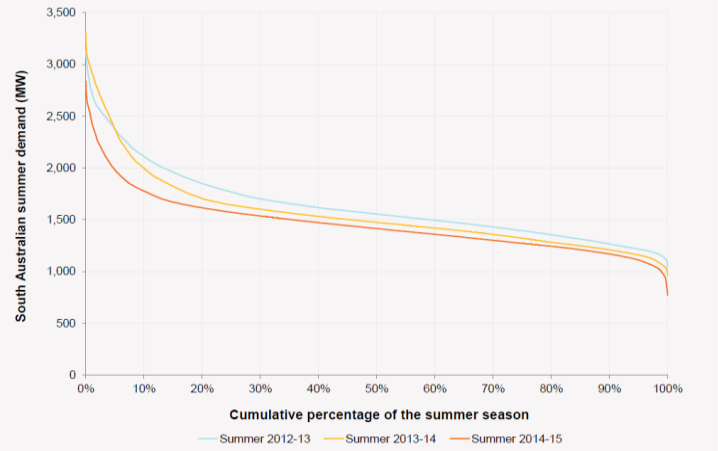


Playford B (240 MW)
Northern (546 MW)
Hallett 4 - North Brown Hill (132.3 MW)
Hallett 1 - Brown Hill (94.5 MW)
Hallett 5 - The Bluff (52.5 MW)
Clements Gap (56.7 MW)
Hallett
Hallett 2 - Hallett Hill (71.4 MW)
(228.3 MW)
Mt Millar (70 MW)
Snowtown (98.7 MW)
Snowtown S2 North (144 MW)
Snowtown S2 South (126 MW)
Waterloo (111 MW)
Mintaro (90 MW)
Angaston (50 MW)
Pelican Point (478 MW)
Port Lincoln (73.5 MW)
Quarantine (224 MW)
Torrens Island (1280 MW)
Cathedral Rocks (66 MW)
Dry Creek (156 MW)
Osborne (180 MW)
Port Stanvac 1 (28.8 MW)
Wattle Point (90.75 MW)
Port Stanvac 2 (28.8 MW)
Starfish Hill (34.5 MW)
Existing Power Stations
Coal
Diesel
Gas
Wind Farms (Operating)
Ladbroke Grove (80 MW)
Snuggery (63 MW)
Canunda (46 MW)
Lake Bonney 1 (80.5 MW)
Lake Bonney 2 (159 MW)
Lake Bonney 3 (39 MW)

SA's Peaky demand profile



Sources: AEMO; AER.

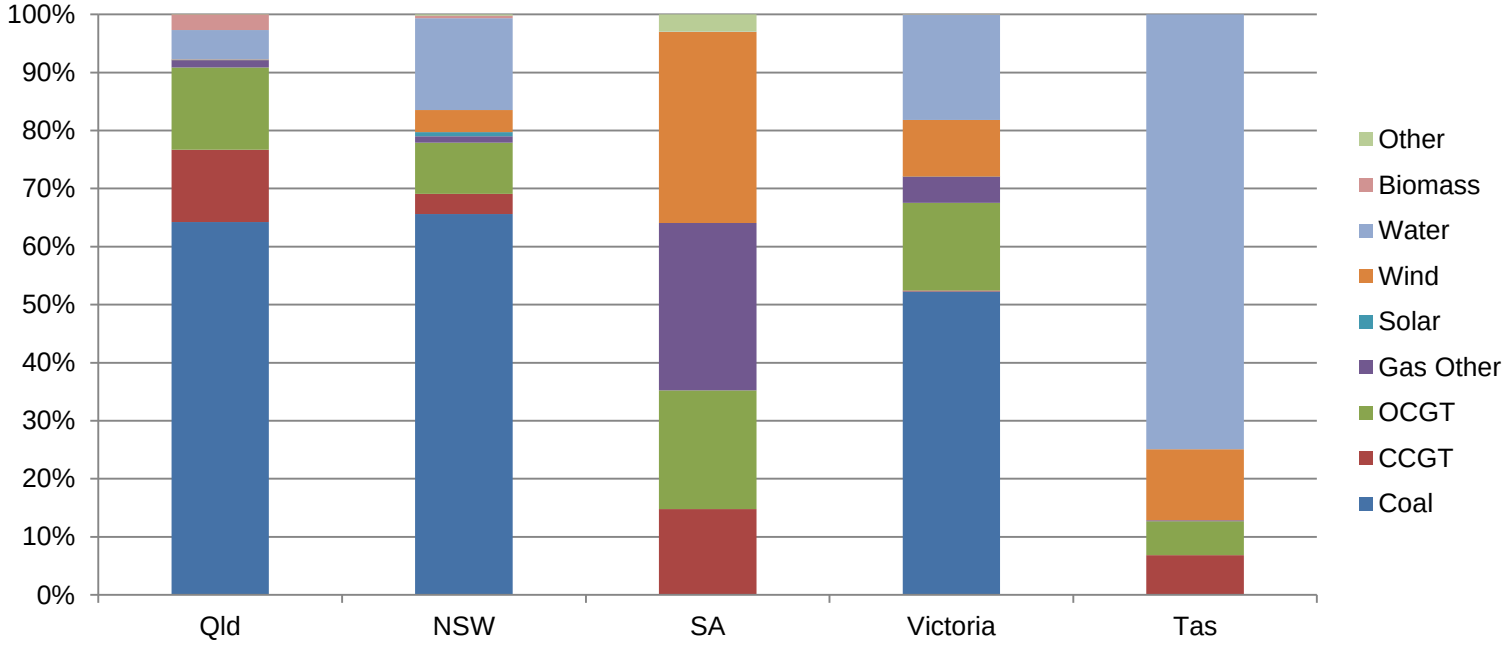


This figure represents the percentage of the time that demand is at or above a given level

In 2014/15 maximum demand was 2872MW and minimum demand 790MW

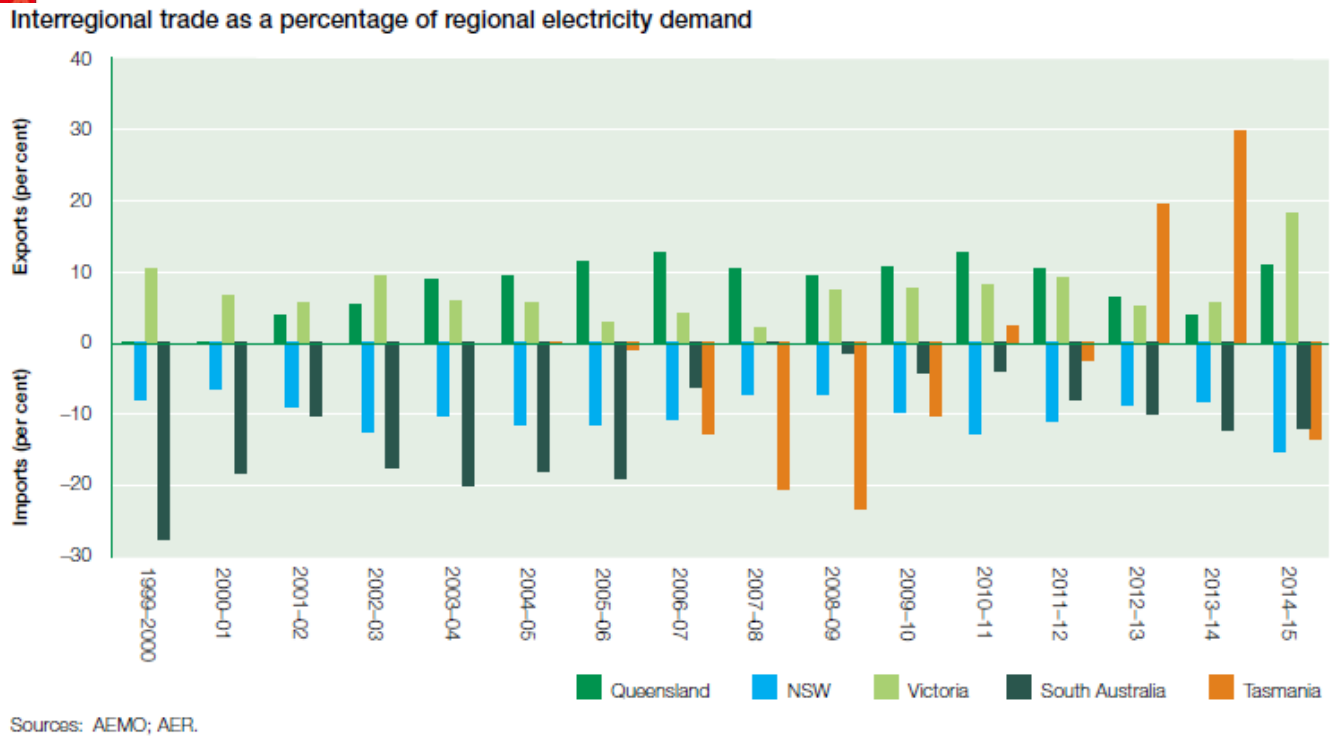
Source: Australian Energy Regulator & Australian Energy Market Operator

Supply - Generation mix



Source: Australian Energy Market Operator

Supply - Inter-regional



Interconnectors:

QNI – AC interconnection between Queensland and New South Wales

Terranora - connecting Queensland and New South Wales via the DC link known as Directlink

VIC / NSW - connecting Victoria and New South Wales

Heywood- AC interconnection between Victoria and South Australia

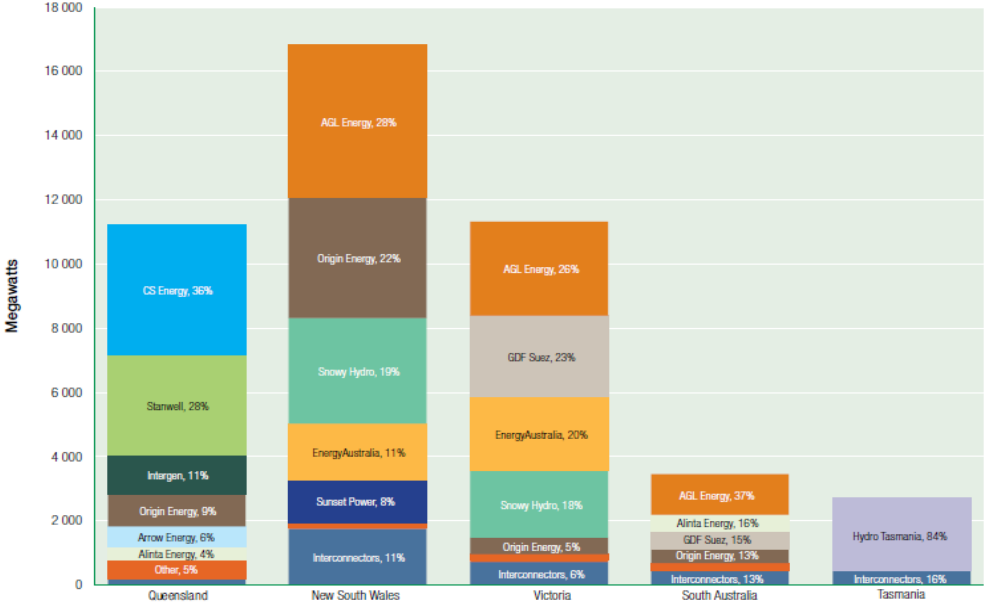
Murraylink – DC interconnection between Victoria and South Australia

Basslink – DC interconnection between Tasmania and Victoria

Source: Australian Energy Regulator & Australian Energy Market Operator

Supply - Generation Market

Market shares in generation capacity, 2015



Notes:

Capacity based on summer availability for January 2015, except wind, which is adjusted for an average contribution factor.

Interconnector capacity is based on observed flows when the price differential between regions exceeds $10 per MWh in favour of the importing region; the data exclude trading intervals in which counter-flows were observed (that is, when electricity was imported from a high priced region into a lower priced region).

Capacity that is subject to power purchase agreements is attributed to the party with control over output.

Sources: AEMO; AER.

Source: Australian Energy Regulator & Australian Energy Market Operator

Networks – comparatively

Figure 8 Customer density (customers / km of route line length, average 2009–2013)

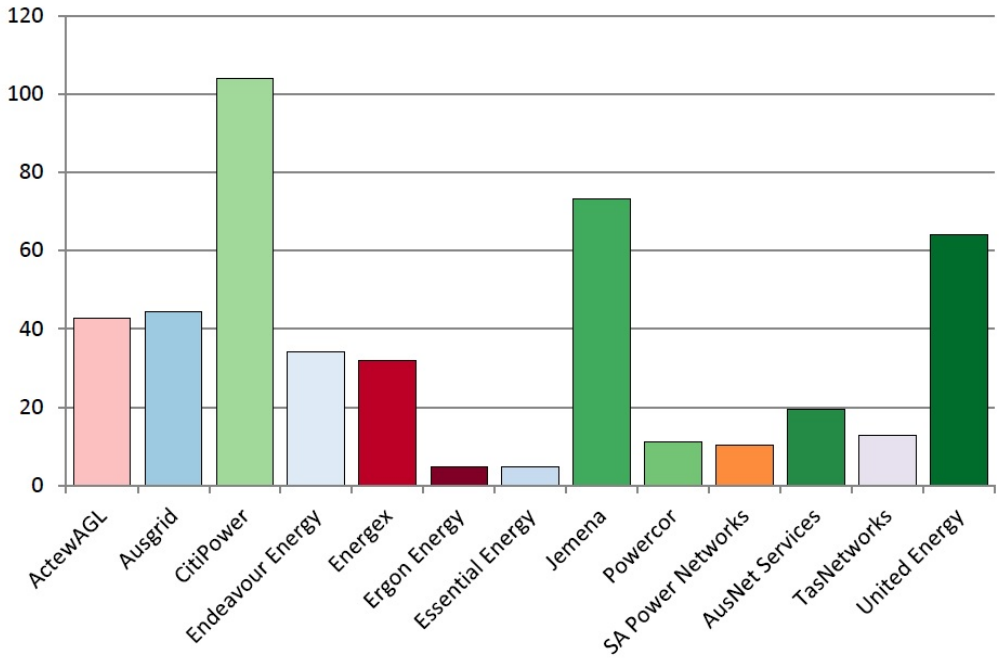
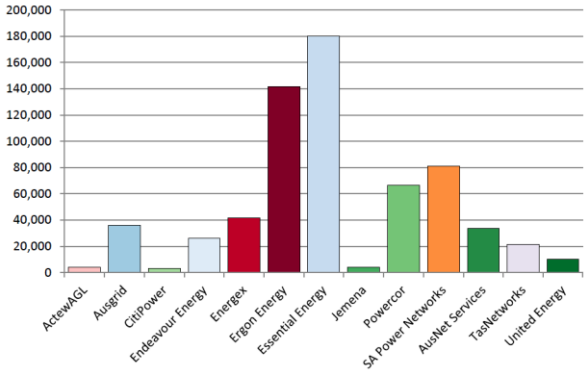


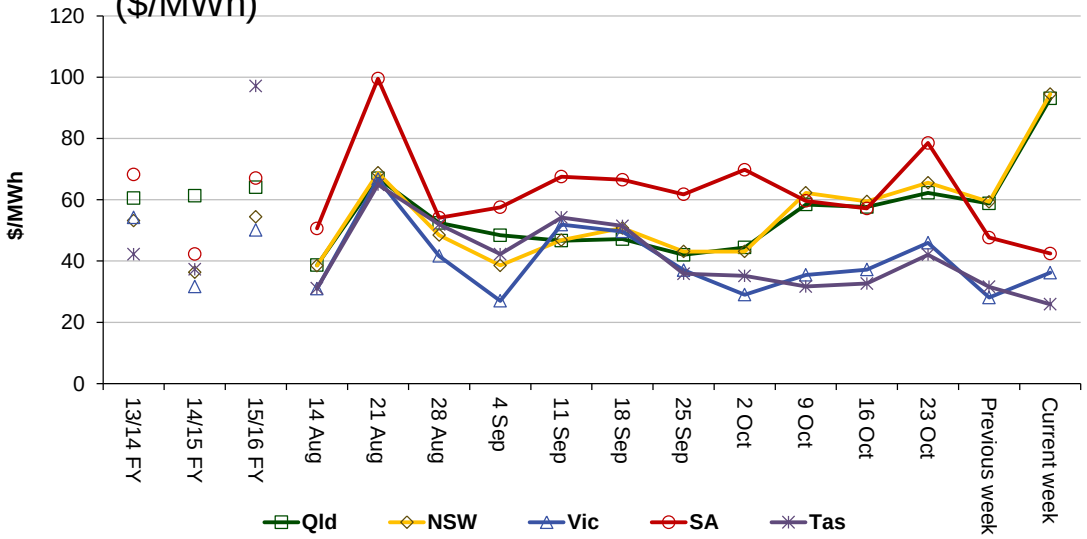
Figure 5 Distributor's five year average route line length (2009–2013, kilometres)



Source: Australian Energy Regulator

Electricity prices

Volume weighted average spot price by region ($/MWh)

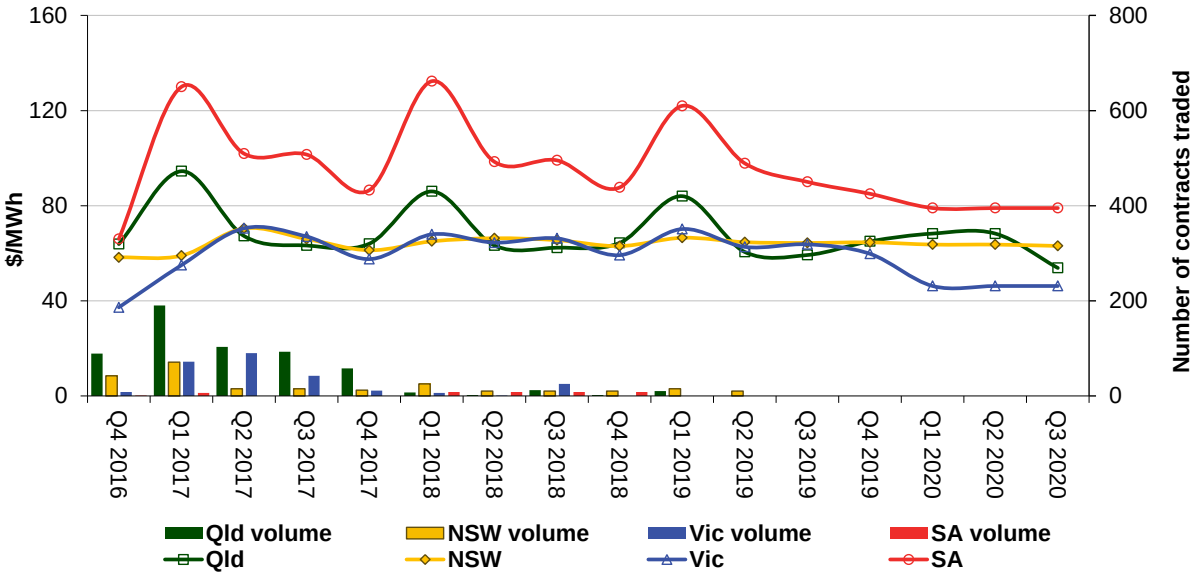


Region	Qld	NSW	Vic	SA	Tas
Current week	93	94	36	42	26
15-16 financial YTD	42	43	38	63	45
16-17 financial YTD	56	58	47	113	48

Source: Australian Energy Regulator

Electricity prices – Forward Contracts

Quarterly base future prices Q4 2016 – Q3 2020

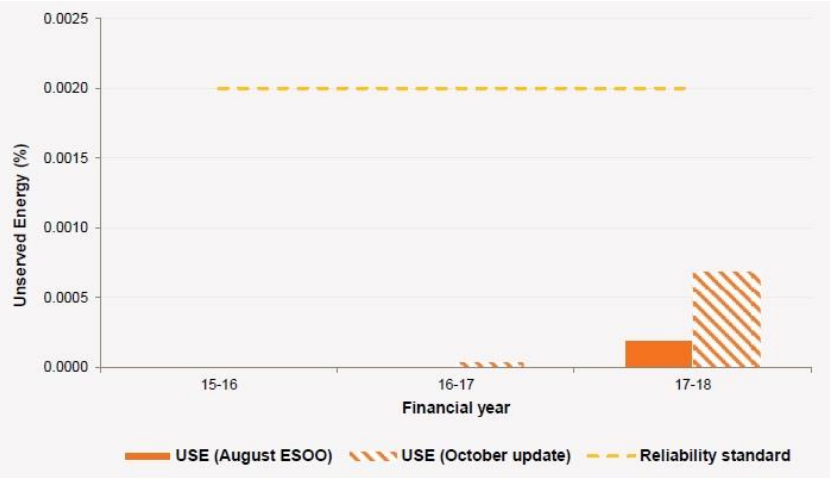


Source: Australian Energy Regulator

Reliability

Challenges	Controls	Activities
• Capacity withdrawal • Reliance on wind generation	• Reliability Standard • Reliability and Emergency Reserve Trader (RERT)	• RERT Rule Change • Heywood upgrade • Additional interconnection • New dispatchable electricity supply proposals

USE comparison August 2015 ESOO to October 2015 ESOO



Source: Australian Energy Market Operator

Security of supply

Challenges	Controls	Activities
• Frequency Control • Inertia - Rate of Change of Frequency • Voltage Control • Low Fault Levels	• Technical Standards • Network Standards • Licensing Requirements • Frequency Control Ancillary Services • Network Control Ancillary Services • Automatic under frequency load shedding • System Restart Ancillary Services	• Interconnector constraints • Enhanced FCAS procedures • Rule changes to provide additional security management mechanisms • Additional interconnection (RIT-T) • Voltage support - Northern Region (RIT-T) • Inquiry licence conditions for renewable energy

Electricity Prices

Challenges	Activities
• Peaky demand profile • Reduced availability of futures contracts • Low competition large electricity customer market • Market concentration • Inter-regional trade • Gas prices	• Additional interconnection (RIT-T) • Energy Ministers response to ACCC and AEMC gas market recommendations • Bidding in good faith rule change • Cost Reflective Tariffs – Small Customers • Wholesale Market Monitoring Function (AER) • New dispatchable electricity supply proposals • Expression of Interest – Low Carbon Electricity Supply and Services • ESCOSA inquiry – Electricity Prices

Electricity Prices

Electricity Procurement Options

Spot Price Exposure				
Standard Retail Contract	Pool Price Pass-through and Hedging via Retailer			NEM Customer
	Progressive Hedging with retailer managing residual spot risk	Progressive Hedging with customer managing residual spot risk	Spot Price Passthrough	
Benefits:				
- known price - no volume risk - known contract term - can incorporate DSM - large loads can have % variance around load	- can utilise retailer to get access to spot and progressive hedging - can elect when to hedge spot risk and volume to hedge - can utilise DSM effectively (physical hedge) - can unbundle LGCs - procure separately or through retailer - can contract networks separately			- suits DSM capability - removes retail costs - on site generation can assist with spot volatility - historic pricing indicates a lower average cost compared to retail prices
Risks:				
- timing of recontracting - subject to retailers T&C - Price premium - risk premium, volume premium, cost to serve, retail premium etc	- customer usually takes on some volume risk (exposure to spot prices) - risk of exposure to volatile spot prices - risk that hedging costs can increase materially or be illiquid - not able to get volume - not ideal for customers that don't have DSM capability or access to hedges or on site generation - Spot price passthrough risk to customers that don't have ability to manage cashflow variances			- spot exposure to volatile pricing - may not always be able to hedge spot price exposure adequately - post AEMO prudentials - contract networks separately
PPA structure is an alternative - customer locks in long term off take with new entrant generation facility				

Source: CQ Partners

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