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Electricity prices, demand and supply in NSW

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by Andrew Haylen

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Andrew Haylen

NSW PARLIAMENTARY RESEARCH SERVICE

Gareth Griffith (BSc (Econ) (Hons), LLB (Hons), PhD),
Manager, Politics & Government/Law ..... (02) 9230 2356

Lenny Roth (BCom, LLB),
Senior Research Officer, Law..... (02) 9230 2768

Alec Bombell (BA, LLB (Hons)),
Research Officer, Law..... (02) 9230 3085

Tom Gotsis (BA, LLB, Dip Ed, Grad Dip Soc Sci)
Research Officer, Law..... (02) 9230 2906

Andrew Haylen (BResEc (Hons)),
Research Officer, Public Policy/Statistical Indicators ..... (02) 9230 2484

Daniel Montoya (BEnvSc (Hons), PhD),
Research Officer, Environment/Planning ..... (02) 9230 2003

John Wilkinson (MA, PhD),
Research Officer, Economics..... (02) 9230 2006

Should Members or their staff require further information about this publication please contact the author.

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SUMMARY

This briefing paper provides an overview of wholesale and retail electricity prices in New South Wales and more broadly in the National Electricity Market. The specific causes of electricity price movements over recent years are discussed, as are consumption and supply forecasts.

This is the first of a series of companion briefing papers related to gas, water and renewable energy sources.

The National Electricity Market

New South Wales is part of the National Electricity Market (NEM) which spans Australia's eastern and south-eastern coasts and comprises four other interconnected states (Queensland, South Australia, Victoria, and Tasmania).

The NEM commenced operation as a wholesale spot market for electricity in December 1998. There are over 100 registered participants in the NEM which collectively supply approximately nine million customers, accounting for $11.4 billion worth of electricity trade in 2012–13. **[2]**

Generators and retailers trade electricity in the NEM through a gross pool managed by the Australian Energy Market Operator (AEMO).

The Australian Energy Market Commission (AEMC) is responsible for reviewing, amending and expanding the National Electricity Rules (NER) which govern the operations of the NEM.

The enforcement of these rules, in addition to the economic regulation of electricity transmission and distribution networks, is the responsibility of the Australian Energy Regulator (AER). **[2.1]**

Wholesale electricity prices

Prices across most NEM regions peaked between 2006 and 2008, largely driven by supply constraints, when drought constrained the availability of water for hydro generation and cooling in coal generation.

Declining electricity demand and the rising uptake of renewable generation (particularly wind and solar) contributed to historically low spot electricity prices in 2011−12.

This trend reversed in 2012–13 as average electricity prices more than doubled in most NEM jurisdictions. According to the AER (2013), the higher prices partly reflected carbon pricing, as well as supply constraints in mainland NEM regions, stemming from plant closures.

With the exception of the cyclical spike in January and February, prices have trended down over the past 12 months, affected largely by relatively subdued demand growth in the NEM.

As at June 2014, South Australia had the highest average spot price in the NEM

at $54.4/MWh; it was followed by Queensland ($50.9/MWh), New South Wales ($49.7/MWh) and Victoria ($49.2/MWh). **[3]**

Between 2004–05 and 2009–10, there was an escalating trend of extreme price outcomes in the NEM. During that period, the number of 30 minute prices above $5000 per MWh peaked at 95 events in 2009–10. The incidence of extreme prices has since fallen sharply. **[3.1]**

Market participants commonly manage their exposure to forward price risk by entering into hedge contracts that lock in firm prices for the electricity that they intend to produce or buy. In Australia, two distinct financial markets support the wholesale electricity market: over-the-counter markets which involves direct contracting between counterparties; or the exchange traded market, in which electricity futures products are traded on the Australian Securities Exchange (ASX). **[3.2]**

NERA Economic Consulting (2013) estimated annual wholesale energy costs out to 2015-16. In the zero carbon price scenario, prices for New South Wales, Queensland and Victoria rise in each year of the modelling period, albeit at a lower price than if the carbon tax was still in place. **[3.3]**

Retail electricity prices

As at March 2014, the ABS electricity price index was highest for Brisbane (134.8) and Melbourne (128.5), followed by Sydney (123.5), Perth (116.4) and Adelaide (115.3). Sydney has experienced the highest rate of growth in retail electricity prices over the last decade, with the index more than doubling since June 2004 at an average quarterly rate of 2.5 per cent.

Until 1 July 2014, the Independent Pricing and Regulatory Tribunal regulated retail electricity prices in New South Wales. In response to a report released by the AEMC in 2013 (which found that competition was effective in NSW electricity markets), the NSW Government removed retail electricity price regulation.

Retail electricity prices have risen significantly over the past five years. The AER concluded that network costs were the key driver. The carbon price also contributed, leading to price increases of 5 to 13 per cent in 2012−13. **[4]**

According to the AEMC (2013), residential prices in most jurisdictions are expected to either increase at a rate less than inflation or decrease over the next three years from 2012/13 to 2015/16. Residential *market offer* prices in New South Wales are forecast to decrease, on average, by 0.7 per cent a year for the three years from 2012-13 to 2015-16. **[4.1]**

Electricity Consumption

As at the end of 2012-13, in total New South Wales consumed the most electricity when compared to the other more populous States in Australia at 74 TWh. Growth in electricity consumption has slowed over the last decade or so across all of the States, except Western Australia, relative to their respective longer term trends. Electricity consumption in New South Wales remains

virtually unchanged in 2012-13 as it was in 2002-03.

Western Australia (13,199 kWh/capita) and Queensland (12,743 kWh/capita) have the highest levels of electricity consumption per capita, followed by New South Wales (10,037 kWh/capita). **[5]**

According to forecasts by the AEMO (2014), growth in electricity consumption in the NEM is forecast to remain relatively subdued over the next few years (increasing by 0.4 per cent annually between 2013-14 and 2016-17).

New South Wales electricity consumption is forecast to increase at an average annual rate of 0.36 per cent between 2013-14 and 2033-34, with growth expected to be constrained due to reduced large industrial forecasts. **[5.1]**

When compared to the other Australian States and Territories, New South Wales ranked fourth in terms of household electricity consumption, consuming on average 133.7 kWh per household per week.

New South Wales ranked third in terms of household electricity expenditure, spending on average $31 per household per week. **[5.2]**

Electricity Supply

Most electricity dispatched in the NEM is generated using coal (55 per cent of generating capacity), gas (20 per cent), hydro (17 per cent) and wind technologies (5.4 per cent).

As at April 2014, 68 per cent of generation capacity in New South Wales came from black coal generation; the majority of the remaining generation capacity came from hydro (17 per cent) and gas (12 per cent). **[6.1]**

Electricity generation trading rights in New South Wales are now split between the government entities Macquarie Generation (28 per cent) and Delta Electricity (12 per cent), and the private entities Origin Energy (26 per cent) and EnergyAustralia (17 per cent).

New South Wales has relatively high fuel costs, making it a net importer of electricity. Imports reached a ‘peak’ in 2010-11 in which they represented 12.8 per cent of regional energy consumption. **[6.2]**

Price signals in the wholesale and forward contract markets for electricity drive new investment in the NEM. From the start of the NEM in 1999 to June 2013, 13 850 MW of registered generation capacity (around 1000 MW per year) has been added to the NEM.

Between 1999-00 and 2012-13, South Australia had increased its capacity by 71 per cent, while Queensland’s capacity was 59 per cent higher. New South Wales and Victoria, on the other hand, have had more subdued growth in generation capacity, increasing by 21 and 16 per cent respectively to the end of 2012-13.

According to the AEMO (2014), committed projects total 1,165 MW of capacity,

with expected commissioning between July 2014 and January 2016. **[6.4]**

For the first time in the NEM's history, as a result of decreasing operational consumption, no new capacity is required in any NEM region to maintain supply-adequacy over the next 10 years.

From the AEMO (2014) analysis, it was found that more than 7,500 MW would need to be removed from the market to affect supply-adequacy in 2014–15. Even by 2023-24 between 1,100 MW and 3,100 MW of capacity could still be withdrawn from New South Wales, Queensland, and Victoria without breaching the reliability standard. **[6.5]**

Profile of the Retail Electricity Market

AGL Energy, Origin Energy and EnergyAustralia jointly supplied 77 per cent of small electricity customers in 2012-13. As at the third quarter of 2013-14, these three retailers accounted for 91 per cent of customers in New South Wales.

Switching activity between retailers by customers in New South Wales and South Australia rose in each of the past few years, with rates in 2012−13 being the highest recorded in each state. **[7.1]**

In October 2013, the AEMC released its final report reviewing competition in New South Wales retail energy markets. The Commission found that competition was delivering discounts and other benefits to small consumers in the New South Wales retail electricity markets.

In response to these and other recommendations, the NSW Government has removed retail price regulation from 1 July 2014. This means that IPART no longer sets electricity prices for regulated customers. **[7.2]**

For a benchmark low income household that receives energy bill concessions electricity costs accounted for between 2.9 and 7.9 per cent in 2012−13.

The number of residential electricity customers in New South Wales with debt stood at 111,514 in the March quarter of 2013-14; with the average size of that debt at $542 per customer, down from $655 in September 2013-14.

Rising electricity prices has led to an increase in the number of residential disconnections, particularly in New South Wales where the number of residential electricity disconnections has risen by 64 per cent between 2009-10 and 2013-14.

New South Wales currently has the largest number of customers on hardship programs, at 19,787 in the March 2013-14 quarter; this is 21 per cent (or 3,404 customers) higher than in the September 2013-14 quarter. **[7.3]**

LIST OF ABBREVIATIONS

ABS	Australian Bureau of Statistics
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ASX	Australian Securities Exchange
BREE	Bureau of Resource and Energy Economics
ESOO	Electricity Statement of Opportunities
IPART	Independent Pricing and Regulatory Tribunal
LNG	Liquefied Natural Gas
LRC	Low Reserve Condition
NEFR	National Electricity Forecasting Report
NEM	National Electricity Market
NERA	NERA Economic Consulting
PV	Photovoltaic

1. INTRODUCTION

Electricity prices are an important component of living expenses in Australia, accounting for 2.7 per cent of the consumer price index at the national level and 2.86 per cent for New South Wales.[1] Consequently, significant and prolonged upward movements in electricity prices can translate into cost of living pressures for New South Wales households; particularly for low income households where electricity expenses account for between 2.9 and 7.9 per cent of disposable income.[2]

Over the last decade, there have been two notable periods of electricity price increases in New South Wales. Prices peaked between 2006 and 2008, driven largely by supply constraints when drought constrained the availability of water for hydro generation and cooling in coal generation. Prices eased in subsequent years but then nearly doubled in New South Wales in 2012-13, partly as a consequence of the carbon tax.

New South Wales is part of the National Electricity Market which spans Australia's eastern and south-eastern coasts and includes four other interconnected states (Queensland, South Australia, Victoria, and Tasmania). Because it is a net importer of electricity from these other jurisdictions in the NEM, electricity supply and demand variables both within and outside of New South Wales need to be considered when assessing the aforementioned movements in the State's electricity prices.

Changes to public policy and legislation have also altered price outcomes in the electricity market. For example, the Gillard Government introduced the carbon tax on 1 July 2012 at $23 per tonne of emissions which resulted in a notable upward swing in electricity prices immediately after its introduction. Renewable energy policies, such as the Renewable Energy Target, have also altered the incentives for generators in supplying electricity from traditional fuel sources.

The main purpose of this briefing paper is to assess historical movements in wholesale and retail electricity prices in New South Wales and more broadly in the NEM. By presenting the associated trends in electricity consumption (demand) and production/generation (supply), this paper will highlight the specific causes for electricity price movements in recent years. Consumption and supply forecasts from the Australian Energy Market Operator are also presented in this paper to provide an insight into the future trajectory of electricity prices in the NEM.

To supplement this discussion, the paper provides a brief overview of the functions and administration of the National Electricity Market, along with a profile of its retail electricity market (in terms of competition between retailers and affordability outcomes stemming from recent electricity price movements).

Information and data in this paper is sourced primarily from the Australia Energy Regulator, Australian Energy Market Operator, Australia Energy Market Commission and the Bureau of Resources and Energy Economics.

2. THE NATIONAL ELECTRICITY MARKET

The National Electricity Market (NEM) spans Australia's eastern and south-eastern coasts and is comprised of five interconnected States, New South Wales, Queensland, South Australia, Victoria, and Tasmania; each State also acts as a distinct price region. Western Australia and the Northern Territory are not connected to the NEM, primarily due to the distance between networks.[3]

The NEM commenced operation as a wholesale spot market for electricity in December 1998. There are over 100 registered participants in the NEM, including market generators, transmission network service providers, distribution network service providers, and market customers. Collectively these participants supply approximately nine million customers; accounting for $11.4 billion worth of electricity trade in 2012–13.

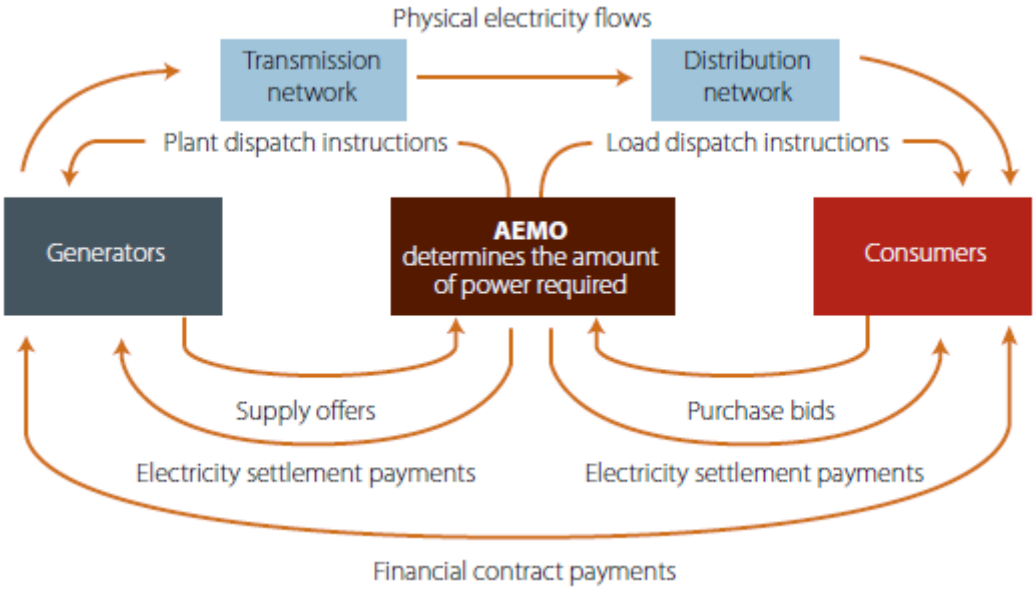
The NEM incorporates around 40,000 km of transmission lines and cables with a total generating capacity of around 50,000 MW. The NEM supplies about 200 terawatt hours of electricity to businesses and households each year.[4]

In 2013, electricity was generated using black coal (50 per cent), brown coal (24 per cent), gas (12 per cent) and other forms of renewables (14 per cent).

2.1 Administration of the NEM

The NEM operates as a wholesale spot market in which generators and retailers trade electricity through a gross pool managed by the Australian Energy Market Operator (AEMO) (Figure 1). AEMO is responsible for aggregating and dispatching supply to meet demand in the lowest cost manner available.

Figure 1: National electricity market structure[5]



The Australian Energy Market Commission (AEMC) is responsible for

reviewing, amending and expanding the National Electricity Rules which govern the operations of the NEM.

The enforcement of these rules, in addition to the economic regulation of electricity transmission and distribution networks and covered gas pipelines, is the responsibility of the Australian Energy Regulator (AER). The AER is also responsible for reporting on generator bidding behaviour in the NEM and compliance with the National Gas Rules.

The interaction between these three bodies (AEMO, AEMC and AER) allows for a consistent near-national approach to regulating Australia's electricity markets.[6]

2.2 Wholesale exchange of electricity

Because electricity cannot be stored easily, the NEM works as a "pool" (or spot market) where power supply and demand is matched instantaneously in real time through a centrally coordinated dispatch process.

Generators offer to supply the market with specified amounts of electricity at specified prices for set time periods, and can re-submit the offered amounts at any time.

From all the bids offered, the AEMO decides which generators will be deployed to produce electricity. Because the NEM is designed to meet electricity demand in the most cost-efficient way, the cheapest generator will be put into operation first.[7]

Electricity production is matched to electricity consumption and spare generating capacity is always kept in reserve. The real time electricity price can be calculated based on this supply and demand balance,. Electricity production is, however, subject to transmission limitations so that the network is not overloaded.

In delivering electricity, a dispatch price is determined every five minutes, and six dispatch prices are averaged every half-hour to determine the "spot price" for each NEM region. AEMO uses the spot price as its basis for settling the financial transactions for all electricity traded in the NEM.

To pay generators, AEMO must recover costs from customers. Most customers do not participate directly in the NEM; they purchase their electricity through a retailer. Customers pay the retailers a commercial tariff and retailers manage customers' energy purchases, including paying AEMO the spot price.

NEM participants manage the financial risks associated with spot price volatility that occurs during trading periods by using financial contracts that lock in a firm price for future electricity production or consumption. These arrangements are generally in the form of derivatives, and include swaps or hedges, options and futures contracts (Section 3.2).[8]

Further information regarding the NEM can be found in the AEMO 'Introduction to the National Electricity Market' fact sheet.

3. WHOLESALE PRICES

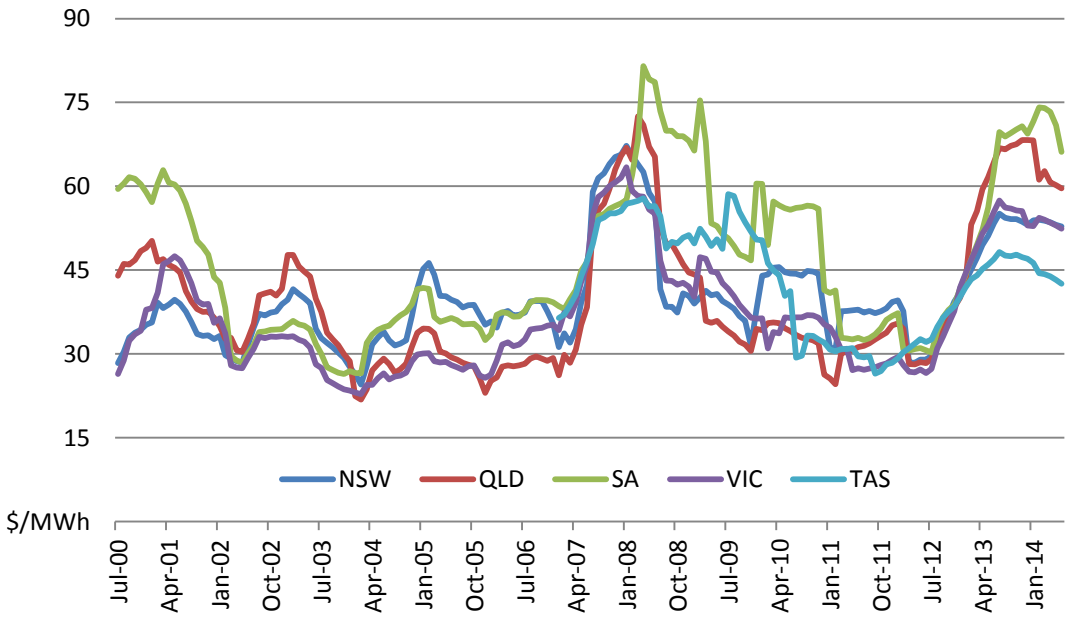
Spot market (or wholesale) prices, which are set based on the marginal cost of supplying another megawatt to the system, can be very sensitive to changes in the level of demand and have fluctuated considerably over the last decade. As NERA Economic Consulting (2013) explains:[9]

> In the NEM, prices are set at the cost of the last and most expensive megawatt supplied to the region. The producer of this final unit is sometimes termed the 'marginal generator'. The marginal generator at any given time is therefore a function of the level of demand, and the short run supply curve for electricity, or 'merit order'.

The short-term effect of a change in demand on prices is therefore relatively straight-forward. A reduction in demand leads to a shift down the merit order and a reduction in price; an increase in demand leads to a shift up the merit order and an increase in price. This short term effect of changes in demand is apparent even at the intraday level, where prices rise and fall in line with daily variation in usage.[10]

Prices across most NEM regions peaked between 2006 and 2008 (Figure 2), largely driven by supply constraints when drought limited the availability of water for hydro generation and cooling in coal generation. This period also coincided with escalating peak and average demand for electricity.[11]

Figure 2: Average spot price per region, 12-monthly moving average[12]



Declining electricity demand and the rising uptake of renewable generation (particularly wind and solar) contributed to historically low spot electricity prices

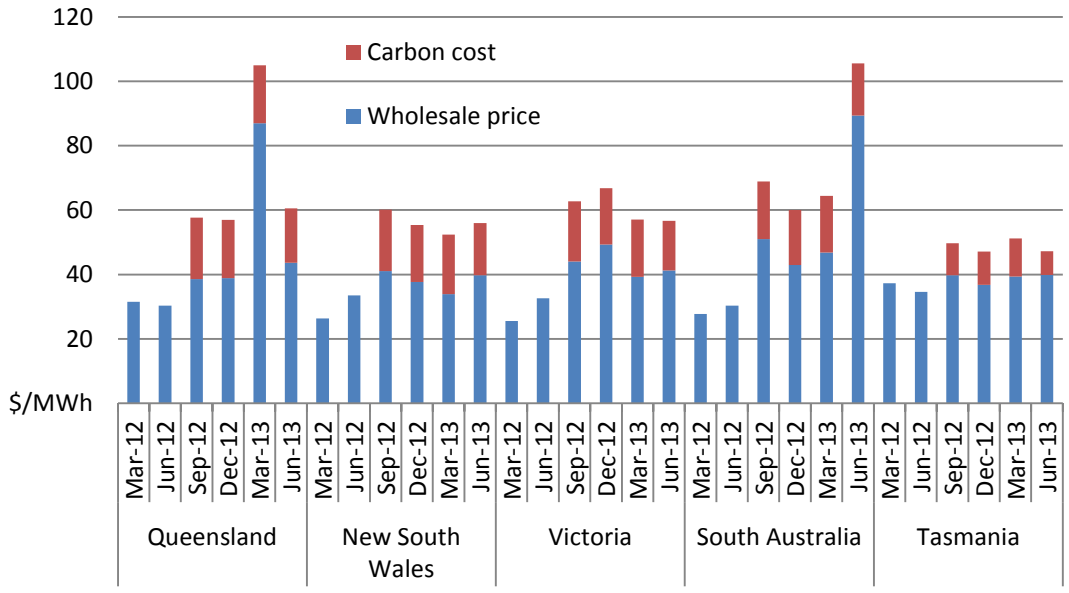
in 2011−12. This trend reversed in 2012–13 as average electricity prices more than doubled in Queensland (to $70/MWh), Victoria (to $61/MWh) and South Australia (to $74/MWh), and almost doubled in New South Wales (to $56/MWh).

According to the AER (2013), the higher prices partly reflected carbon pricing which was introduced on 1 July 2012 at $23 per tonne of emissions and increasing by 2.5 per cent above inflation in each subsequent year of the fixed price period. The initial impact on spot electricity prices was much greater, with average prices in the first week of July 2012 ranging from $38 to $84 per MWh above 2011−12 averages.[13] The AER (2013) noted that:[14]

> While other factors unrelated to carbon affected outcomes, some generators raised their offer prices above the levels required to adjust for the carbon intensities of their plant. Spot prices moderated over the following weeks and continued to ease into spring 2012.

The average carbon pass-through (i.e. cost of electricity directly attributable to the carbon tax) to spot electricity prices during 2012–13 was broadly consistent across the mainland NEM regions (at around $17.70/MWh), but was significantly lower in Tasmania ($10/MWh), due to its high concentration of hydro generation (Figure 3).

Figure 3: Spot electricity prices isolating carbon costs[15]



Based on analysis conducted by NERA Economic Consulting (NERA), the merit order (i.e. short-term cost structure of the market) did not change considerably in the NEM following the introduction of a carbon price. As NERA (2013) noted:[16]

> Immediately before the introduction of the carbon price, the brown coal-fired power stations in the Latrobe valley dominated the bottom of the merit order. These were closely followed by black coal-fired power stations in Queensland and New South Wales, with gas turbine units located higher in the merit order.

NERA (2013) found that after adjusting for the impact of the carbon price, the operating costs of brown and black coal-fired power stations were more comparable but, for the most part, the merit order remained unchanged. In particular, gas-fired generators tended to be higher in the merit order than coal-fired generators.

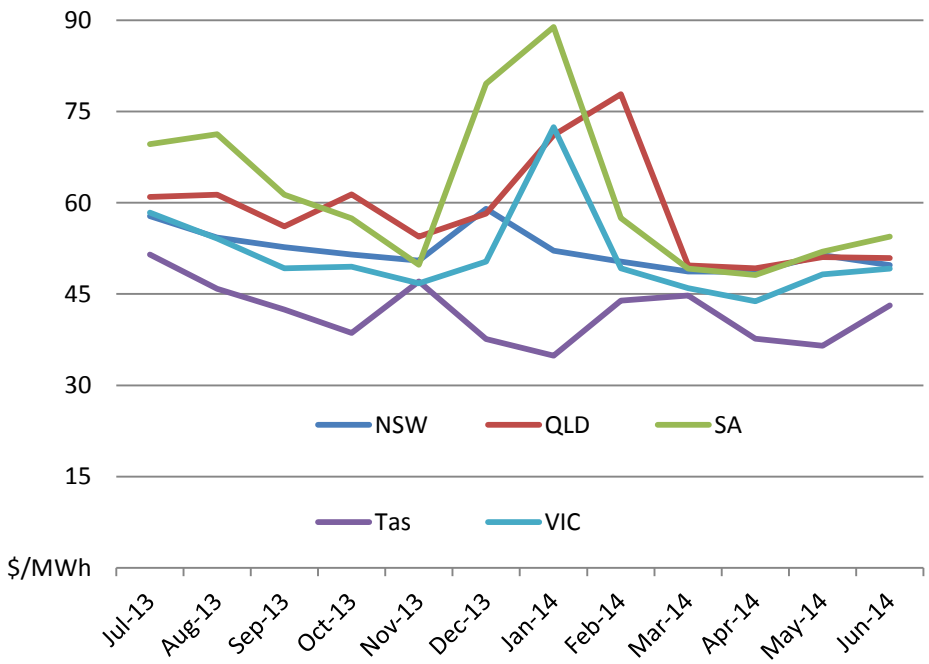
Average prices across the NEM rose by around $31 per MWh during 2012–13, suggesting other factors beyond carbon pricing contributed. For example, supply constraints in mainland NEM regions, stemming from plant closures, contributed to lower than expected reserves at times, driving high prices and at times resulting in opportunistic bidding by major generators.[17]

With the exception of the cyclical spike in January and February, prices have trended down over the past 12 months (Figure 4), affected largely by relatively subdued demand growth in the NEM, the result of:[18]

- continued increases in domestic rooftop PV installations incentivised through feed-in tariffs and reduced system installation prices;
- lower-than-expected demand growth in most industrial sectors;
- higher estimated impacts from energy efficiency measures through capture of changes in building standards and regulations; and
- higher estimate of customer response to high price events based on analysis of historical demand-side participation behaviour.

As at June 2014, South Australia had the highest average spot price in the NEM at $54.4/MWh; it was followed by Queensland ($50.9/MWh), New South Wales ($49.7/MWh) and Victoria ($49.2/MWh).

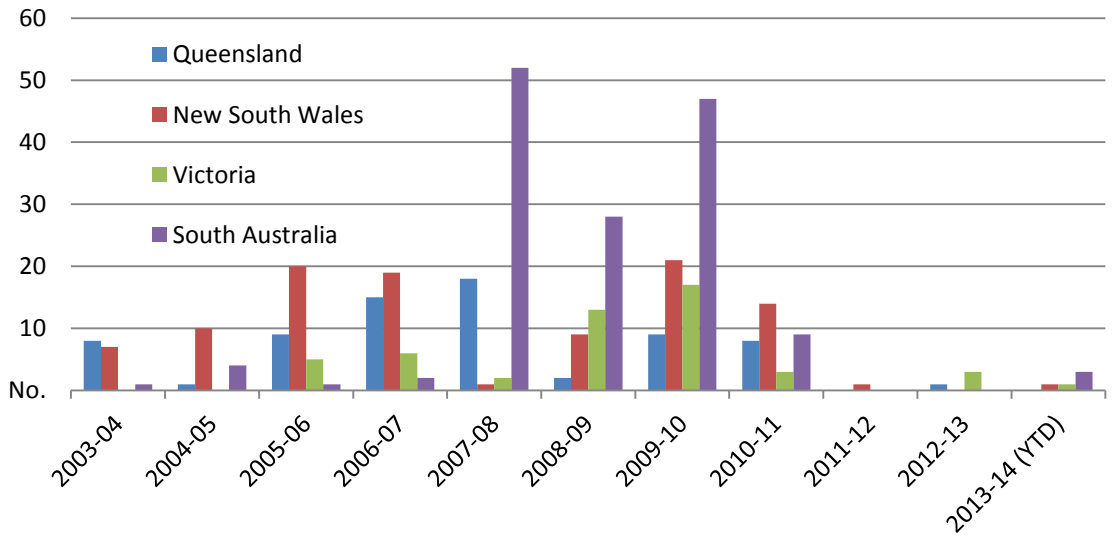
Figure 4: Average monthly spot prices in the NEM[19]



3.1 Short term price fluctuations

According to the AER (2013), a relatively tight supply and demand balance during periods of peak demand contributed to an escalating trend of extreme price outcomes in the NEM between 2004–05 and 2009–10.[20] During that period, the number of 30 minute prices above $5000 per MWh peaked at 95 events in 2009–10. The incidence of extreme prices has since fallen sharply. Only one such event occurred in 2011–12 (the lowest number since the NEM commenced); with four events in 2012–13 and five events thus far in 2013-14 (Figure 5).

Figure 5: Trading intervals where the spot price has exceeded $5000/MWh, 2003-04 to 2013-14[21]



The AER (2013) concluded that the sharp decline in extreme price outcomes reflects the decline in energy use across the NEM and the subsequent plateau in peak demand, resulting in surplus installed capacity in most regions. Additionally, recent summers have had few prolonged heatwaves, avoiding the spike in demand for air conditioning that typically occurs in those conditions.[22]

While prices rarely spiked above $5000/MWh in 2012–13, the number of prices above $200/MWh was the highest for seven years. The number of such events recorded a sevenfold increase compared with 2011–12, rising from 99 to 704 events.[23]

These events mostly occurred in Queensland and South Australia, and were often unrelated to demand. For example, in Queensland, network congestion triggered waves of disorderly generator bidding and market volatility; while in South Australia, the withdrawal of significant capacity from the market led to a tight supply–demand balance and price sensitivity to minor shifts in demand.[24]

3.2 Futures prices

NEM market participants commonly manage their exposure to forward price risk

by entering into hedge contracts that lock in firm prices for the electricity that they intend to produce or buy.[25]

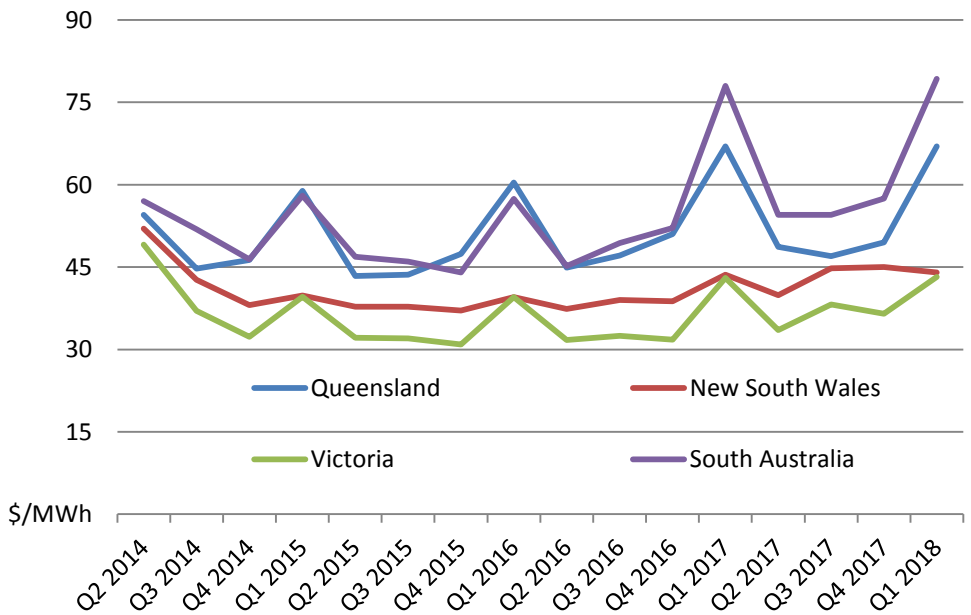
In Australia, two distinct financial markets support the wholesale electricity market: over-the-counter markets which involves direct contracting between counterparties; or the exchange traded market, in which electricity futures products are traded on the Australian Securities Exchange (ASX). Specific details relating to each of these markets and their products can be found in Section 1.8 of the AER State of the Energy Market 2013 report.

Electricity futures trading on the ASX covers instruments for Victoria, New South Wales, Queensland and South Australia. The trading volume in 2012−13 was equivalent to 186 per cent of underlying energy demand, down from 231 per cent in 2011–12 and 285 per cent in 2010−11. New South Wales accounted for 44 per cent of traded volume, followed by Queensland (29 per cent) and Victoria (24 per cent).[26]

The most heavily traded products in 2012−13 were base futures (54 per cent of traded volume), followed by options (27 per cent).

Fluctuations in futures prices reflect changing expectations of the cost of underlying wholesale electricity. According to the AER (2013), uncertainty about the introduction of a carbon price scheme in recent years led to prices fluctuating as the scheme's likely implementation and nature was reassessed. For example, future prices peaked towards the end of 2011 when the Senate passed the Clean Energy Future Plan, and rose again in the first half of 2012 when the scheme's introduction was imminent.[27]

Figure 6: Quarterly base contract prices, 2014 to 2018[28]



According to the latest available data from the ASX, base futures prices for the

next three years are the highest in South Australia and Queensland which reflects the recent price volatility in each of these regions because of their respective network congestion and capacity issues (Figure 6).

3.3 Wholesale price outlook

As part of the 2013 AEMC investigation into residential electricity prices, NERA (2013) estimated the cost of electricity supply to residential customers in the NEM, which included estimating annual wholesale energy costs.

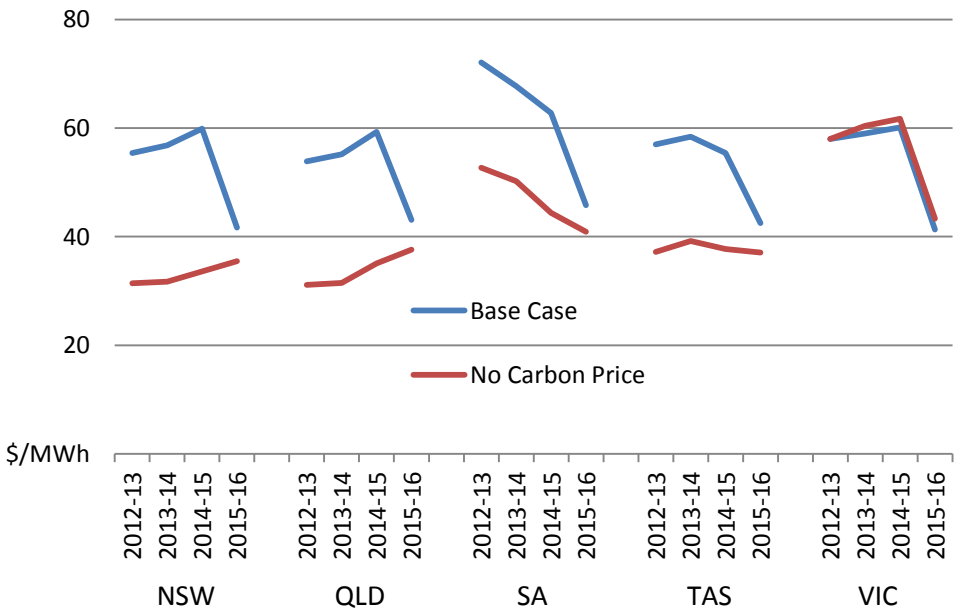
From this analysis, it was found that wholesale prices across all regions, with the exception of South Australia, were forecast to rise gradually in 2013-14 and 2014-15 due to:[29]

- assumed rises in gas costs;
- small increases in the carbon price, given the assumption that the fixed price will be retained until 30 June 2015; and
- the firming of total system demand driven predominantly by significant demand growth in Queensland associated with the construction of LNG terminals.

The projected decline in prices in 2015-16 was attributable to a decrease in the carbon price as the fixed price period ends.

The removal of the carbon tax by the Abbott Government in July 2014 meant that such trends will not be realised. NERA (2013) did however undertake sensitivity analysis to account for a zero carbon price scenario; the results of which are presented in Figure 7.

Figure 7: Project electricity spot prices – base case and zero carbon sensitivity ($/MWh)



Under the zero carbon price scenario, prices for New South Wales, Queensland and Victoria rise in each year of the modelling period, albeit at a lower level than if the carbon tax was still in place. The rise is largely driven by the firming of demand across the NEM, but is also influenced by rising gas prices.[30]

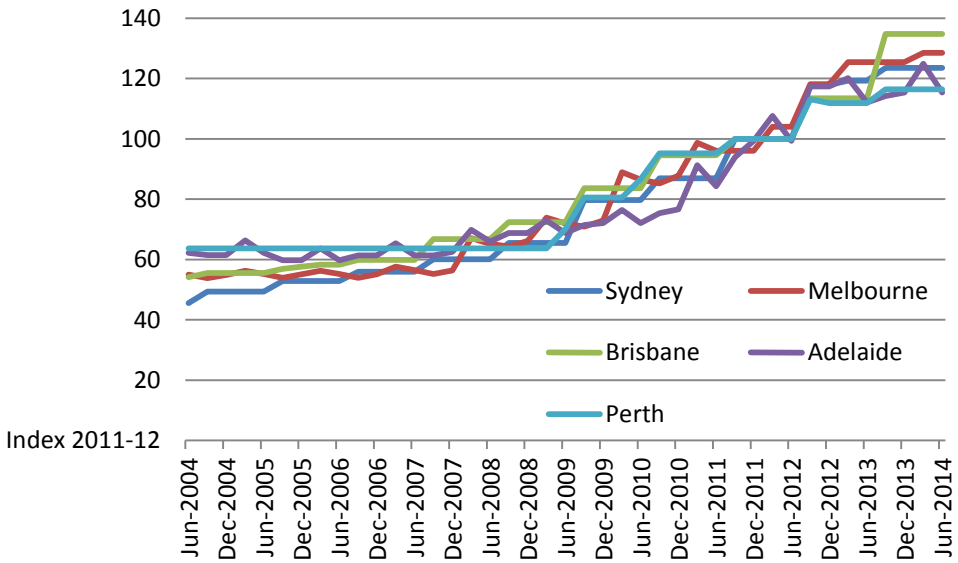
According to NERA (2013), the difference between the spot prices in the base case and in the zero carbon price case is the 'carbon pass-through' (i.e. a measure of the contribution of the carbon price to spot price outcomes). The carbon pass-through varied by region, but was largely a function of the emissions intensity of generation capacity within a region:[31]

> The pass-through is greatest in Victoria at between 115 and 125 per cent, which reflects the high emissions intensity of generation of brown coal fired generators such as Hazelwood and Yallourn. New South Wales and Queensland exhibit a lower carbon pass-through reflecting the use of black coal fired generation in those states. The carbon pass-through in Tasmania is also considerable, despite the fact that most generation in Tasmania is from hydro-electric plants.

4. RETAIL PRICES

Using the electricity component of the ABS consumer price index, Figure 8 tracks movements in electricity prices for metropolitan households over the last decade. As at June 2014, the electricity price index was highest for Brisbane (134.8) and Melbourne (128.5), followed by Sydney (123.5), Perth (116.4) and Adelaide (115.3). Given the reference period for the index is 2011-12, Brisbane and Melbourne have experienced the highest rate of electricity price growth in the last two to three years.

Figure 8: Electricity price indices for Australian capital cities[32]



Sydney has experienced the highest rate of growth in retail electricity prices over the last decade, with the index more than doubling since June 2004 at an average quarterly rate of 2.5 per cent. Brisbane (2.3 per cent quarterly growth)

and Melbourne (2.1 per cent) also experienced relatively high rates of retail electricity price growth.

The energy bills paid by retail customers cover the costs of wholesale energy, transport (through transmission and distribution networks) and retail services. The AEMC (2013) estimated the composition of a typical electricity retail bill for a residential customer in each NEM jurisdiction.[33] In electricity, the cost of using transmission and distribution networks to transport electricity is the largest component (36 to 57 per cent) of retail bills, followed by wholesale costs (21 to 27 per cent). Retailer operating costs contribute 10 to 15 per cent of retail bills (Table 1).

Table 1: Composition of residential electricity bills (% of typical small customer bill), 2013[34]

Jurisdiction	Network costs	Wholesale Energy Costs	Retail costs	Carbon costs	Green costs
Queensland	52	21	15	9	3
New South Wales	51	23	10	7	8
Victoria	36	na	na	8	4
South Australia	55	21	13	4	8
Tasmania	57	27	9	3	4
ACT	43	26	11	12	8

Until 1 July 2014, all NEM jurisdictions except Victoria and South Australia applied some form of retail price regulation for electricity supplied under a standard retail contract. The regulated prices are set by state or territory government agencies; the Independent Pricing and Regulatory Tribunal (IPART) regulated retail electricity prices in New South Wales.

In September 2013, the AEMC released their final report (Review of Competition in the Retail Electricity and Natural Gas Markets in New South Wales) which found competition was effective in New South Wales energy retail markets, with substantial discounts being offered from the regulated price. It recommended the NSW Government remove retail price regulation and improve consumer information and ongoing market monitoring (Section 7.2).[35] The NSW Government has subsequently removed retail price regulation, meaning that IPART no longer sets electricity prices for retail customers.[36]

Table 2, which is sourced from the AER State of the Energy Market report, summarises recent movements in regulated and standing offer electricity prices, and presents estimates for the annual bills of customers under these arrangements. This estimated annual bill cost is based on a customer using 6500 kilowatt hours of electricity per year on a single-rate tariff at August 2013.

Retail electricity prices have risen significantly over the past five years. The AER concluded that network costs were the key driver. The carbon price also contributed, leading to price increases of 5 to 13 per cent in 2012−13. Cost pressures from other climate change policies also had an impact, but have remained fairly stable since changes to the renewable energy target scheme from 1 January 2011 affected retail prices in 2011−12.[37]

Table 2: Movements in regulated and standing offer prices for electricity[38]

Jurisdiction	Regul-ator	Distribution Network	2009 -10	2010 -11	2011 -12	2012-13	2013 -14	Estimated annual cost ($)
Queensland	QCA	Energex and Ergon Energy	15.5	13.3	6.6	10.6	20.4	2113
New South Wales	IPART	Ausgrid	21.7	10	17.9	20.6	3.9	2106
		Endeavour Energy	21.1	7	15.5	11.8	1.6	2044
		Essential Energy	17.9	13	18.1	19.7	-0.6	2725
Victoria	Unreg-ulated	Citipower	5.7	14.6	3.7	19.9	6.4	2006
		Powercor	5.2	15.4	7.7	23.1	5.8	2389
		SP AusNet	6	11.3	23.6	19.7	12.4	2386
		Jemena	7.7	17.7	10.5	23.2	6.1	2339
		United Energy	7	11.4	9.7	25.2	4.8	2167
South Australia	Unreg-ulated	ETSA Utilities	3.1	18.3	17.4	12.7	2.8	2510
Tasmania	OTTER	Aurora Energy	6.2	15.3	11	10.6	1.8	2205
ACT	ICRC	ActewAGL	6.4	2.3	6.5	17.7	3.5	1577

New South Wales regulated electricity prices were relatively stable for 2013−14, increasing by an average 1.7 per cent. The AER (2013) concluded that:[39]

> …a rise in retailer operating costs (such as for customer service and billing) was the main driver, adding 4.4 per cent to retail charges. Costs associated with green schemes also had a small impact, pushing up prices by 1.3 per cent. But falling wholesale and network costs partly offset these price increases**.**

Retailers offer contracts for a range of products with different price structures. The offers may include standard products, green products, ‘dual fuel’ contracts (for gas and electricity) and packages that bundle energy with services such as telecommunications. The variety of discounts and non-price inducements makes direct price comparisons difficult.

The AER (2013) used data from the price comparison website *Energy Made Easy* and state regulators' price comparison websites to estimate electricity price offerings for residential customers in Queensland, New South Wales, Victoria and South Australia (Table 3).

The annual bill spread in August 2013 (measured within specific distribution networks) varied among jurisdictions. In electricity, it ranged from $200 in Queensland to around $1000 in Victoria. The spread for most networks was generally larger in August 2013 than in August 2012.[40]

Table 3: Price diversity in retail product offers for electricity – August 2012 and August 2013[41]

Distribution Network	Date	Min	Mean	Max
Queensland				
Energex	August 2012	1557	1653	1755
	August 2013	1880	1999	2113
New South Wales				
Ausgrid	August 2012	1675	1929	2128
	August 2013	1833	2015	2307
Endeavour Energy	August 2012	1688	1904	2031
	August 2013	1779	1955	2132
Essential Energy	August 2012	2342	2587	2810
	August 2013	2392	2617	2826
Victoria				
Citipower	August 2012	1348	1711	2296
	August 2013	1492	1818	2444
Powercor	August 2012	1588	1984	2736
	August 2013	1808	2122	2916
United Energy	August 2012	1552	1864	2400
	August 2013	1624	1996	2584
SP Ausnet	August 2012	1680	1976	2656
	August 2013	1844	2206	2836
Jemena	August 2012	1628	1937	2500
	August 2013	1720	2099	2688
South Australia				
SA Power Networks	August 2012	2170	2405	2661
	August 2013	2231	2473	3016

Victoria exhibited the greatest price diversity, with the annual cost under the

cheapest contract 35 to 40 per cent lower than under the most expensive contract. The average discount in annual electricity bills across all contracts in August 2012 was 5 to 6 per cent below the base offer in Queensland, New South Wales and South Australia, and 8 to 9 per cent lower in Victoria.

The average discount in August 2013 remained relatively unchanged in Queensland, but fell in New South Wales (to below 4 per cent) and South Australia (to 1.5 per cent). The variation in average discounts across Victorian network areas was 7 to 11 per cent.

4.1 Residential electricity price outlook

The AEMC (2013) published the fourth annual residential electricity price trends report in December 2013 which sets out, in broad terms, the drivers of price movements and trends in residential electricity prices over the financial years from 2012-13 to 2015-16. According to the AEMC (2013):

> The drivers of price trends are based on trends occurring in the competitive wholesale and retail market sectors and are influenced by factors including changes in electricity demand, input prices, overall economic conditions, gas market developments and the impacts of external environmental policies.

A detailed discussion around each of these pricing factors can be found in Chapter 2 of the AEMC report.

The AEMC (2013) specifically estimated a range for wholesale and retail costs associated with *market offer* prices in South Australia, Victoria, New South Wales and Queensland. It also estimated wholesale energy purchase costs associated with the representative *standing offers* in Queensland, the Australian Capital Territory and in Western Australia.

Market offers are plans where prices are set by energy retailers and are provided to residential consumers under competitive market contracts. Market offers can differ between retailers and may include discounts and/or non-monetary incentives. *Standing offer prices* are typically set by jurisdictional regulators or by the relevant state or territory government. Until July 2014 in New South Wales, the standing offer price was approved by IPART.[42]

According to the AEMC (2013), at a national level, residential electricity price increases are expected to moderate over the next three years, rising by 1.2 per cent a year over the three years from 2012-13 to 2015-16:[43]

> This national trend is largely driven by stabilising regulated network costs, and both upward and downward pressure from the costs of different government environmental policies. Competitive wholesale and retail market costs are expected to remain relatively stable.

Specifically, regulated network and competitive market costs are estimated to increase by 4.6 and 2.3 per cent a year respectively between 2012-13 and 2015-16. The report states that the costs of the renewable energy target and energy efficiency schemes are expected to remain stable over the period to

2015-16; however these expectations were formed under the assumption of unchanged policy settings. The removal of carbon pricing by the Abbott Government is likely to change these expectations and may place downward pressure on electricity prices.

Generally, residential prices in most jurisdictions are expected to either increase at a rate less than inflation or decrease over the next three years from 2012/13 to 2015/16. Prices are only expected to show a real increase in Queensland and the Northern Territory.[44]

Residential *market offer* prices in New South Wales are forecast to decrease, on average, by 0.7 per cent a year for the three years from 2012-13 to 2015-16. Within this period, prices are expected to increase slightly then fall. The fall from 2014-15 to 2015-16 was expected to occur as a result of the move from a fixed carbon price to a floating carbon price under previous legislation. Aforementioned changes in legislation by the Abbott Government will inevitably effect such price expectations.

Based on an annual household consumption of 6,500 kWh, the forecast price rises would result in an increase of around $47 in annual household electricity expenditure in 2014/15, compared to 2013/14. Consumers may have saved by switching to a market offer, with savings of around 9 per cent if they switched in 2012/13.[45]

In those states where *market offers* are available (including New South Wales), residential consumers are able to shop around for the best offer. According to the AEMC (2013):

> Depending on where they live and their electricity consumption, households may have saved between 5 and 16 per cent by switching from a *standing offer* to a *market offer* in 2012/13.

5. CONSUMPTION

5.1 Aggregate consumption

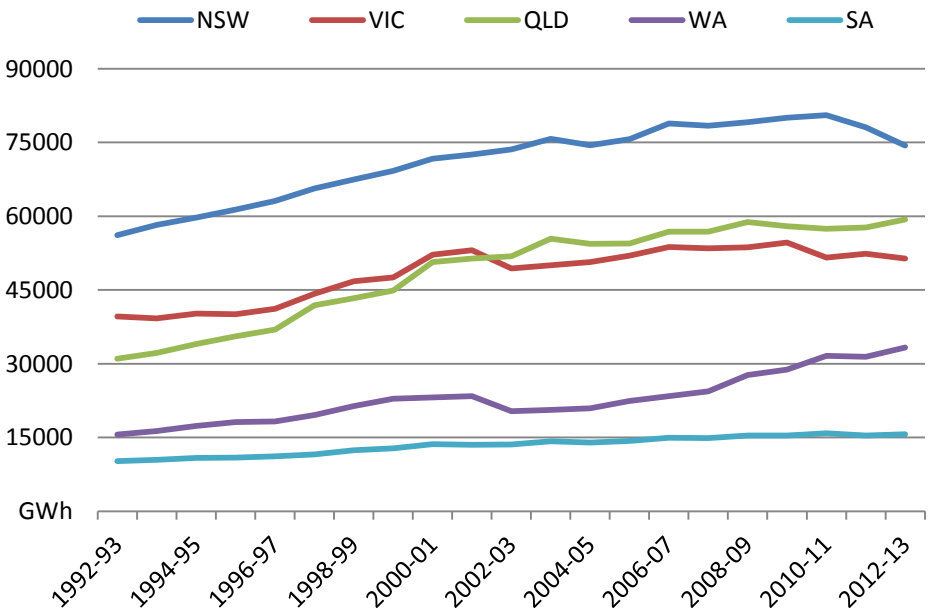
As at the end of 2012-13, in total New South Wales consumed the most electricity when compared to the other more populous States in Australia; which is to be expected given its population size.

Between 1992-93 and 2012-13, total electricity consumption in New South Wales grew from 56 TWh to 74 TWh, at an average annual rate of 1.4 per cent. Queensland and Western Australia experienced the highest rate of electricity consumption growth over this period, increasing at average annual rates of 3.3 and 3.9 per cent respectively.

Growth in electricity consumption has slowed over the last decade or so across all of the States, except Western Australia, relative to their respective longer term trends (Figure 9). For example, electricity consumption in New South Wales remains virtually unchanged in 2012-13 as it was in 2002-03. Western

Australia has had the highest rate of growth over the last decade at an annual rate of 5 per cent.

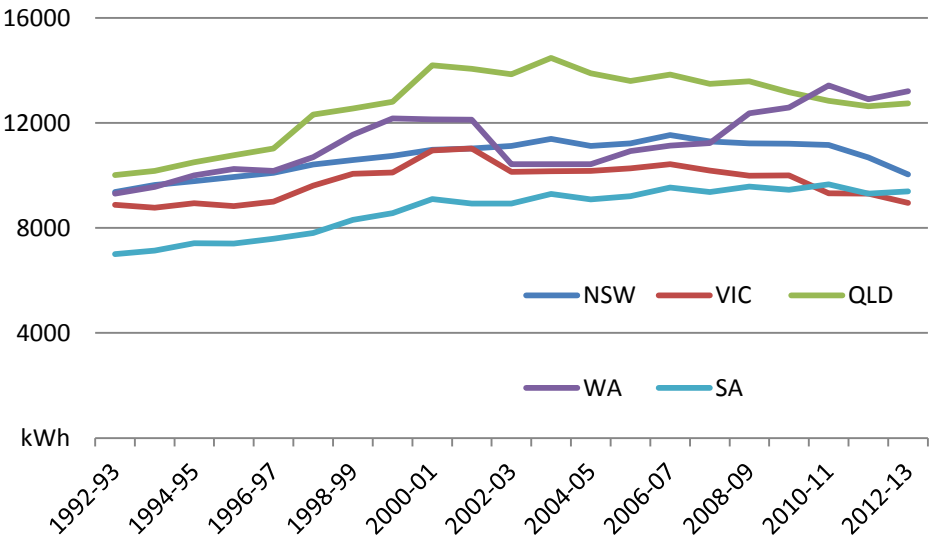
Figure 9: Consumption of electricity, by State[46]



Of the States presented, Western Australia (13,199 kWh/capita) and Queensland (12,743 kWh/capita) have the highest levels of electricity consumption per capita, followed by New South Wales (10,037 kWh/capita), South Australia (9,389 kWh/capita) and Victoria (8,951 kWh/capita).

Electricity consumption per capita remained relatively flat in New South Wales through the 2000s and has declined by 10 per cent since 2010-11 (Figure 10).

Figure 10: Electricity consumption per capita, by State[47]



Western Australia is the only State to experience any notable increases in per capita consumption in recent years, rising by 27 per cent between 2004-05 and 2012-13.

Electricity demand has been declining across the NEM since 2007-08. According to the AER (2013), electricity demand has been declining along the east coast as a result of:[48]

> …commercial and residential customers responding to higher electricity costs by reducing energy use and adopting energy efficiency measures such as solar water heating; subdued economic growth and weaker energy demand from the manufacturing sector; and the continued rise in rooftop solar photovoltaic generation (which reduces demand for electricity supplied through the grid).

The AEMC (2013) also highlighted the economic downturn and rising electricity prices as reasons behind the recent decline in demand:[49]

> Many factors may have contributed to this decrease in average demand, including the sectoral shifts in the economy such as growth in services sector as opposed to decreases in manufacturing sector, global economic trends, demand response from increasing electricity prices, energy efficiency programs and the installation of rooftop solar generation units. This is consistent with Western Australia, where similar factors have contributed to a general decrease in average demand since 2008-09.

5.1.1 AEMO National Electricity Forecasting Report 2014

The AEMO National Electricity Forecasting Report provides independent electricity consumption forecasts for each NEM region over a 10 to 20 year outlook period (2013–14 to 2033-34). The forecasts explore a range of scenarios across high, medium, and low demand growth outlooks, where the medium scenario is considered the most likely.[50]

Electricity demand forecasts for the National Electricity Market

Growth in electricity demand in the NEM is forecast to remain relatively subdued over the next few years (increasing by 0.4 per cent annually between 2013-14 and 2016-17); this growth is driven predominantly by liquefied natural gas (LNG) industrial demand in Queensland, as it consumes electricity in the extraction, transfer and processing of gas along the supply chain.

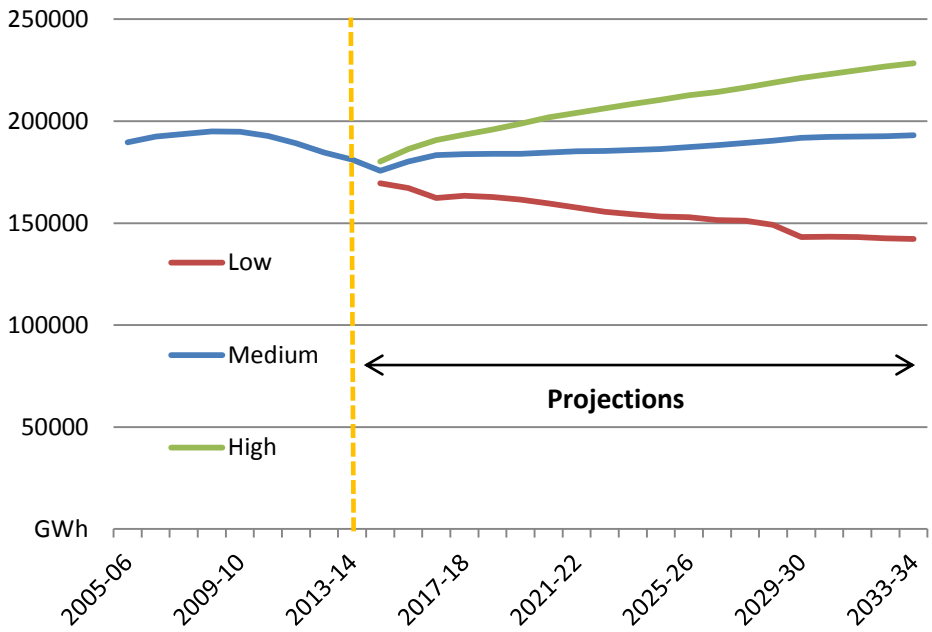
Without the LNG contribution, electricity consumption in the NEM would otherwise decline by 1.1 per cent annually between 2013-14 and 2016-17. Specifically, large industrial consumption (without LNG) is forecast to decline under this scenario by 3 per cent annually. Residential and commercial consumption is forecast to decline by 0.5 per cent annually irrespective of LNG.[51]

Industrial consumption growth from LNG is expected to be offset by a decline from energy-intensive industries, including the closure of the Point Henry aluminium smelter in Victoria. Other offsetting demand factors include forecast

strong growth in rooftop PV installations (particularly in Queensland and Victoria) and improved energy efficiency savings (with key contributions from air conditioning, refrigeration and electronics).

Over the longer term, after the initial ramp-up due to LNG projects, NEM electricity consumption flattens; this primarily reflects the impact of unfavourable economic conditions on energy-intensive industries (Figure 11).

Figure 11: 2014 NEM total annual energy consumption forecast[52]



Between 2013-14 and 2023-24, under the medium forecast scenario, NEM electricity consumption will increase at an average annual rate of 0.3 per cent. This compares with growth rates of 1.4 and -1.6 per cent under the low and high forecast scenarios respectively.

Between 2023-24 and 2033-24, under the medium forecast scenario, NEM electricity consumption will increase at an average annual rate of 0.4 per cent. This compares with growth rates of 1.2 and -1.2 per cent under the low and high forecast scenarios respectively.

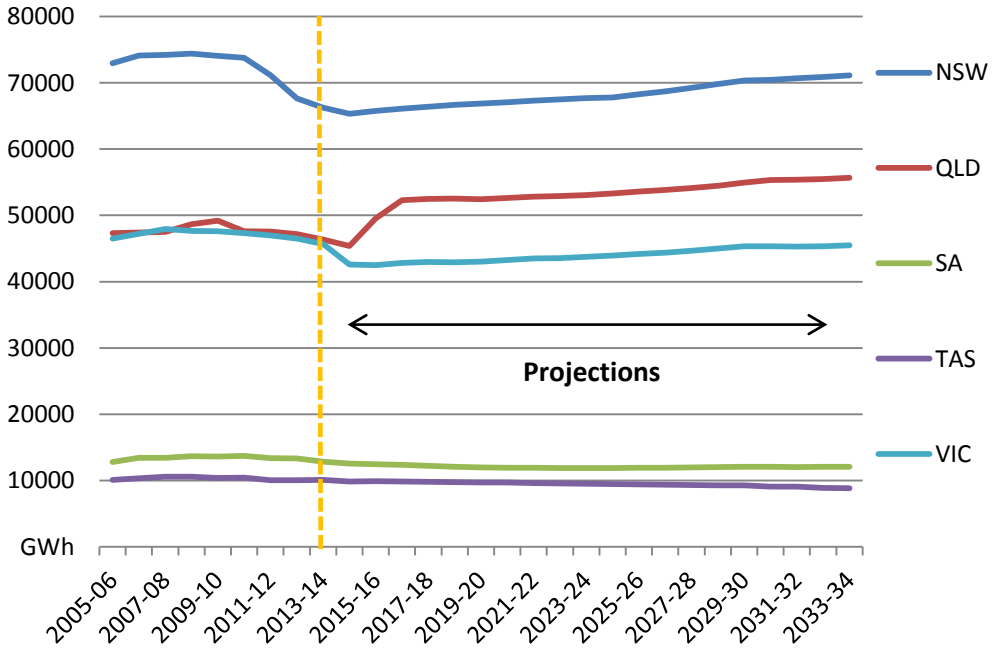
Under the medium demand scenario, electricity consumption in Queensland is forecast to grow at an average annual rate of 0.9 per cent between 2013-14 and 2033-34; the highest of the NEM regions. It is the only region in the NEM experiencing industrial growth, due to LNG projects. It also has the strongest growth in rooftop PV installations, which offsets overall consumption growth from the grid (Figure 12).

New South Wales consumption is forecast to increase at an average annual rate of 0.36 per cent between 2013-14 and 2033-34. Growth in New South Wales is expected to be constrained due to reduced large industrial forecasts.

Victorian consumption is forecast to decline slightly, driven by large industrial and manufacturing plant closures, including the Point Henry aluminium smelter in August 2014.

South Australian consumption is forecast to decline, with the desalination plant reducing consumption due to the completion of operational tests. Decreasing residential and commercial consumption in South Australia is a result of the highest existing levels of installed rooftop PV per capita.

Figure 12: 2014 NEFR operational annual energy forecasts[53]



Tasmanian consumption is forecast to decline despite increased production at the Norske Skog Boyer paper mill. The decline reflects subdued population growth and high rooftop PV installations.[54]

More detailed discussions around forecasts for specific States in the NEM can be found in their respective chapters of the National Electricity Forecast Report. Details relating to New South Wales' energy consumption forecasts are presented below.

Electricity demand forecasts for New South Wales

Over the medium term (2013-14 to 2016-17) electricity consumption in New South Wales is forecast to decline at an average annual growth rate of 0.07 per cent.

According to the AEMO (2014), key factors affecting growth in short-term demand include:[55]

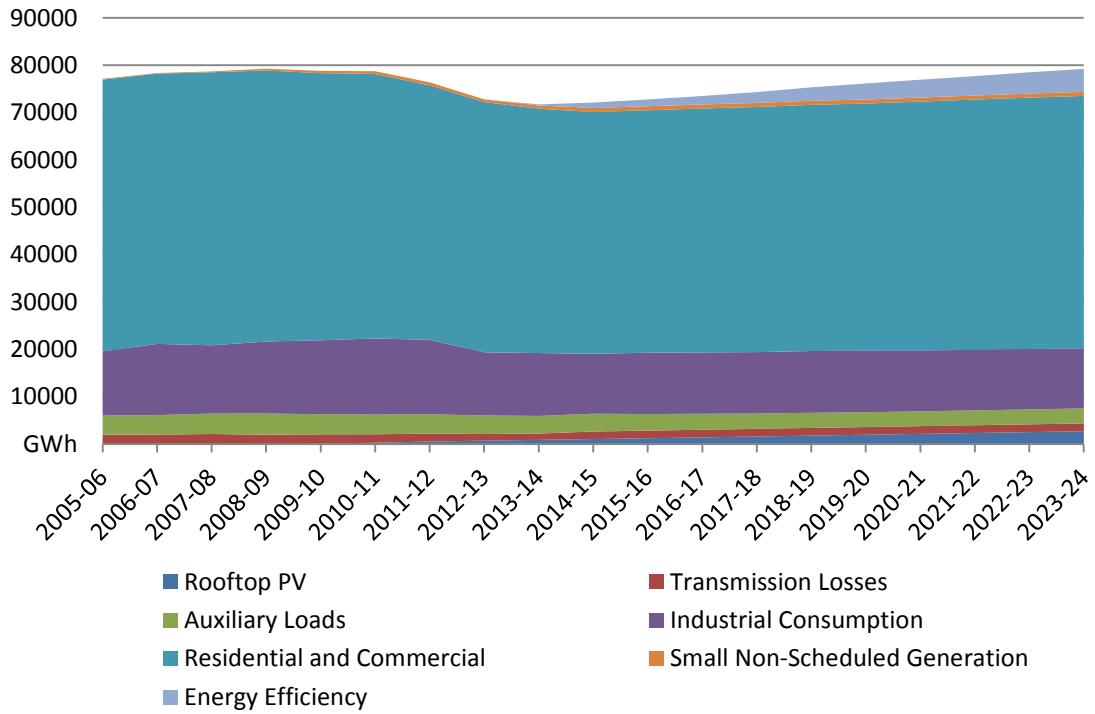
> Decreased large industrial forecasts which reflect lower production levels in key industries due to lower aluminium production than forecast in 2013, in response

to the global demand trends, lower metal prices, the high Australian dollar of recent years, and higher input costs. This includes implementation of on-site electricity generation by some companies, and Caltex refinery converting to a fuel import terminal with reduced electricity requirements.

A slight decline in residential and commercial consumption forecasts due to the continued impact of high existing levels of PV (combined with EE impacts) offsets any increase driven by state population and income growth.

Between 2013-14 and 2023-24, growth in energy demand in New South Wales is expected to be moderate, increasing at an average annual rate of 0.2 per cent. Demand growth is forecast to be higher in the following decade, increasing at an average annual rate of 0.5 per cent (Figure 13).

Figure 13: Annual energy forecast segments for New South Wales[56]



Maximum demand

Electricity demand fluctuates throughout the day (usually peaking in early evening) and by season (peaking in winter for heating and summer for air conditioning). Maximum demand or peak demand (the *largest* volume of electricity demanded within a specific time frame) rose steadily in the NEM until 2008–09. A succession of hot summers and the increasing use of air conditioners drove this trend. The proportion of Australian households with air conditioning or evaporative cooling increased from 59 per cent in 2005 to 73 per cent in 2011.[57]

According to the AEMC (2013), between 2007-08 and 2010-11, maximum demand grew at a much faster rate than average demand (the *total* amount of

electricity that is demanded across a specific time frame):[58]

> This is described as a decrease in "load factor", or the ratio of average demand to peak demand. Reductions in load factor can result in a proportion of the power system being underused, except on those days where peak demand is reached. This occurs because network and generation assets built to meet a few short periods of peak demand may not be used in other periods.
>
> This is not efficient if the costs of having such spare network and generation capacity is more than the value consumers place on the end use services from the electricity supplied during these peak times. It may result in additional costs for consumers and may contribute to increases in residential electricity prices.

The Clean Energy Council (2014) also concluded that the growth in peak demand and the subsequent need to increase generation capacity during these periods was a major factor contributing to rising electricity prices:[59]

> The growth in 'peak demand'…is a major factor that has helped drive up power bills. Peak demand periods typically occur on the hottest few days in summer…
>
> In the whole of 2012, peak demand occurred for a total period of less than 40 hours, but the cost of ensuring the power system can meet peak demand continues to add disproportionate costs.
>
> Energy policy experts generally agree that building additional power plants specifically to meet the small number of peak demand periods each year is the most expensive way to deal with the issue.

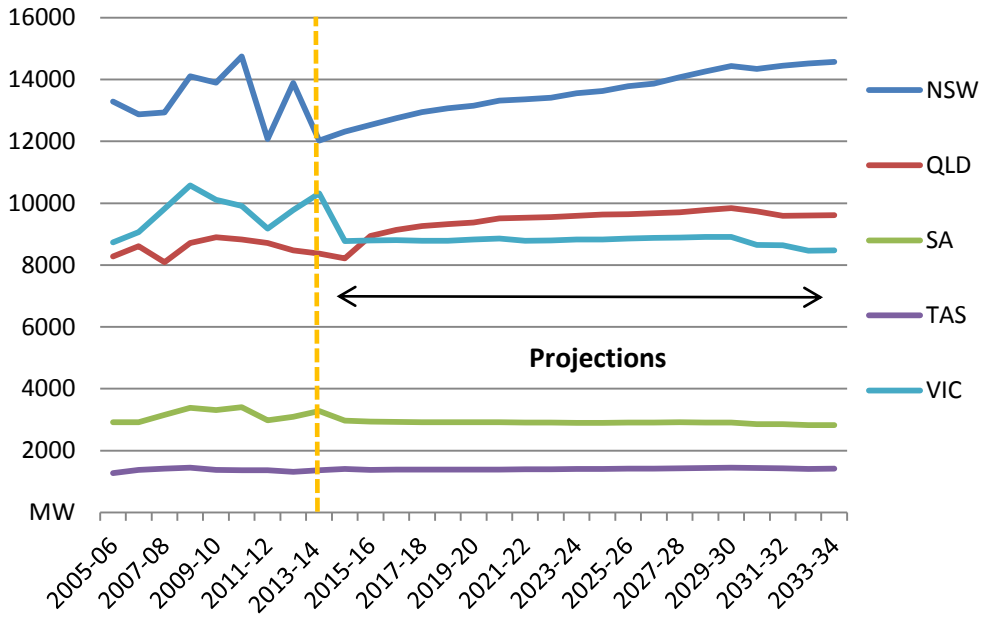
The AER (2013) also emphasised that the growth in maximum demand was a key driver of rising investment in energy networks over the past decade. At the time, maximum demand was forecast to keep rising at a rapid rate. But maximum demand has flattened since 2008–09, moving significantly below trend in the 24 months to 30 June 2013.[60]

According to the AEMO (2014), maximum demand over the next decade is forecast to increase in Queensland and New South Wales but remain below previous highs in the other regions in the NEM (Figure 14).

For New South Wales, the medium 50 per cent 'probability of exceedence' (i.e. the likelihood that a maximum demand forecast will be met or exceeded) maximum demand is forecast to increase at an annual average rate of 1.2 per cent between 2013-14 and 2023-24; Queensland is forecast to increase at an annual rate of 1.4 per cent over this period.

Only Queensland and New South Wales are expected to reach their historical record maximum demand within the long-term outlook period to 2034. Queensland reaches its historical record in 2015-16 due to LNG projects, and New South Wales in 2022-23 due to the lowest rate of growth in rooftop PV installations across the NEM.[61]

Figure 14: 2014 NEFR operational summer maximum demand forecasts[62]



For the other States in the NEM, peak demand is either forecast to grow at the same rate as average demand or to show an overall decline over the next decade. The net effect is that across the NEM, there is little divergence in future average and peak demand growth. According to the AEMC (2013):[63]

> A moderation in the historical trend of divergent peak and average demand growth may lead to more efficient and productive utilisation of the power system.

With such a trend the "load factor" (the ratio of average demand to peak demand) remains constant, meaning that less of the power system is underutilised outside of periods of peak demand; resulting in more efficient use of the electricity generation and distribution network.

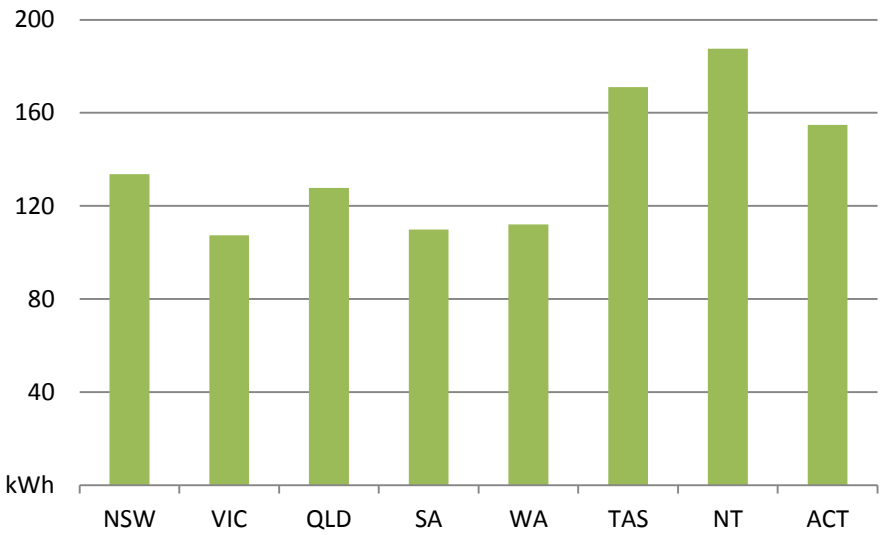
5.2 Household consumption

The Australian Bureau of Statistics published the results of the first Household Energy Consumption Survey in 2013 which included information on household energy expenditure, consumption, behaviours, perceptions and other characteristics related to household energy use.

When compared to the other Australian States and Territories, New South Wales ranked fourth in terms of household electricity consumption, consuming on average 133.7 kWh per household per week (Figure 15).

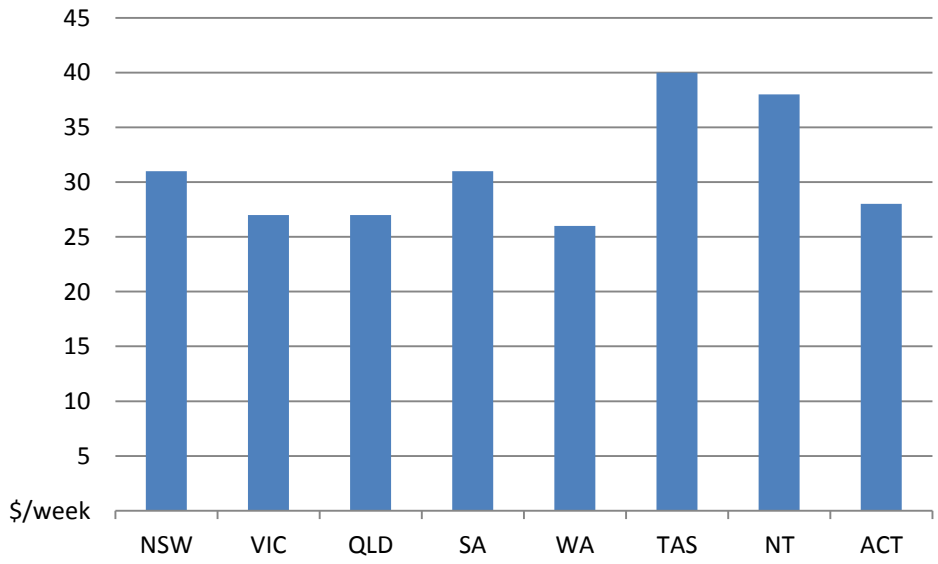
According to the survey results, the Northern Territory (187.5 kWh) consumed the most electricity per household, followed by Tasmania (171.1 kWh) and the ACT (154.8 kWh).

Figure 15: Mean weekly household electricity consumption, 2012[64]



New South Wales ranked third in terms of household electricity expenditure, spending on average $31 per household per week (Figure 16). According to the survey results, Tasmania ($40/week) spent the most on electricity per household, followed by the Northern Territory ($38/week) and South Australia ($31/week).

Figure 16: Average weekly household expenditure on electricity, 2012[65]



6. ELECTRICITY SUPPLY

New South Wales generates a significant share of its electricity from black coal (Table 4). In 2012-13, 70,337 GWh of electricity was generated in New South Wales; of this, 56,798 GWh (or 81 per cent) was generated from black coal. This figure is down from 2008-09 when 91 per cent of the State's electricity was generated from black coal. Black coal production has been increasing

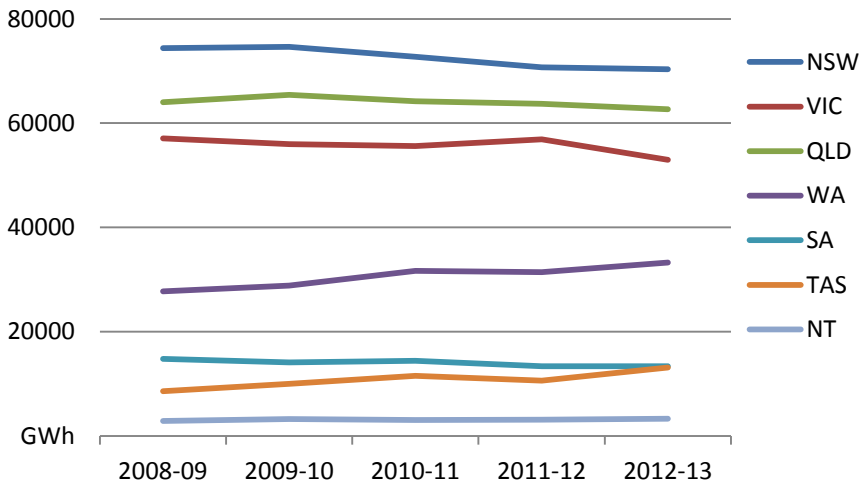
consistently in New South Wales over the last couple of decades; more than doubling between 1992-93 and 2012-13 at an average annual growth rate of 4.1 per cent.

Table 4: Electricity generation in New South Wales, by fuel type[66]

	2008-09	2009-10	2010-11	2011-12	2012-13
	GWh	GWh	GWh	GWh	GWh
Non-renewable fuels					
Black coal	67 650.3	64 398.6	60 732.2	60 453.7	56 798.6
Natural gas	2 445.1	4 681.3	4 742.7	4 212.1	5 168.7
Oil products	24.7	5.6	61.4	42.1	190.9
Other	336.6	493.6	266.1	0.0	0.0
Total non-renewable	**70 456.6**	**69 579.1**	**65 802.4**	**64 708.0**	**62 158.2**
Renewable fuels					
Bagasse, wood	291.3	295.3	253.3	413.6	425.4
Biogas	383.4	385.8	360.0	408.7	413.4
Wind	41.3	432.5	530.1	697.6	832.6
Hydro	3 173.7	3 820.8	5 267.0	3 792.8	5 651.6
Solar PV	36.3	119.2	526.3	657.7	856.0
Total renewable	**3 926.0**	**5 053.6**	**6 936.7**	**5 970.3**	**8 179.0**
Total	**74 382.6**	**74 632.7**	**72 739.1**	**70 678.3**	**70 337.2**

Electricity generation has actually declined in recent years across most of the eastern States in Australia. Between 2008-09 and 2012-13, electricity generation declined in New South Wales (down by 5.4 per cent), Victoria (7.2 per cent), Queensland (2.1 per cent) and South Australia (9.4 per cent); while increasing in Western Australia (up by 20 per cent), Tasmania (53 per cent) and the Northern Territory (13 per cent).

Figure 17: Electricity generation in Australia, by State



6.1 Electricity generation capacity in the NEM

Most electricity dispatched in the NEM is generated using coal, gas, hydro and

wind technologies. Figure 18 illustrates the location of major generators in the NEM and the technologies in use.

Figure 18: Electricity generation in the National Electricity Market[67]

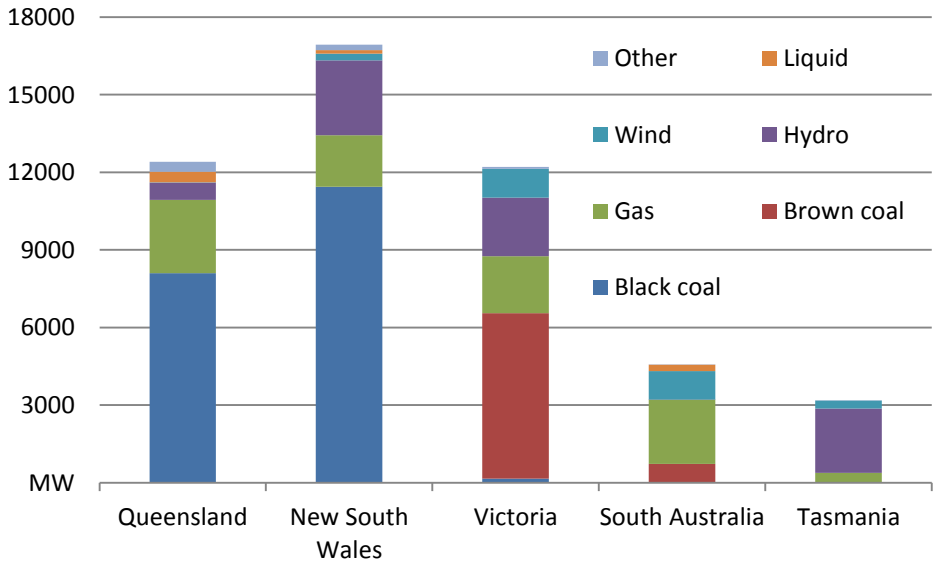
The diversity in electricity generation capacity in the NEM is, according to the AER (2013), required to respond to the changing demand and supply characteristics within market: [68]

The demand for electricity is not constant, varying with the time of day, the season and the ambient temperature. A mix of generation technologies is needed to respond to these demand characteristics. Plant with high start-up and shut down costs, but low operating costs tend to operate relatively continuously; for example, coal generators may require up to 48 hours to start up. Generators with higher operating costs, but with the ability to quickly change output levels (for example, open cycle gas powered generation) typically operate when prices are high (especially in peak demand periods). Intermittent generation, such as wind and solar, can operate only when the weather conditions are favourable.

In the NEM, black and brown coal account for 55 per cent of registered capacity, but supply 75 per cent of output. Gas powered generators account for 20 per cent of registered capacity, but they supply only 12 per cent of output. Hydroelectric generators account for 17 per cent of registered capacity but contribute 9 per cent of output. Wind generators account for 5.4 per cent of capacity and contribute 3.4 per cent of output.[69]

As at April 2014, 68 per cent of generation capacity in New South Wales came from black coal generation; the majority of the other generation capacity came from hydro (17 per cent) and gas (12 per cent) (Figure 19).

Figure 19: Registered generation capacity, by region and fuel source, as at April 2014[70]

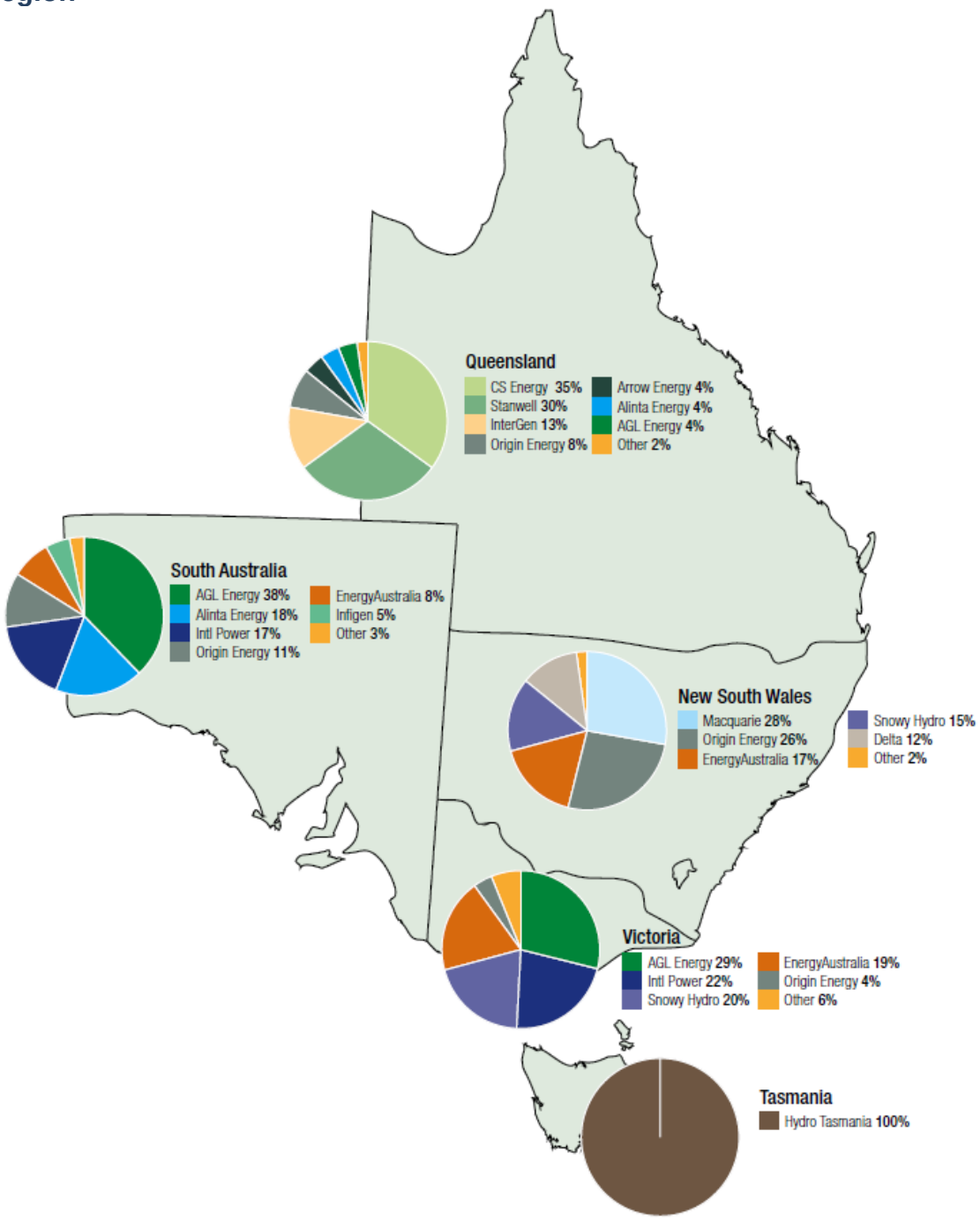


In Queensland, the majority of capacity is sourced from black coal (65 per cent); and the remainder from gas (23 per cent) and hydro (5 per cent). The majority of Victoria's generation capacity is sourced from brown coal (52 per cent); while the Tasmania source the majority of their electricity from renewable sources such as hydroelectricity and wind turbines. Among the NEM jurisdictions, South Australia is the most reliant on gas powered generation.

6.2 Electricity trading in the NEM

In New South Wales, state corporations own around 90 per cent of generation capacity. In 2011 the State Government sold one-third of the State owned generation trading rights[71] to TRUenergy (rebranded in 2012 as EnergyAustralia) and Origin Energy (Figure 20).

Figure 20: Market shares in electricity generation trading rights, by region[72]



Following the sale, control over the electricity generation trading rights in New South Wales is now split between the government entities Macquarie

Generation (28 per cent) and Delta Electricity (12 per cent), and the private entities Origin Energy (26 per cent) and EnergyAustralia (17 per cent) (Figure 21).[73]

More details around the electricity generation ownership arrangements in the NEM can be found in Section 1.4 of the AER State of the Energy Market 2013 report.

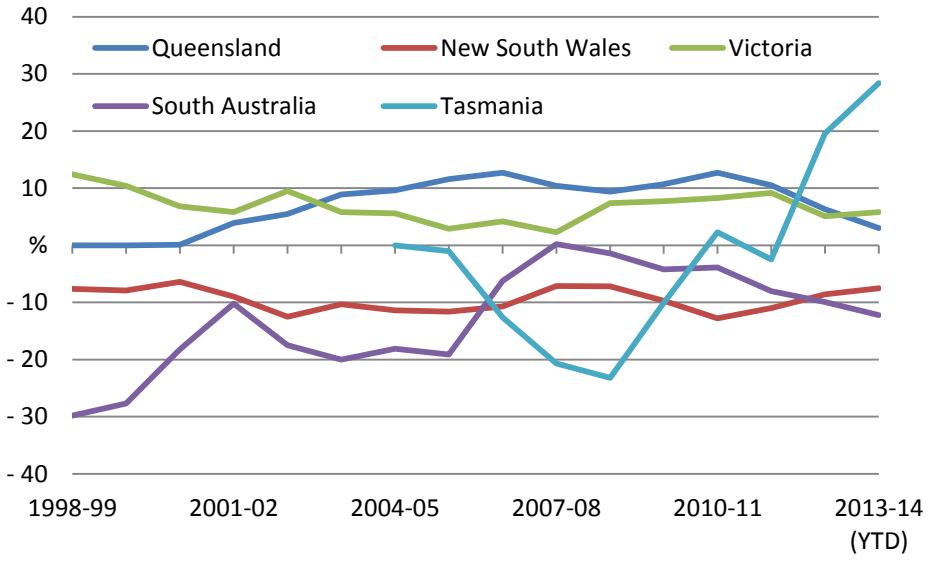
The NEM promotes efficient generator use by allowing electricity trade between the five regions, which transmission interconnectors link. According to the AER (2013):[74]

> Trade enhances the reliability of the power system by allowing each region to draw on a wider pool of reserves to manage generator outages. It also allows high cost generating regions to import electricity from lower cost regions.

Figure 21 presents the net trading positions of the regions since the NEM commenced. Specifically, it shows the annual interregional trade as a percentage of regional energy consumption, with a negative value corresponding with imports, and vice versa.

In 2012-13, annual interregional imports into New South Wales accounted for 8.6 per cent of regional energy consumption. New South Wales has relatively high fuel costs, making it a net importer of electricity. Imports reached a 'peak' in 2010-11 in which they represented 12.8 per cent of regional energy consumption.

Figure 21: Net trading positions of NEM regions



Victoria has substantial low cost coal fired generation, making it a net exporter of electricity (particularly to New South Wales and South Australia). Queensland's surplus capacity and low fuel prices make it a net exporter. The region's relatively high spot prices in 2012–13 resulted in lower export volumes than in previous years.

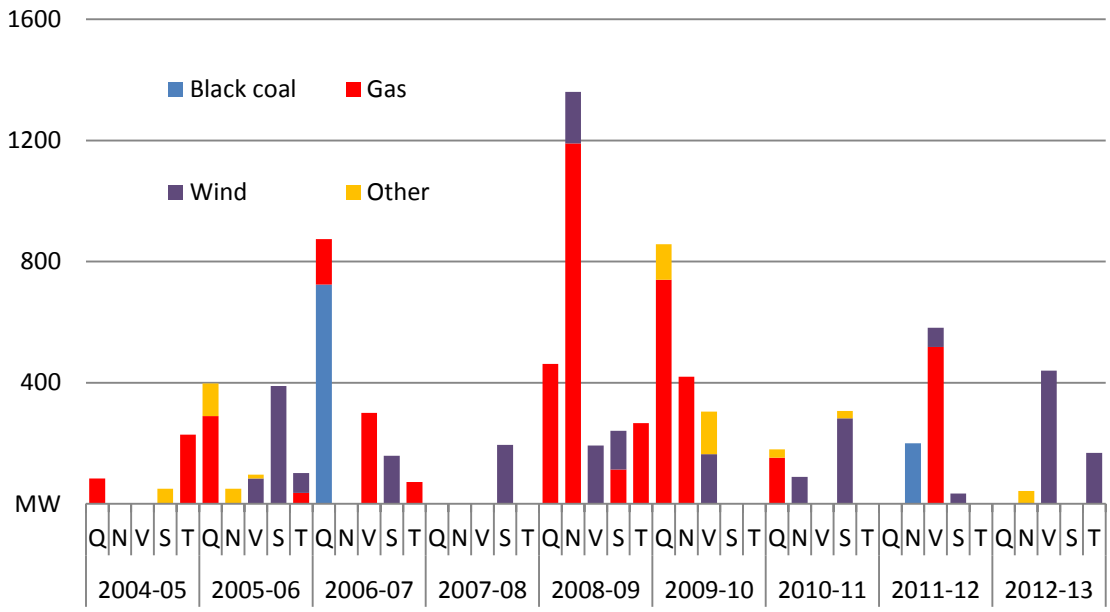
Tasmania has a volatile trade position, depending on market conditions for hydro generation. It has frequently been a net importer, notably when drought affected hydro generation between 2007 and 2009. But the introduction of carbon pricing in July 2012 enhanced the competitiveness of hydro generation, resulting in Tasmania becoming a major net exporter in 2012–13.[75]

6.3 Investment in electricity generation capacity

Price signals in the wholesale and forward contract markets drive new electricity generation investment in the NEM. From the start of the NEM in 1999 to June 2013, 13 850 MW of registered generation capacity (around 1000 MW per year) has been added to the NEM.[76]

A tightening in supply conditions led to an upswing in generation investment between 2008−09 and 2009−10, with over 4100 MW of new capacity added in those years; predominantly gas fired generation in New South Wales and Queensland (Figure 22).

Figure 22: Annual investment in registered generation capacity[77]



Adequate capacity and subdued demand expectations reflect the limited amount of investment recently. Of the 2000 MW of capacity added over the three years to 30 June 2013, over 50 per cent was in wind generation (which the renewable energy target scheme partly subsidises). The balance of investment over the past three years was in gas fired plants in Victoria, South Australia and Queensland. The only investment in coal fired generation related to upgrades of the Eraring power station in New South Wales.[78]

In 2012–13, 522.7 MW of new large-scale generation was added to NEM generation capacity. The majority of this new capacity (439.5 MW) was in wind generation (Macarthur Wind Farm (420 MW) and Morton's Lane Wind Farm (19.5 MW)) in Victoria. New thermal generation in 2012-13 comprised a 60 MW

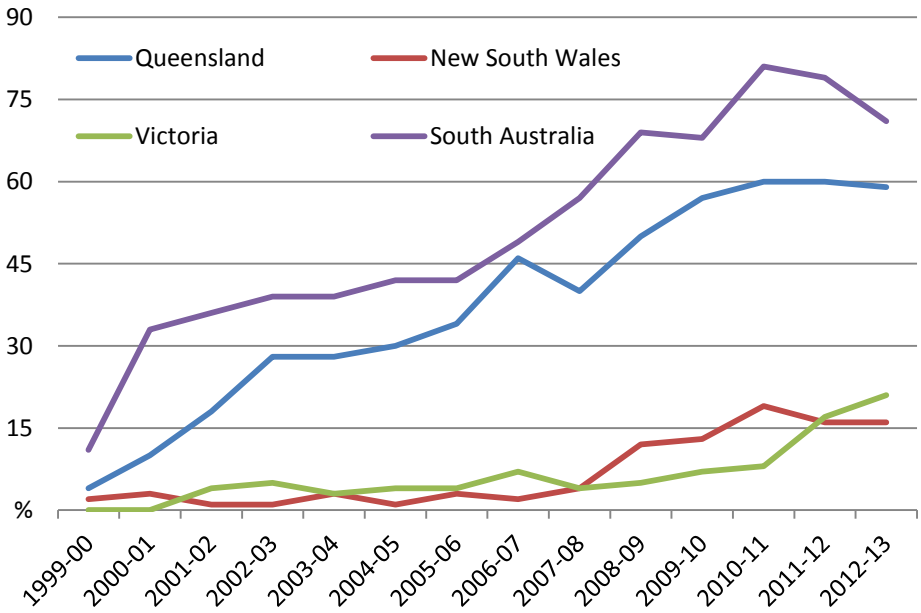
capacity increase of Unit 4 at New South Wales' Eraring Power Station.[79]

Only 170 MW of new generation capacity was commissioned in 2013-14. The Musselroe Wind Farm (168 MW) was the only large-scale generation plant commissioned in 2013–14. The Mildura demonstration solar plant (1.5 MW) in Victoria and the Capital East Solar Farm (0.13 MW) in New South Wales were also commissioned in this period.[80]

Figure 23 shows the cumulative net change in generation capacity since the start of the NEM. South Australia and Queensland have had the greatest net change in generation capacity since 1990-00.

As at the end of 2012-13, South Australia had increased its capacity by 71 per cent, while Queensland's capacity was 59 per cent higher. New South Wales and Victoria, on the other hand, have had more subdued growth in generation capacity, increasing by 21 and 16 per cent respectively to the end of 2012-13.

Figure 23: Cumulative net change in generation capacity, 1999-00 to 2012-13[81]



6.4 Outlook for investment in generation capacity

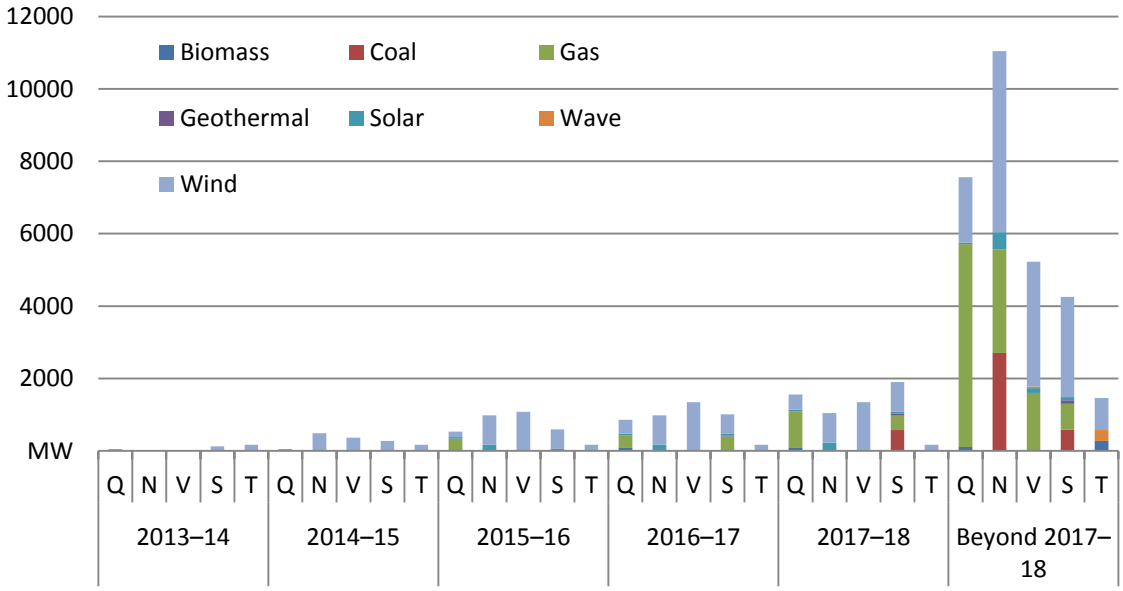
Subdued electricity demand and surplus capacity have pushed out the required timing for new electricity generation investment (Figure 24). According to the AEMO (2013):[82]

> Reduced growth in energy use across the National Electricity Market compared to 2012, rising domestic rooftop photovoltaic generation, increasing consumer response to recent growth in electricity prices, and the development of new large-scale renewable generation is expected to defer new thermal electricity generation investment.

According to the AEMO (2014), committed projects total 1,165 MW capacity,

with expected commissioning between July 2014 and January 2016. This capacity includes: 219 MW of large-scale solar generation; 940.2 MW of wind generation; and 6MW of additional gas generation.

Figure 24: Major proposed generation investment – cumulative, as at June 2012[83]



The AEMO (2014) is also tracking 25,329 MW of proposed new generation capacity; this includes 58 per cent (14,589 MW) wind, 25% per cent (6,300 MW) gas, 8 per cent (2,000 MW) coal, 4 per cent (1,152 MW) solar, 2 per cent (599 MW) water, and 3 per cent (689 MW) other generation.

Climate change policies, including the renewable energy target and subsidies for rooftop solar PV installations, catalysed the growth in solar PV generation capacity over the past five years. The subsidies include feed-in tariff schemes established by state and territory governments, under which distributors or retailers pay households for electricity generated from rooftop installations.[84] The AEMO (2013) noted the role of such renewable energy policies in the changing composition of generation in the NEM:

> The NEM generation fleet continues to evolve in response to government renewable energy policies. For example, the Large-scale Renewable Energy Target (LRET) continues to drive the entry of renewable generation capacity. However, demand-driven investment signals for new plant remain muted.

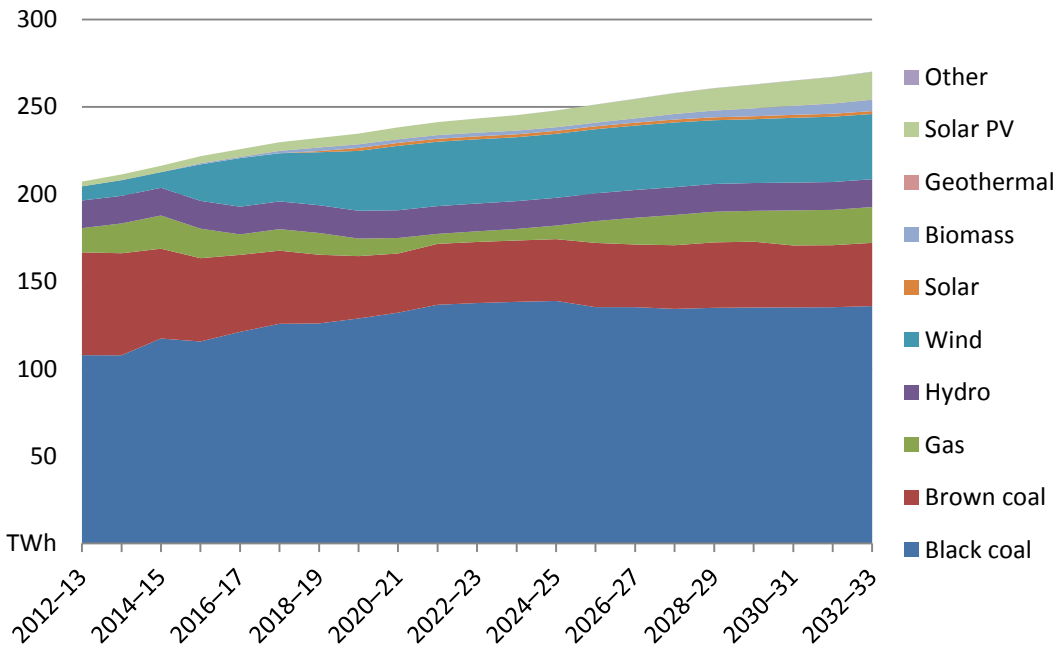
With further investment scheduled in renewable technologies, the contribution of traditional fuel sources (such as black and brown coal) to the NEM is forecast to decline in the medium to longer term (Figure 25).

The AEMO (2013) highlighted the pivotal role future government policy will have in determining the energy mix in the NEM:[85]

> Any changes resulting from the forthcoming 2013 Federal Government election

may also impact current energy policy settings and investment drivers. Potential changes may impact the future mix of generation projects, either through changed incentives for withdrawing existing plant, or a reassessment of the timing and/or technology of proposed future projects.

Figure 25: Forecast contribution of generation technologies to meet electricity demand[86]



6.5 Future adequacy of electricity supply in the NEM

The 2014 Electricity Statement of Opportunities (ESOO) by the AEMO provides analysis of electricity generation and demand-side investment in the NEM over a 10-year outlook period under a range of economic scenarios.

The ESOO specifically assesses the adequacy of existing and committed electricity supply to meet demand in the NEM by identifying Low Reserve Condition (LRC) points; these points indicate when additional investment in generation or demand-side participation may be required to maintain electricity supply reliability within the NEM Reliability Standard.[87]

For the first time in the NEM's history, as a result of decreasing electricity consumption, no new capacity is required in any NEM region to maintain supply adequacy over the next 10 years.[88] Consistent with the 2013 ESOO, the 2014 modelling shows no reserve deficits under the low growth scenario. Under medium growth conditions, the previous LRC point in Queensland (2019–20) is deferred by at least four years to beyond 2023–24. No other LRC points exist under the medium growth scenario.

According to the AEMO (2014), changes to LRC points since the 2013 ESOO are primarily linked to the lower forecast growth in electricity consumption

reported in the 2014 NEFR:[89]

> The 10-year average annual growth rate for the 2014 NEFR medium scenario is 0.3%, which is lower than the 1.3% forecast in the 2013 NEFR. The 2014 NEFR high scenario forecasts are lower than the 2013 NEFR medium scenario forecasts.

Reasons for reduced electricity consumption in the short-term (2013–14 to 2016–17) include:[90]

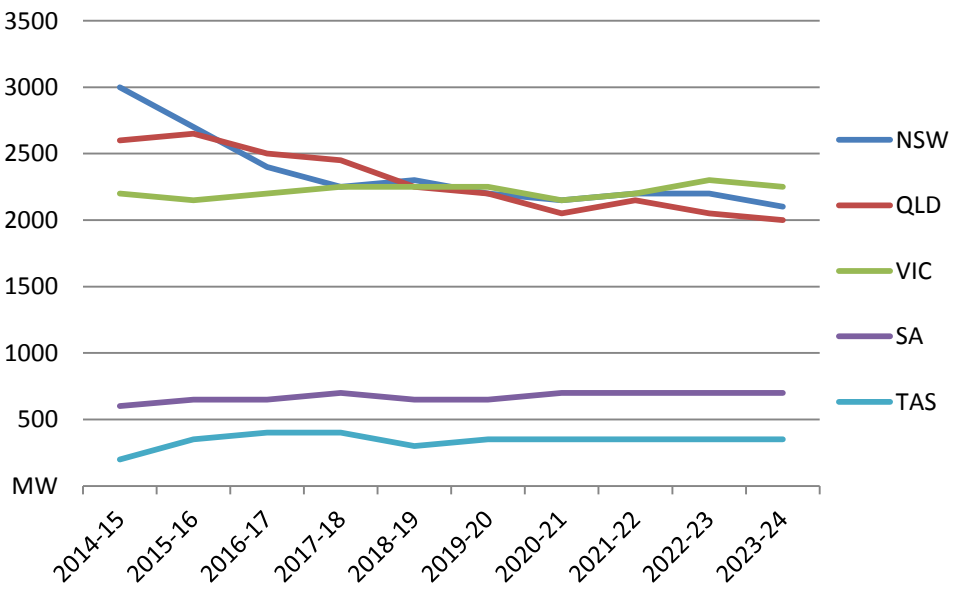
- A decline in energy-intensive industries, including closure of the Point Henry aluminium smelter in Victoria.
- Strong growth (24 per cent average annual) in rooftop PV installations, particularly in Queensland and Victoria.
- Strong growth (10 per cent average annual) in total energy efficiency savings.

6.5.1 Surplus capacity in the NEM

As part of the 2014 ESOO, the AEMO (2014) calculated how much generation capacity could be removed from the NEM without affecting system reliability (For details around the methodology see page 7 of the 2014 ESOO).

From the analysis, the AEMO (2014) found that more than 7,500 MW would need to be removed from the market to affect supply-adequacy in 2014–15.There is potentially between 7,650 MW and 8,950 MW surplus capacity across the NEM in 2014–15. Approximately 90 per cent of this is in New South Wales, Queensland, and Victoria. Figure 26 shows the amount of capacity that can be removed for each individual region under the medium scenario.

Figure 26: Surplus capacity by NEM region under medium scenario



As operational consumption increases, the level of surplus capacity decreases. However, even with 10 years of consumption growth, by 2023-24 between 1,100 MW and 3,100 MW of capacity could still be withdrawn from each of New South Wales, Queensland, and Victoria without breaching the reliability standard (Table 5).

Table 5: Surplus capacity by region across high, medium and low growth scenarios[91]

Region	2014-15	2023-24
Queensland	2,200 MW to 2,850 MW	1,100 MW to 3,650 MW
New South Wales	2,800 MW to 3,100 MW	1,500 MW to 3,450 MW
Victoria	1,950 MW to 2,200 MW	1,450 MW to 3,100 MW
South Australia	550 MW to 600 MW	350 MW to 1,050 MW
Tasmania	150 MW to 200 MW	250 MW to 750 MW
Total	7,650 MW to 8,950 MW	4,650 MW to 12,000 MW

6.5.2 Future adequacy of electricity supply in NSW

For New South Wales, even under the high economic growth scenario, no LRC point is observed within the 10-year outlook period. This represents an LRC point delay of at least two years compared to the 2013 ESOO. Over the outlook period, New South Wales will have sufficient surplus generation capacity to meet growing local consumption and exports to Queensland.[92]

Prospective generation investment in New South Wales is focused on wind, with 27 projects identified, mainly through the Liverpool Range, Uungula, Rye Park, Yass Valley, and Sapphire proposals.

The committed projects, Gullen Range (166 MW) and Taralga (107 MW), are due to be completed in 2014; and Boco Rock Stage 1 (113 MW) is to be completed in 2015. The Golspie Wind Farm is no longer being pursued.

There has been a significant reduction in the number of gas-powered generation proposals, with 1,470 MW of total generation capacity no longer being pursued. This includes the Bannaby, Buronga, Leafs Gully, Narrabri 1 and 2, and Parkes Peaking proposals.

Solar generation investment remains strong in New South Wales, with 11 projects identified. These include three committed projects: Royalla (20 MW) to be completed in 2014; and Broken Hill (53 MW) and Nyngan (102 MW), to be completed in 2015.[93]

7. PROFILE OF THE RETAIL ELECTRICITY MARKET

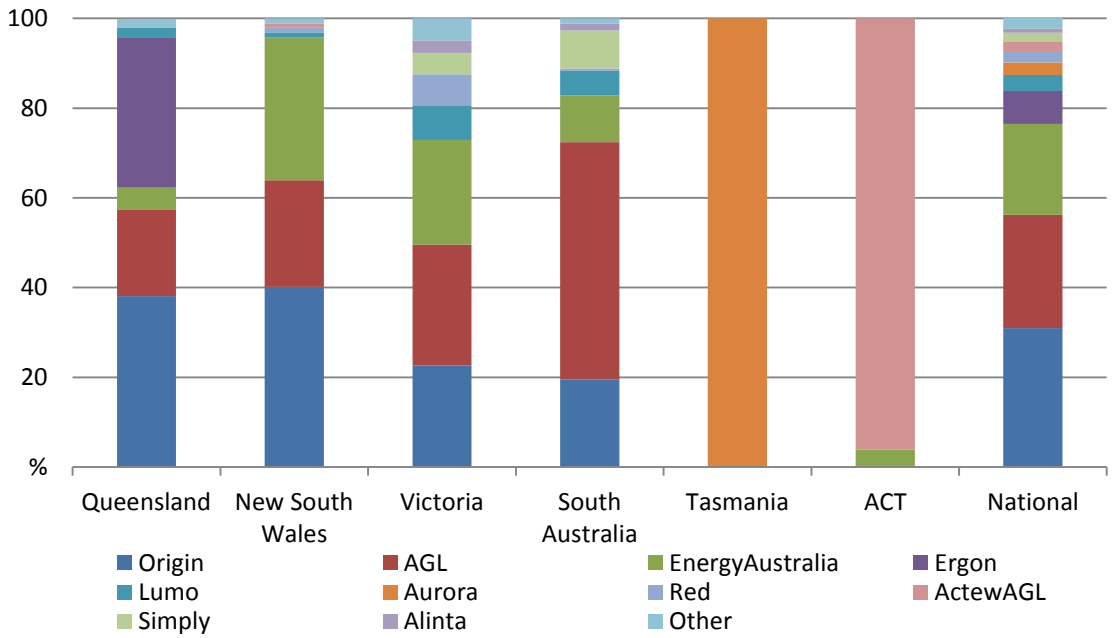
7.1 Retail competition

Australia's retail electricity market tends to be highly concentrated, with three or fewer retailers accounting for more than 90 per cent of share in four of the six jurisdictions.

AGL Energy, Origin Energy and EnergyAustralia (formerly TRUenergy) are the leading energy retailers in southern and eastern Australia.[94] The three jointly supplied 77 per cent of small electricity customers.

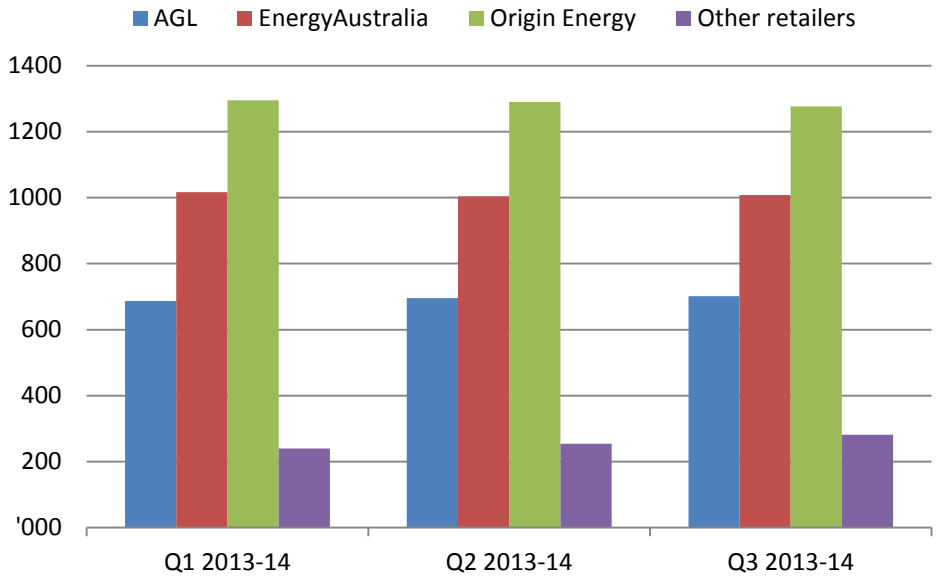
Victoria has the highest penetration of smaller private retailers, which accounted for 27 per cent of electricity customers. In South Australia, smaller retailers accounted for 17 per cent of electricity customers (Figure 27).

Figure 27: Retail electricity market share (small customers), August 2013[95]



At the end of the third quarter of 2013-14, the three major retailers (AGL, EnergyAustralia and Origin Energy) accounted for around 91 per cent of residential and small business electricity customers in New South Wales. The distribution of customers between these retailers has remained relatively stable over the 2013-14 financial year; data is not available prior to this period (Figure 28).

Figure 28: Small customers for NSW electricity retailers, Q1 to Q3 2013-14[96]



The rate at which customers switch their supply arrangements can indicate customer participation in the market. While switching rates may indicate competitive activity, the AER (2013) noted that such data must be interpreted with care:[97]

> Switching is sometimes high during the early stages of market development, when customers can first exercise choice, but may then stabilise as a market acquires depth. Similarly, switching may be low in a competitive market if retailers deliver good quality and low priced service that gives customers no reason to change.

The AEMO publishes data measuring the number of customer switches from one retailer to another (but not customer switches between contracts with the same retailer).

Victoria continues to have a highest switching rate in Australia, and in 2013−14 recorded its highest ever switching rates in electricity (30 per cent of customers).

Switching activity in New South Wales and South Australia rose in each of the past few years, with rates in 2012−13 being the highest recorded in each state. Strong growth in New South Wales in 2012−13 led to its switching rates exceeding that of South Australia for the first time; and its switching rate for electricity reached a level previously seen only in Victoria (Figure 29).

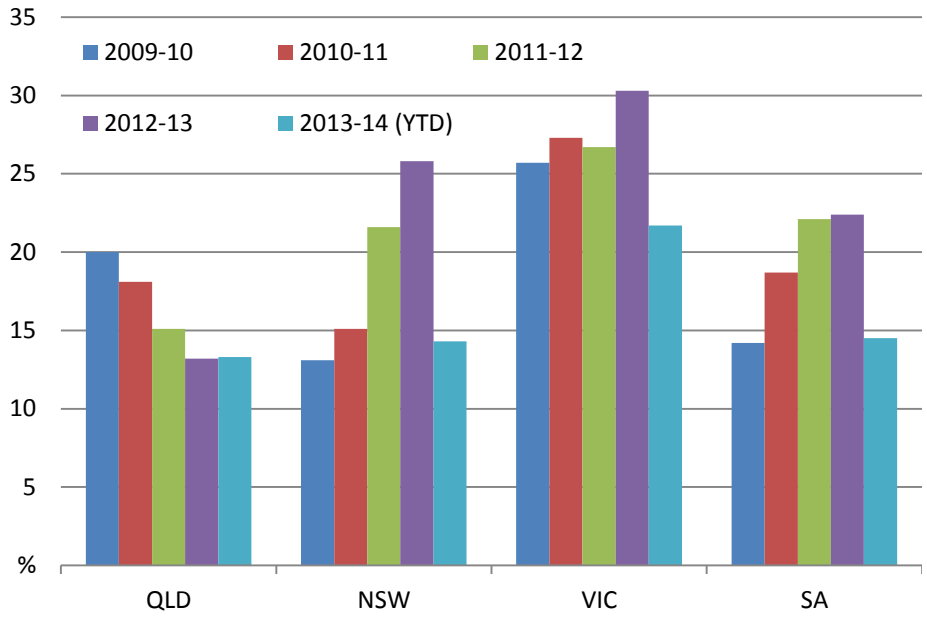
Queensland's switching rates were once comparable with those in New South Wales and South Australia, but have fallen in recent years. According to the AER (2013):[98]

> This fall coincided with a reduction in the marketing effort by energy retailers in Queensland, reflecting concerns about the process for setting regulated

electricity prices.

Queensland's electricity switching rate in 2012−13 was its lowest since the introduction of full retail contestability.

Figure 29: Small customer switching of electricity retailers[99]



7.2 Australian Energy Market Commission Review of Competition in Retail Electricity and Natural Gas in New South Wales

In October 2013, the AEMC released its final report reviewing competition in New South Wales retail energy markets. As part of the review, the Commission considered whether: consumers were active in the market; there were any barriers to entry, expansions, or exit from the market; there was independent rivalry; consumers were satisfied with market outcomes; and retailers were making profit margins consistent with a competitive market.

The Commission found that competition was delivering discounts and other benefits to small consumers in the New South Wales retail electricity markets. The Commission concluded that:[100]

> …competition in NSW is now sufficiently robust to promote choice for consumers and we expect removing retail price regulation for all consumers will lead to more innovation, increased product choice, and competitive pricing.

In forming this view, the Commission noted that the nature of the retail operating environment had been affected by the privatisation of government-owned retail businesses. Specifically, new retailers had entered the New South Wales electricity retail market in recent years, further challenging the incumbents. As a result, retailers have had to compete more actively to attract and to retain customers by providing greater discounts.

With respect to consumer participation in the market, the Commission noted that:[101]

> Consumers are responding to increasing prices by shopping around and taking advantage of the numerous competitive offers available. Consumers have been changing retailers at increasing rates and the number of consumers on regulated tariffs is consistently decreasing.
>
> As a result of increased consumer participation, retailers have responded to the way in which consumers want to engage. Following high complaint levels regarding door knocking practices, all of the large retailers have announced they will cease door knocking.

Based on the level of consumer participation and retail competition in the market the Commission concluded that:[102]

> Regulated pricing does not provide benefits to consumers where there is effective competition. Retaining price regulation can lead to prices being higher than necessary or being temporarily set too low, forcing retailers to reduce service or leave the market.

Following the review, the Commission recommended that:[103]

> …retail price regulation is removed for all consumers at the same time. Where competition is providing consumers with a choice of energy products at efficient prices, retail price regulation is more likely to inhibit competition than to promote it.

In response to these and other recommendations, the NSW Government removed retail price regulation from 1 July 2014. This means that IPART no longer sets electricity prices for regulated customers.

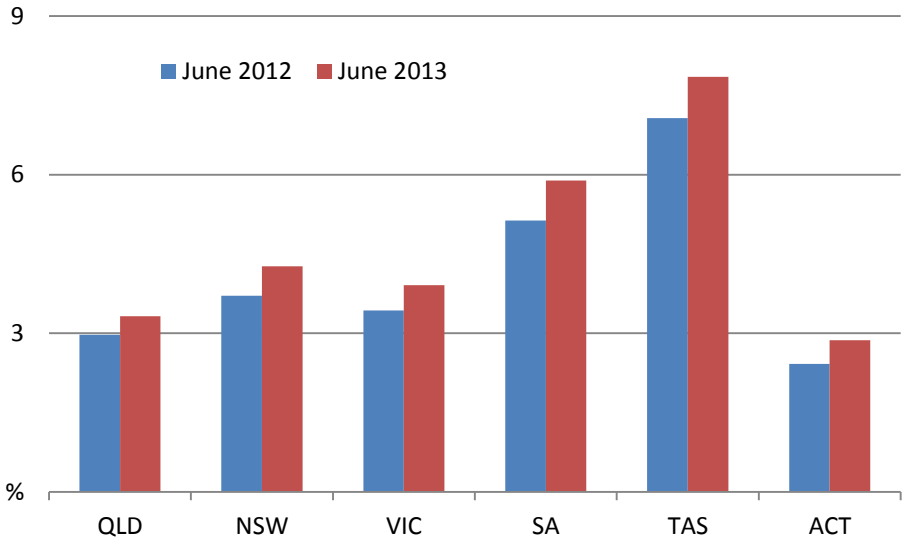
7.3 Electricity affordability - debt and disconnections[104]

Energy affordability, according to the AER (2013), relates to:[105]

> …a customers' ability to pay their energy bills. While rising energy prices contribute to the number of customers with payment difficulties, affordability also depends on energy consumption levels, household income and financial assistance or concessions.

AER research found average electricity costs rose faster than household disposable income during 2012−13. For a benchmark low income household that receives bill concessions, electricity costs accounted for between 2.4 and 7.1 per cent of their disposable income in 2011−12 (depending on region), rising to between 2.9 and 7.9 per cent in 2012−13 (Figure 30).

Figure 30: Annual electricity costs, as a percentage of disposable income for low income households[106]

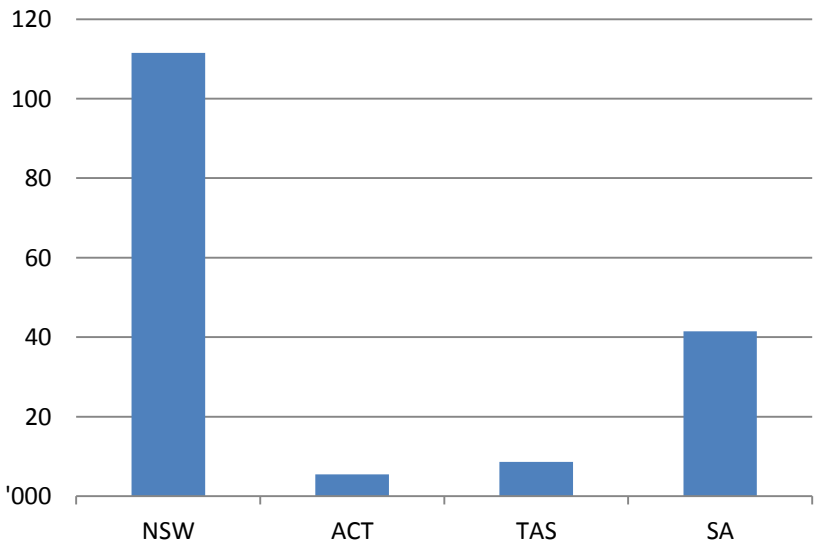


Energy bill debt, as defined by the AER (2013):[107]

> …is the amount owed to a retailer that has been outstanding for 90 days or more. Energy bill debt indicates how well customers are managing the cost of their energy service, and demonstrates the retailers' responsiveness to customers experiencing financial difficulty.

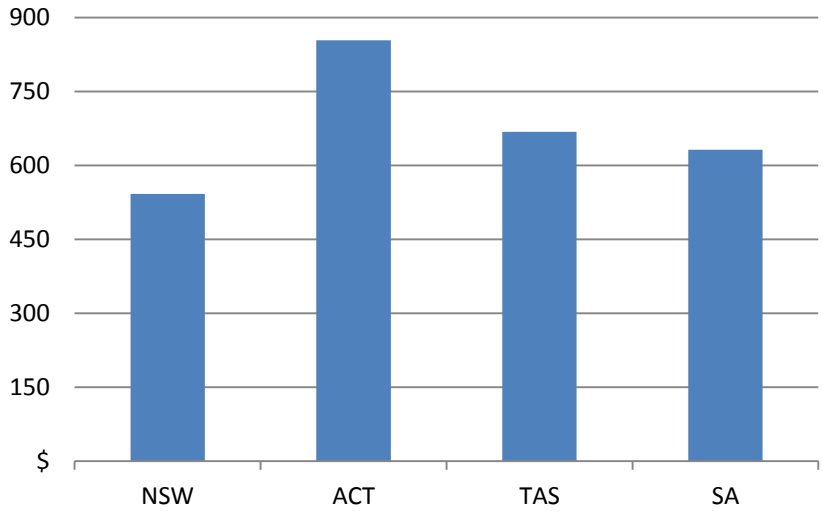
The number of residential electricity customers in New South Wales with debt stood at 111,514 in the March quarter of 2013-14 (Figure 31). This is slightly down on the number recorded for the December quarter (115,138). South Australia had 41,488 residential customers with electricity debt; while Tasmania and the ACT had 8,603 and 5,430 customers with debt respectively.

Figure 31: Residential electricity customers with debt, Q3 2013-14[108]



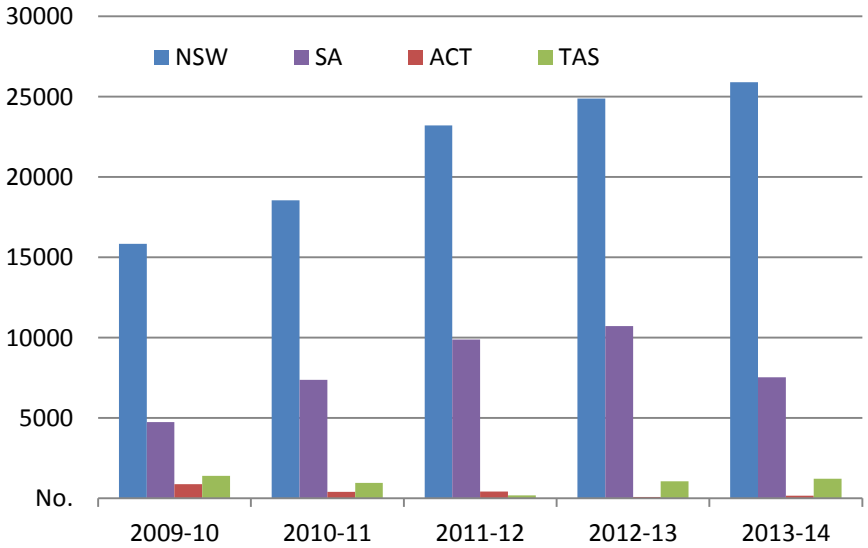
The average size of the electricity debt varied across jurisdictions, with the ACT recording the highest average level of residential electricity debt in the March quarter of 2013-14 (Figure 32). This continues a steady increase in the average size of the electricity debt for customers in the ACT, with average debt now 15 per cent higher than a year previous. Tasmania ($668 per customer) and South Australia ($632) had the next highest average electricity debts. New South Wales recorded the lowest average level of electricity debt at $542 per customer; this is down from $655 in the September quarter in 2013-14.

Figure 32: Average residential electricity debt, Q3 2013-14 [109]



Rising electricity prices, over the medium term, has led to an increase in the number of residential disconnections; particularly in New South Wales where the number of residential disconnections has risen by 64 per cent between 2009-10 and 2013-14 (Figure 33).

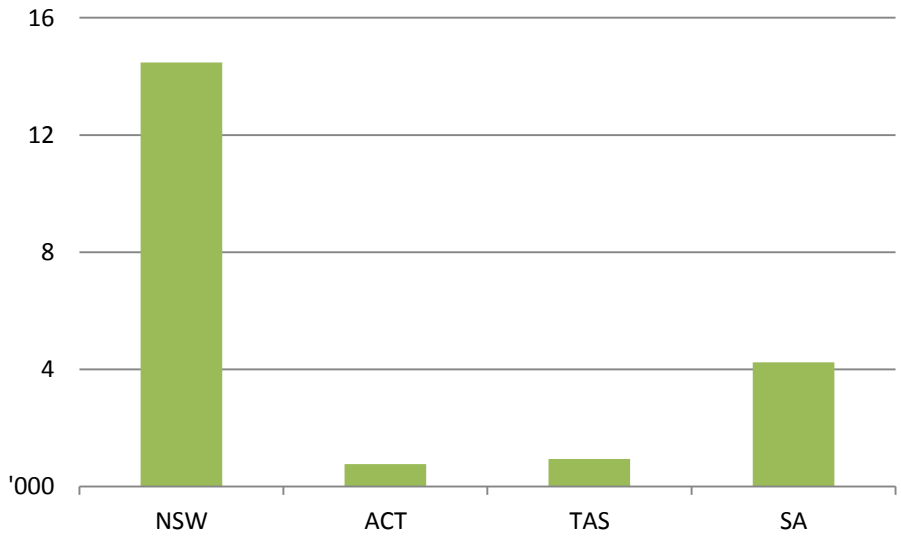
Figure 33: Residential electricity disconnections, 2009-10 to 2013-14[110]



The number of residential electricity disconnections also increased in South Australia (having doubled between 2009-10 and 2012-13); while decreasing from low bases in Tasmania and the ACT.

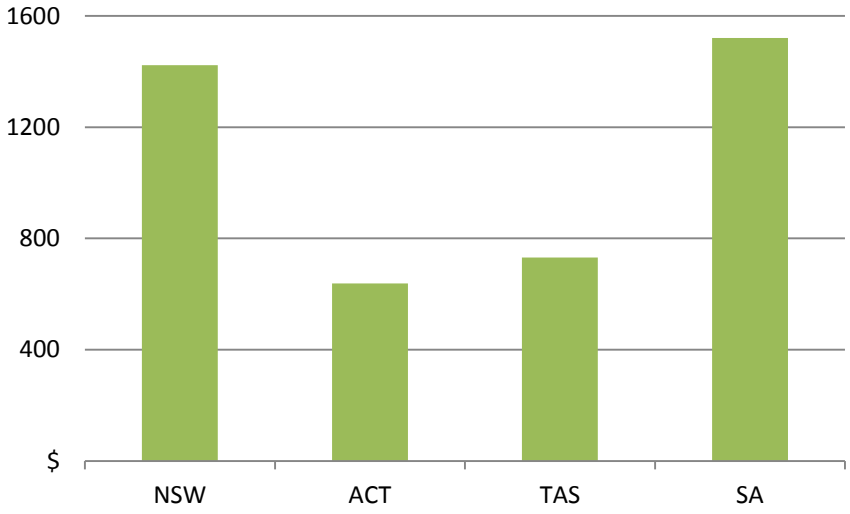
The number of small business electricity customers in New South Wales with debt stood at 14,475 in the March quarter of 2013-14. This is slightly down on the number recorded for the December (14,505) and March (14,720) quarters (Figure 34). South Australia had 4,234 small business customers with electricity debt; while Tasmania and the ACT had 942 and 767 customers with debt respectively. South Australia has seen a notable reduction in this figure, down from 6,925 in the March quarter of 2012-13. Tasmania and the ACT are mostly unchanged from a year previous.

Figure 34: Small business electricity customers with debt, Q3 2013-14[111]



As expected, the average size of small business electricity debt is mostly higher (except for the ACT) than that of residential customers (Figure 35).

Figure 35: Average small business electricity debt, Q3 2013-14[112]

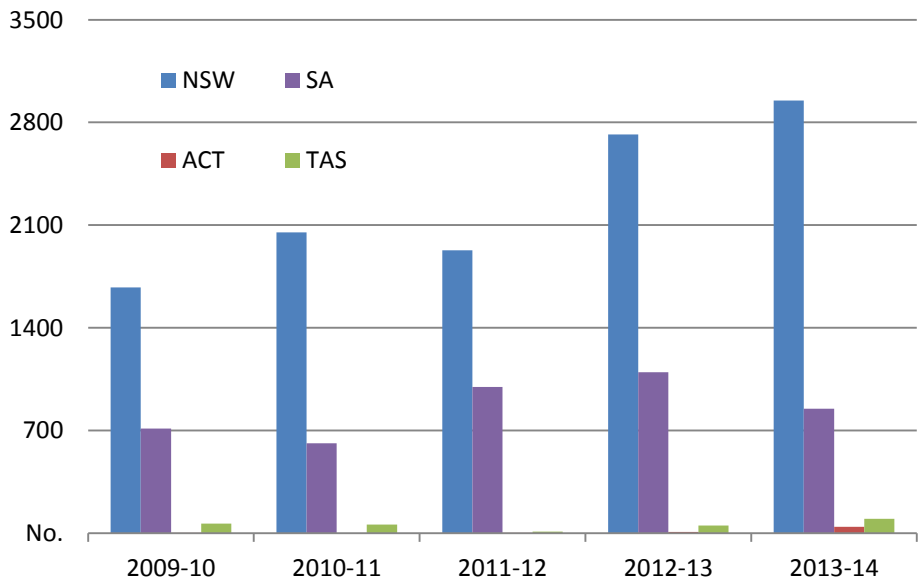


Tasmania and the ACT, which recorded the highest average level of residential electricity debt, have the lowest levels of small business electricity debt at $731 and $638 respectively for the March 2013-14 quarter. South Australia had the highest average level of small business electricity debt at $1,521 for the March 2013-14 quarter. New South Wales recorded average debt at $1,423, nearly 40 per cent lower than the September 2013-14 quarter.

Rising electricity prices and subsequent increases in the size and number of customers with electricity debt has also led to an increase in the number of small business disconnections in New South Wales which rose by 76 per cent between 2009-10 and 2013-14 (Figure 36).

The number of residential electricity disconnections also increased in South Australia (up 54 per cent between 2009-10 and 2012-13); while decreasing in Tasmania and remaining unchanged in the ACT.

Figure 36: Small business electricity disconnections, Q3 2013-14[113]



The Retail Law (National Energy Retail (South Australia) Act 2011 and Statute Amendment (National Energy Retail Law) Act 2011) requires retailers to assist customers experiencing payment difficulties or financial hardship. Retailers must:

- protect customers from disconnection in certain circumstances, including when a customer's premises are registered as requiring life support equipment; and
- assist customers before considering disconnection for non-payment of a bill. Such assistance includes offering access to a hardship program.

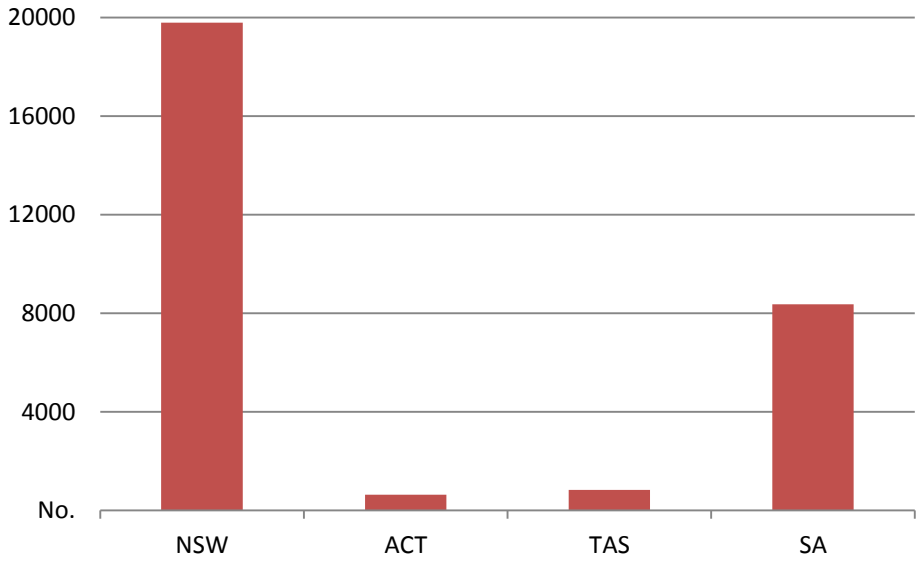
According to the AER (2013), hardship programs aim to provide early assistance to customers and may include:[114]

- specialised staff and teams as a dedicated contact for customers;

- extensions of time to pay, as well as flexible payment options;
- help to identify government concession and rebate programs;
- referrals to financial counselling services;
- a review of a customer's energy contract to make sure it suits their needs; and/or
- a waiver of late payment fees that might have applied.

New South Wales currently has the largest number of customers on hardship programs, at 19,787 in the March 2013-14 quarter; this is 21 per cent (or 3,404 customers) higher than in the September 2013-14 quarter (Figure 37).

Figure 37: Electricity customers on hardship programs, Q3 2013-14[115]



The number of electricity customers on hardship programs in South Australia has also increased over the past year or so, recorded at 8,365 in the March quarter of 2013-14; 49 per cent higher than the March quarter the previous year. The number of customers on hardship programs in the ACT and Tasmania are relatively low, although it has increased in recent quarters.

8. CONCLUSION

Rising electricity prices and affordability for low income households has been at the forefront of the political debate in recent years, particularly following the introduction of carbon pricing by the Gillard Government and even more recently following its removal by the Abbott Government.

While prices have fluctuated significantly over the last decade, this paper has shown that supply and demand variables independent of government climate change policies (both carbon pricing and renewable energy targets) have influenced the severity and trajectory of these price movements.

Prices across most NEM regions peaked between 2006 and 2008, largely driven by supply constraints, when drought limited the availability of water for

hydro generation and cooling in coal generation. This period also coincided with escalating peak and average demand for electricity.

While carbon pricing contributed to the electricity price escalation in 2012-13, other factors unrelated to carbon also affected this outcome. Supply constraints in mainland NEM regions, stemming from plant closures, contributed to lower than expected reserves at times, driving prices higher and resulting in opportunistic bidding by major generators.

Over the past 12 months, prices have actually eased across the NEM network. This has been influenced largely by relatively subdued demand growth in the NEM, the result of: continued increases in domestic rooftop PV installations incentivised through feed-in tariffs and reduced system installation prices; lower-than-expected demand growth in most industrial sectors; higher estimated impacts from energy efficiency measures through capture of changes in building standards and regulations; and higher estimate of customer response to high price events based on analysis of historical demand-side participation behaviour.

The longer term outlook for electricity consumption in the NEM remains relatively subdued. Between 2013-14 and 2023-24, under the medium forecast scenario, NEM electricity consumption will increase at an average annual rate of 0.3 per cent. Between 2023-24 and 2033-24, under the medium forecast scenario, NEM electricity consumption will increase at an average annual rate of 0.4 per cent. Consumption in New South Wales is forecast to increase at an average annual rate of 0.36 per cent between 2013-14 and 2033-34.

For the first time in the NEM's history, as a result of the forecast decline in electricity consumption, no new capacity is required in any NEM region to maintain supply-adequacy over the next 10 years. From its analysis, the AEMO (2014) found that in 2014–15 more than 7,500 MW would need to be removed from the market to affect supply-adequacy. Even with 10 years of consumption growth, by 2023-24 between 1,100 MW and 3,100 MW of capacity could still be withdrawn from each of New South Wales, Queensland, and Victoria without breaching the reliability standard.

Although electricity consumption and supply forecasts remain relatively subdued, in New South Wales over the medium term electricity prices are still forecast to rise (albeit at a lower rate than previously experienced). Because of this, the data presented in this paper (in terms of electricity debt, disconnections and number of customers on hardship programs) suggests that electricity affordability will remain a policy concern in New South Wales, particularly for lower income households.

[1] ABS, Consumer Price Index, Australia, Cat. No. 6401.0, June 2014, Table 14
[2] AER, State of the Energy Market 2013, December 2013, Figure 5.5, p.136
[3] AEMO, The National Electricity Market, 2013, Fact Sheet, p.1
[4] Ibid
[5] BREE, Energy in Australia, May 2013, Figure 12, p.27
[6] BREE, Energy in Australia, May 2013, p.25-26
[7] AEMO, The National Electricity Market, 2013, Fact Sheet, p.2
[8] AEMO, The National Electricity Market, 2013, Fact Sheet, p.3
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