



The Health of the National Electricity Market

2018

ENERGY SECURITY BOARD

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Glossary

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AFMA	Australian Financial Markets Association
ARENA	Australian Renewable Energy Agency
ASX	Australian Securities Exchange
BOM	Bureau of Meteorology
Capex	Capital Expenditure
CER	Clean Energy Regulator
COAG	Council of Australian Governments
COGATI	Coordination of Generation and Transmission Investment Review
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DNSP	Distribution Network Service Provider
ECA	Energy Consumers Australia
ENA	Energy Networks Australia
ESB	Energy Security Board
ESOO	Electricity Statement of Opportunities
GJ	Gigajoule
GSOO	Gas Statement of Opportunities
IEA	International Energy Agency
ISP	Integrated System Plan
LNG	Liquefied Natural Gas
MWh	Megawatt hour
NEM	National Energy Market
NTNDP	National Transmission Network Development Plan
Opex	Operating Expenditure
PV	Photovoltaic
RAB	Regulated Asset Base
RERT	Reliability and Emergency Reserve Trader
RIT	Regulatory Investment Test
RIT-D	Regulatory Investment Test for Distribution
RIT-T	Regulatory Investment Test for Transmission
TNSP	Transmission Network Service Provider
USE	Unserved Energy
VCR	Value of Customer Reliability

Executive Summary

This *Health of the National Electricity Market* (NEM) report is an assessment of how the NEM is functioning now and where improvement is required. The current challenges facing the electricity market and a transition path forward were identified in the *Independent Review into the Future Security of the National Electricity Market* (the Finkel Review). The Finkel Review highlighted objectives of security, reliability, emissions reduction and customer reward. It noted that delivering on these goals relies on strengthened governance, better system planning and an orderly transition.

The NEM is transforming at a rapid rate. It is moving toward a system that requires the integration of more variable and distributed energy resources, and both chemical and hydro storage. The shift toward more variable and distributed energy resources has been driven by government policies, significant reductions in technology costs and changing consumer preferences. This transformation will continue with the addition of embedded micro-systems, peer to peer trading through block chain capability and, over time, electrification of the transport sector. With these changes, traditional concepts of the way in which the system is managed, how investment should be rewarded, and the role played by supply, storage, networks and consumers must be revisited.

The Health of the NEM

This report assesses the current status and the forward outlook in each of the key areas identified by the Finkel Review and the recently approved Strategic Energy Plan. The following table and commentary summarise the current status and outlook for each of the key areas.

TABLE 1: CURRENT STATUS AND FORWARD OUTLOOK FOR THE NEM

	Current Status	Outlook
Affordability and satisfied consumers	Critical	Moderate
Secure electricity system	Critical	Critical
Reliable and low emissions electricity supply	Moderate	Critical
Effective development of open and competitive markets	Moderate	Good-Moderate
Efficient and timely investment in networks	Moderate-Critical	Moderate-Critical
Strong but agile governance	Critical	Moderate-Critical

The status of **Affordability and satisfied consumers** is rated as **Critical**. Household electricity costs have increased by 56% in real terms over the past 10 years,¹ much faster than wages growth or inflation. Households and businesses see rising costs as a critical issue, and customers with financial vulnerabilities are particularly exposed to the impact. Nevertheless, the outlook for both wholesale prices and network charges is improving.

Despite these signs of improvement, electricity retailers are not delivering for consumers. Retail tariffs are often deliberately complex which erodes consumer trust. The complexity and confusion for customers in the retail market must stop. Consumers need to be informed in a way that helps them make the best decisions and empowers them to manage their demand, access distributed energy resources and utilise energy efficiency solutions so that affordability can improve.

Since April 2017, there have been at least 25 new rules, policies and programs introduced by governments and market bodies that are intended to assist energy consumers. The Australian Competition and Consumer Commission's (ACCC) *Retail Electricity Pricing Inquiry* and its ongoing role in monitoring and reporting is also of assistance.

The overall outlook for **Affordability and satisfied consumers** is improving to **Moderate**.

The current status of **Secure electricity system** is rated as **Critical**. As the Finkel Review noted, the existing rules and market frameworks are largely premised on system security parameters being managed through services provided by large, centralised synchronous generators. The energy transformation underway in the NEM is leading to a system made up of many small, distributed and non-synchronous generators. The NEM is no longer as resilient to disruptions as it used to be. Changes in the generation mix and patterns of consumption affect the ability of the system to operate in a secure state in the event of credible disruptive events.

Many of the immediate challenges that the system faces are being addressed but a comprehensive understanding of risks in the near and longer term still requires work. The outlook for a **Secure electricity system** remains **Critical** despite the work done to mitigate risks in the short term. To improve this status, a clear plan for how to reward flexibility and essential system services is necessary in order to reduce AEMO's requirement to intervene in the market.

The current status of **Reliable and low emissions electricity supply** is rated **Moderate**. The 2018 Electricity Statement of Opportunities (ESOO) identifies clear shortfalls in Victoria, New South Wales and South Australia in the medium-term but does not identify any immediate gaps in the supply-demand balance except in Victoria for this summer. The NEM is also broadly on track to meet its share of Australia's emissions reduction commitment.

However, more than 15 years of uncertainty around the integration of energy and climate policy has reduced policy confidence in the NEM and distorted generation investment and disinvestment decisions in the sector. Government schemes have encouraged investment in renewable generation irrespective of demand for electricity and price signals from the spot

¹ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

and contract markets. The design of these schemes has broken the link between the physical needs of a reliable power system and the economic incentives on market participants that keep wholesale energy costs as low as possible.

Without a clear, modern, integrated and achievable electricity market design and climate policy, ad hoc government policies will continue to enter the policy and regulatory landscape at an unpredictable rate. As a result, investment in new or existing dispatchable generation will continue to be challenged by this uncertainty. Without change, the outlook for a **Reliable and low emissions electricity supply** is expected to worsen to **Critical**. The risk of government intervention and distortion of the drivers for future investment remain real, which in turn increases the likelihood of negative impacts on competition, reliability, pricing and investment decisions.

The status of **Effective development of open and competitive markets** is rated **Moderate**. The ACCC's *Retail Electricity Pricing Inquiry* found that high and entrenched levels of concentration in the NEM may be contributing to elevated prices and that the current market structure is not conducive to vigorous competition.

Wholesale markets in the NEM are concentrated, with the largest three retailers controlling approximately 45% of generation capacity. While wholesale prices are currently high, the rapid entry of variable renewable energy and the impact this is having on the outlook for forward prices is expected to bring relief. Concentrated control of dispatchable resources in the NEM remains a concern because it can result in higher and more volatile wholesale costs to retailers that flow through to consumer pricing.

Retail markets in the NEM are also concentrated, with the largest three retailers controlling approximately 70% of the retail market. The ACCC found that large retailers enjoy significant advantages over smaller competitors, including inactive customers who don't seek competitive offers, economies of scale and a greater ability to take advantage of vertical integration.²

The financial markets that support the NEM are generally sufficient in supporting retail activity in most regions, despite concerns that contract markets are relatively thin as the coming summer approaches. More specific concerns around the low level of liquidity of standard financial contracts in South Australia, and the challenges faced by small retailers in accessing hedge markets more generally, require further investigation.

Reforms are underway and recommendations made by the ACCC and actions by the AER and AEMC are expected to prevent further deterioration and should improve the outlook in the medium term. The outlook for **Effective development of open and competitive markets** is therefore expected to improve to **Good-Moderate**.

The status of **Efficient and timely investment in networks** is rated **Moderate-Critical**. The launch of AEMO's first Integrated System Plan (ISP) is an important step in enhancing system planning and fulfils a key Finkel recommendation. Investments made today will significantly shape the network of the future along with the costs faced by customers.

² ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

Proactive planning of aspects of the network now can create the flexibility to respond to changing technologies. Such an approach has the potential to reduce the cost of the system over the longer-term when partnered with effective regulation.

The outlook for **Efficient and timely investment in networks** remains stable at **Moderate-Critical**. All the market bodies and the ESB are focused on delivering an actionable ISP. Improving the outlook for network investment more broadly requires a clear plan for the operation and regulation of networks under high levels of distributed energy resource penetration.

The status of **Strong but agile governance** is rated **Critical**. The risks to delivering a coherent and coordinated approach to energy policy in the NEM have increased during 2018 with the piecemeal approach to setting energy policy. At a time when investment is needed in dispatchable generation and to action the ISP, it is not helpful for the Commonwealth Government to be threatening powers of divestment, price setting and discretionary asset write-downs.

The outlook for **Strong but agile governance** would improve if COAG Energy Council committed to a new Australian Energy Market Agreement and focused on achieving the agreed outcomes and objectives in the Strategic Energy Plan – both key recommendations from the Finkel Review.

It is notable that the market bodies have effectively co-ordinated their work and meaningfully engaged stakeholders on the National Energy Guarantee/Retailer Reliability Obligation and, most recently, on the Integrated System Plan – Action Plan. This level of co-ordination must continue.

Emerging Risks and Opportunities

- Monitoring for unintended consequences from continued policy uncertainty on outlook for investment.
- Understanding the long-term, fit-for-purpose market design needed to support security and reliability from the mid 2020's as the market transitions.
- Ensuring future workforce requirements to manage the continued rapid uptake of variable renewable energy and distributed energy resources are understood and met.
- Ensuring that regulatory frameworks can adequately respond to the rapid transformation of the system while continuing to provide safeguards for consumers.
- Reinvigorating the national policy discussion on supporting energy efficiency through the National Energy Productivity Plan implemented by COAG in 2015.
- Understanding the changing role of financial contracts in the NEM as the operating profiles and generation mix transforms and the impact this has on the competitive dynamics at a wholesale and retail level.

1. Introduction

During 2018 the scale and pace of transformation in the National Electricity Market (NEM) increased. Utility scale wind and solar PV continued to roll out rapidly (see Figure 1), with 20% more wind and solar now expected on the ground in 2018-19 than was forecast just two years ago.³

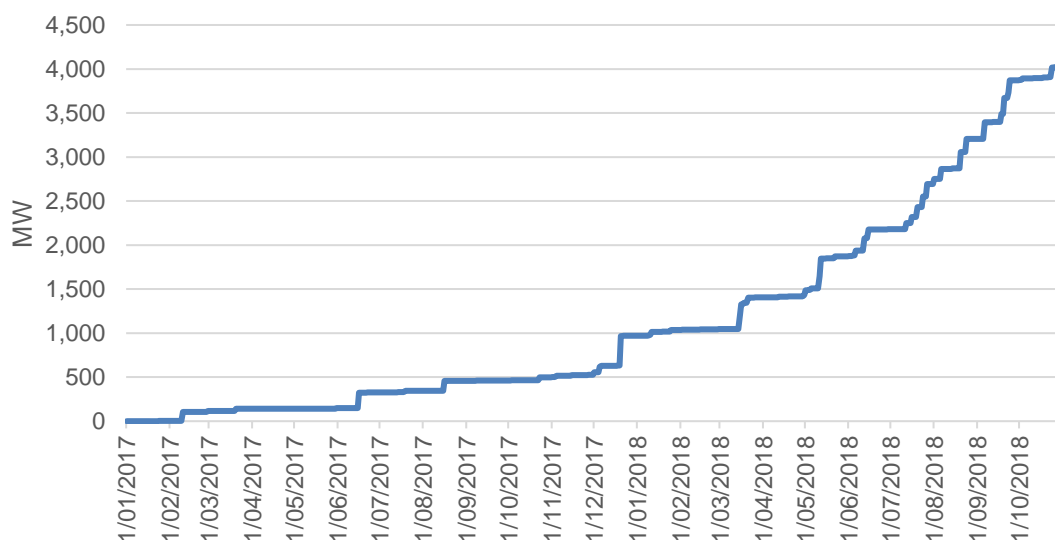


FIGURE 1: LARGE-SCALE RENEWABLE GENERATION ACCREDITED FOR THE NEM SINCE 1 JAN 2017 SOURCE: CLEAN ENERGY REGULATOR

Distributed Energy Resources are also experiencing growth (see Figure 2), in both the number and average size of small-scale solar PV installations. Rooftop solar PV is increasingly being accompanied by residential battery capacity.

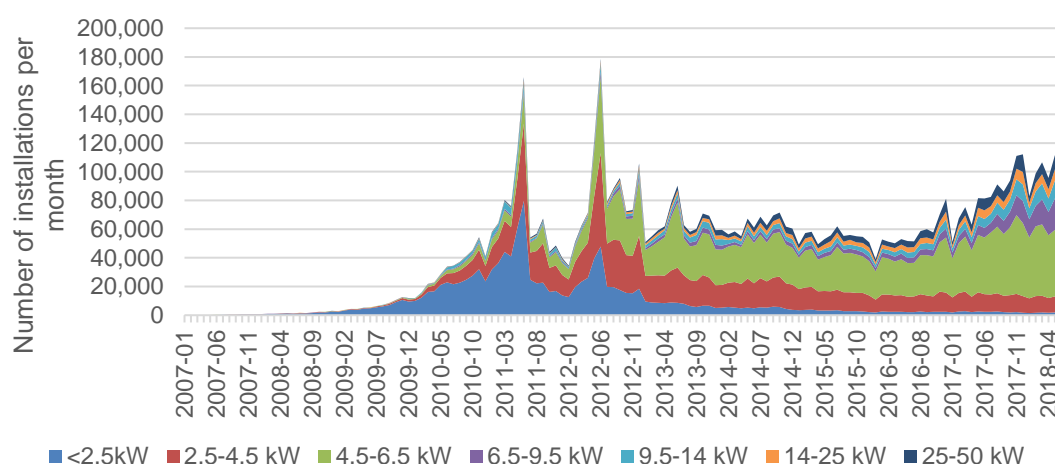


FIGURE 2: SMALL SCALE SOLAR INSTALLATIONS BY SIZE SINCE JAN 2007 SOURCE: AUSTRALIAN PV INSTITUTE

³ Including rooftop PV, neutral scenario in AEMO, *National Transmission Network Development Plan*, 2016 compared to neutral scenario in AEMO, *Integrated System Plan*, 2018.

A shift towards more variable and distributed energy resources has been driven by more than just government policies. Significant reductions in technology cost and changing consumer preferences have also contributed to the rapid uptake. The NEM will not continue to operate smoothly without greater control over when and where this generation exports into the grid.

The fundamentally different characteristics of variable distributed energy resources to traditional generation mean that changes to the way the NEM operates must be made. It is critical that a reliable, secure and affordable market is delivered as new technologies replace aging assets. If this is not managed through policy in an orderly way, then dispatchable generators will not be rewarded for the services they provide and will continue to exit; distributed energy resources will be delivered in an ad-hoc and inefficient way; and the transmission system needed to access lower cost sources of energy in the future will not be built. Ultimately this chaotic approach to energy policy will result in consumers paying more than is necessary.

The *Independent Review into the Future Security of the National Electricity Market* (the Finkel Review) provided a blueprint for how this transition in the NEM should occur. One of the Finkel recommendations was that the Energy Security Board produce an annual *Health of the NEM* report to track this transition. This is the second such report. The *Health of the NEM Report* also assesses performance against the outcomes described in Council of Australian Governments' (COAG) Energy Council's Strategic Energy Plan. The Strategic Energy Plan is intended to guide market bodies and the operation and evolution of the NEM. It is consistent with the Finkel Review blueprint though more detailed in its measurable objectives for the market bodies.

This report assesses the current status and the forward outlook in each of the key areas identified by the Finkel Review and Strategic Energy Plan. It identifies work underway to tackle existing problems as well as emerging risks and opportunities. We rate the current 'health' as either good, moderate or critical and provide an outlook that reflects whether this status is expected to remain the same or change.

Key areas that will have a material impact on the outlook for the NEM include:

- Changes in the cost of existing and emerging technologies such as wind and solar PV, hydrogen, concentrated solar thermal and batteries
- Changes in system demand, which will be especially influenced by the rate of uptake of rooftop solar PV and electric vehicles
- The development of consumer preferences
- Government policy.

2. Overview of the National Electricity Market

The NEM is the electricity market that supplies most customers across Queensland, New South Wales, the Australian Capital Territory, South Australia, Victoria and Tasmania. These States and Territory make up the five regions in the NEM with the Australian Capital Territory included in the New South Wales region. This market delivers electricity to approximately 22 million people or 89% of the Australian population.⁴

183 TWh of electricity was consumed in the NEM in 2017-18. Residential customers accounted for approximately 26% of energy sales by volume, while commercial and industrial customers accounted for the remaining 74%. Aluminium smelters account for 13% of total consumption and 3% of the total is associated with the upstream projects supplying the Liquefied Natural Gas (LNG) facilities in Gladstone, Queensland.

2.1. The wholesale market

To provide a reliable supply of electricity to customers, the volume of electricity generated (supply) must balance with the volume of electricity consumed (demand) in real time at every location on the system. Reserve sources of energy to protect against the risk of outages and unexpected demand increases must also be provided. To achieve supply-demand balance, the wholesale market coordinates the dispatch of generators, through an 'energy only' market, where generators get paid a variable price for the electricity they produce, depending on supply-demand conditions at the time.

Generators bid the price at which they are willing to supply a certain volume of electricity and they are then dispatched in order of lowest price. Generator bids reflect a mix of technical characteristics (eg. fuel and shutdown costs, minimum load, contract volumes and capital costs). As demand from customers increases, more expensive generation is required to be dispatched to meet demand. The most expensive generator dispatched to meet demand (the marginal generator) sets the price paid to all generators dispatched in that time period (see Figure 3). This process of setting a dispatch price occurs every five minutes, and generation dispatched is paid the average price across a 30-minute settlement period (i.e. six dispatch periods).⁵

⁴ Western Australia and the Northern Territory each have their own electricity markets physically not connected to the rest of the country.

⁵ However, on 1 July 2021 the settlement period will change to five minutes to align with the dispatch period. This is discussed further in Section 3.3

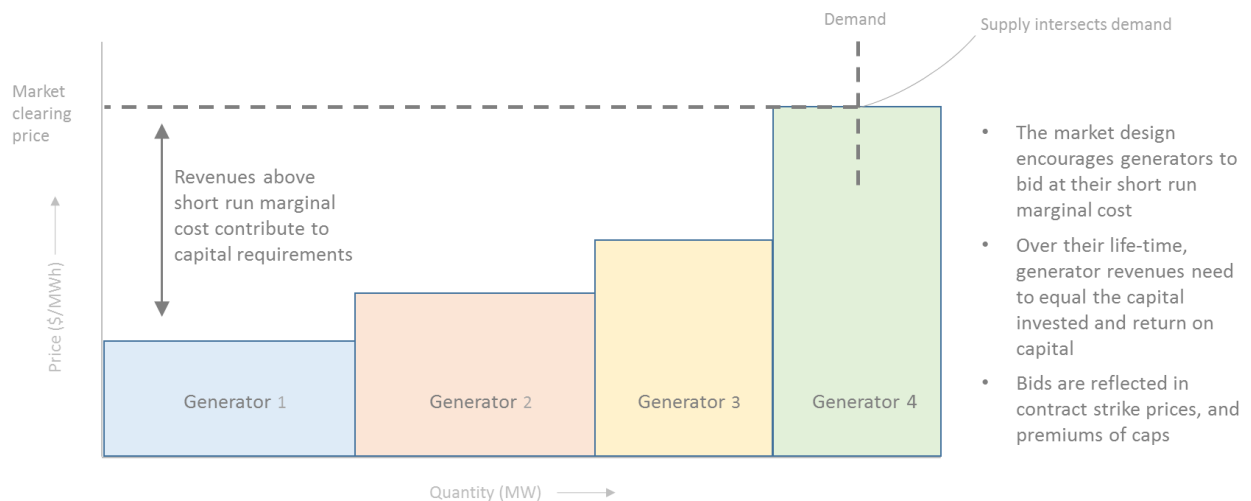


FIGURE 3: SIMPLIFIED EXAMPLE OF GENERATOR BID STRUCTURES. SOURCE: AEMC

The growth in variable renewable energy that is occurring brings additional low fuel cost supply (at close to zero) into the market. At times, the supply curve shifts to lower price generation; at other times throughout the day and across the year when variable renewable energy is operating at lower levels, the supply stack will not shift as much and may even worsen as technical limitations restrict the flexibility of ageing dispatchable generation. Ultimately this may lead to high cost coal and gas units needing to close or be mothballed for periods of time. The challenge for the market is ensuring that enough flexible generation remains to “firm” the output of the variable renewable energy when it is not operating.

Electricity generators who sell into the wholesale market use a mix of technologies, including coal fired plant, gas powered generators, wind turbines, utility scale solar PV, hydroelectric plant (including pumped hydro storage), and battery storage (see Figure 4). Electricity generated by small rooftop solar systems is not traded through the NEM and is treated by the market operator as a reduction in demand. New businesses are now emerging that look at the utilisation of residential PV and battery storage to allow the aggregation and trading of this output in the wholesale market.

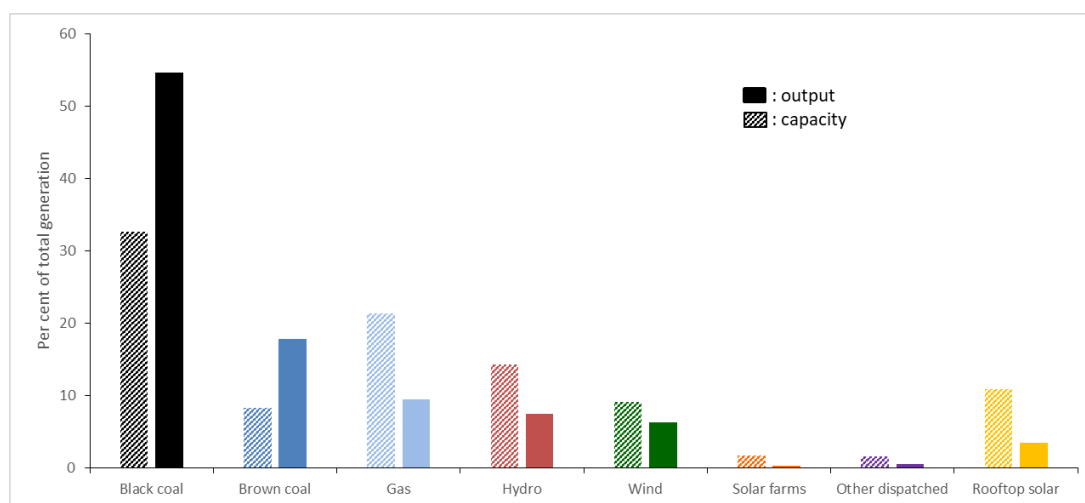


FIGURE 4: GENERATION IN THE NEM BY FUEL SOURCE, 2017-18. SOURCE: AER

Energy retailers buy electricity directly from the wholesale market and pay for its transport through transmission and distribution networks to customers. They bundle a series of charges and manage the risk of price variability in the wholesale market to provide electricity to customers at a pre-determined rate.

In 2017-18, the wholesale spot price could vary between -\$1,000/MWh and \$14,200/MWh. This variability presents a significant risk to retailers (and to some extent generators) because retailers generally charge customers an effective rate of around \$70-\$150/MWh for wholesale costs (i.e. 7-15c/kWh).⁶ To manage this risk, retailers and generators enter into financial hedge arrangements. These contracts allow market participants to fix the price for specified times and under certain conditions, thereby managing the risk of higher prices.

The financial market supports numerous financial products (such as caps, swaps, asian options, and swaptions) each with unique characteristics that together allow a participant to manage this financial risk under a variety of scenarios.

The contract market is an important feature of the NEM. When generation is contracted it has a strong incentive to be available and operating and to ensure plant is maintained to be able to defend contracts written with retailers. Contract markets can also provide longer-term investment signals for new generation. Consequently, it is important in future years as variable renewable energy continues to enter the market, typically supported through long term power purchase agreements, that the contract market continues to inform and signal the need for investment in firming assets that support the market when variable renewable energy is not at full production.

In addition to using financial hedge contracts, a retailer may also own and operate its own generation capacity. This allows companies to manage the risk of price volatility through an internal hedge. A company which is vertically integrated between generation and retail in this way is often called a 'gentailer'.

2.2. Networks

Transmission and distribution networks in the NEM transport electricity from generators to consumers (see Figure 5). Transmission networks transport power at high voltages from generators to major load centres in cities or large industrial users. Distribution network

⁶ Wholesale component of average residential customer effective prices 2017-18, ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018, p.8 The wholesale prices (cents/kWh) exclude GST.

transport electricity from various connection points along the transmission network, delivering electricity to customers through lower voltage networks. See Figure 5 below.

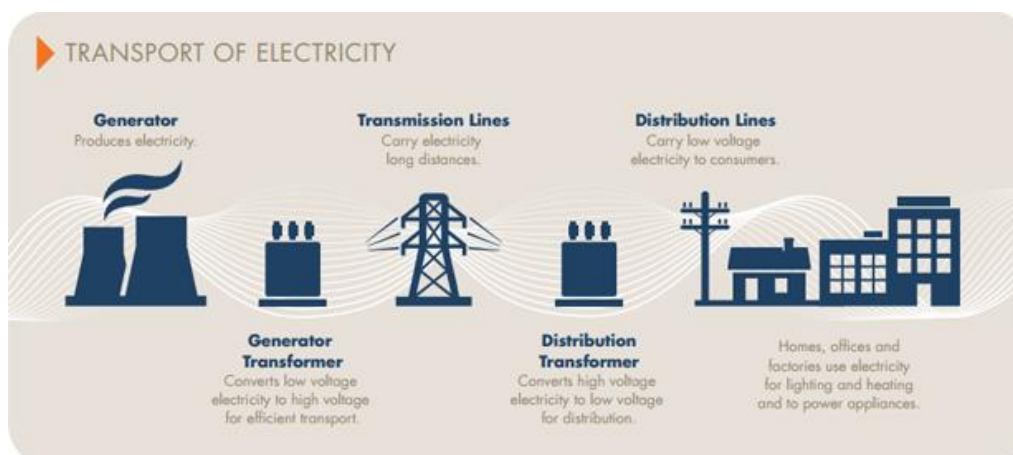


FIGURE 5: TRANSPORT OF ELECTRICITY SCHEMATIC. SOURCE: AEMO

Electricity networks are capital-intensive and incur declining average costs as output increases. Networks are natural monopolies. Efficient investment in both transmission and distribution networks is achieved through regulation.

When transmission and distribution networks are considering augmentation or replacement of assets, the regulatory framework requires a range of options be considered, including consideration of non-network solutions, such as demand-side response or local generation. Expenditure is then recovered from consumers (via retailers) through network charges.

2.3. Changes underway in the NEM

Fundamental transformation is underway in the NEM. A system characterised by more variable and distributed generation technologies is emerging rapidly – more wind, solar PV and distributed batteries. AEMO estimates that 16% of electricity consumed in the NEM in 2018-19 will be generated by wind and solar PV,⁷ but this level is forecast to increase rapidly,⁸ driven by reductions in technology costs, government-based renewable energy targets and changing consumer preferences.

While a shift towards renewable energy is imperative to meet Australia's committed emissions reduction targets, more variable and distributed generation in the system is creating operational challenges. The current and emerging include:

- The impact on system security, including frequency control and system strength
- The increased risk of significant load shedding

⁷ AEMO, Integrated System Plan Generation Outlook, 2018

⁸ Estimated to be 40% by 2030-31, AEMO, Integrated System Plan Generation Outlook, 2018

- The increased economic pressure on thermal generation due to lower operating cost of wind and solar plant.

The existing variable renewable energy generation in the NEM varies across regions. AEMO estimates approximately 57% of electricity generated in South Australia will be from wind and solar PV in 2018-19.⁹ When compared to major electricity systems internationally, only Denmark has a higher proportion of variable generation than South Australia (see Figure 6). South Australia has entered what the International Energy Agency has termed ‘Phase 4’ of variable renewable integration, where advanced technologies are required to ensure reliability. South Australia is at the forefront of the global energy transition towards renewable energy and the associated technical challenges. While the variable renewable energy share across the balance of the NEM and the rest of Australia in 2018 brought the IEA’s annual share figures below 10%, the Clean Energy Regulator estimates that over 6,000 MW of large-scale renewable generation is expected to be operating by 2020, with the majority of this new generation being built in Victoria, Queensland and New South Wales.

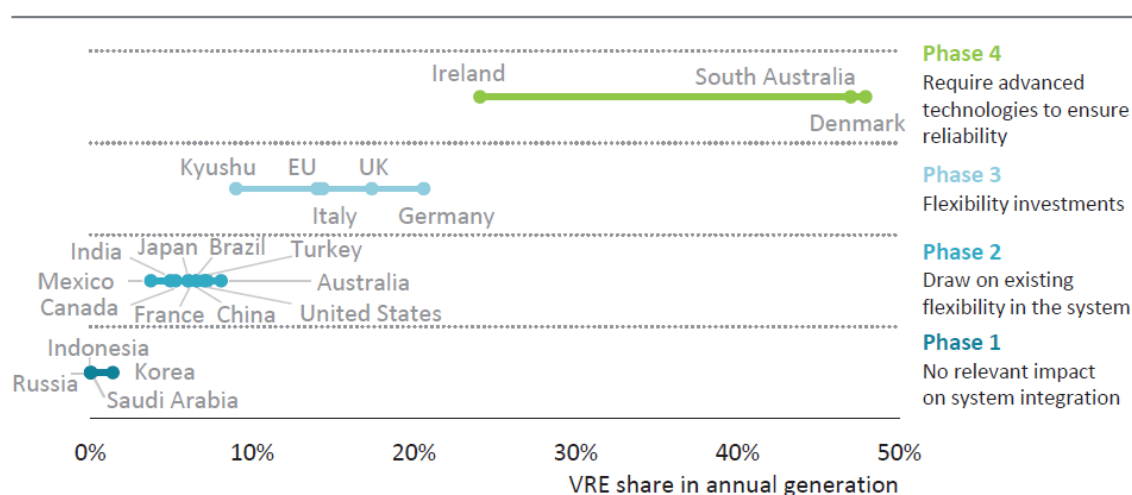


FIGURE 6: ANNUAL SHARE OF VARIABLE RENEWABLES GENERATION AND RELATED INTEGRATION PHASES IN SELECTED REGIONS/COUNTRIES, 2017. SOURCE: IEA WORLD ENERGY OUTLOOK 2018

2.4. Role of the market bodies

There are three market bodies tasked with the regulation, operation and market development of the NEM: the Australian Energy Regulator (AER), the Australian Energy Market Operator (AEMO) and the Australian Energy Market Commission (AEMC).

The AER is responsible for the economic regulation of the non-competitive sectors of the NEM, essentially distribution and transmission networks. The AER is also responsible for the enforcement of compliance with the National Electricity Law and Rules and the National Energy Retail Law and Rules, and for providing information to consumers.

AEMO operates the power system and gas and electricity wholesale spot markets. AEMO is the body that keeps the electricity system operating. AEMO is responsible for implementing changes to the rules that impact on its system and market operations and importantly also

⁹ AEMO, Integrated System Plan Generation Outlook, 2018

provides information to market participants, for long term planning of the interconnected power system, including forecasting demand and supply and network development.

The AEMC is the market institution responsible for assessing changes to the National Electricity Rules and National Energy Retail Rules. These rules are the general statutory framework under the National Electricity Law and National Energy Retail Law which regulate the operation of the NEM. The AEMC is also responsible for market development and provides advice to the COAG Energy Council.

The Energy Security Board (ESB) was formed in 2017 to support the transition of Australian energy markets in the context of technological change and to advance the long-term interests of consumers in this process. It has responsibility for the implementation of recommendations from the Finkel Review, to enhance coordination between market bodies and the COAG Energy Council and to provide strategic advice to the COAG Energy Council on energy security, reliability and affordability in the NEM.

3. The Present Health and Forward Outlook in the National Electricity Market

This section assesses the current health and future outlook of six key areas in the NEM. These areas are identified in the Finkel Review and the recent Strategic Energy Plan and are all required outcomes for a healthy electricity system. The areas are:

1. Affordability and satisfied customers
2. A secure electricity system
3. A reliable and low emissions electricity supply
4. Effective open and competitive markets
5. Efficient and timely network investments
6. Strong and agile governance

Each of these are addressed in turn and the Executive Summary is basically a brief of this section.

3.1. Affordability and satisfied consumers

3.1.1. Overall assessment

The current status of affordability is rated as Critical (See Table 2). As noted earlier, household electricity costs have increased by 56% in real terms over the past 10 years,¹⁰ much faster than wages growth or inflation (Figure 7). Households and businesses consider rising costs to be a critical issue, and customers with financial vulnerabilities are particularly exposed to the impact. Nationally, only 25% of households have confidence the market is working in their interests, down 8% from just a year ago.¹¹

The largest components of residential bills in 2017-18 were wholesale electricity and network costs, accounting for 34% and 43% of customers' bills respectively. Retail and environmental costs together account for the remainder of residential bills. Of the 43% that goes toward covering network costs, 70-80% of this goes to the costs of distribution and metering while the balance goes to covering the costs of transmission.¹²

In the near term, wholesale electricity prices remain high due to a combination of tight supply-demand conditions, high coal and gas prices and low hydro storage levels. However, over the medium term, wholesale prices are expected to decline as committed sources of variable renewable energy reduce the reliance on higher cost coal and gas output. The risk remains though that the disorderly exit of ageing coal generation will change this outlook, reversing the declines in wholesale prices. Investment in new dispatchable sources of energy (such as gas peakers, pumped hydro or battery technologies) and new requirements on generators to provide three years' notice of closure should help address these risks. The outlook needs to be monitored closely.

Network charges increased over the 2008-13 period, driven by increased investment to meet higher reliability requirements and expected demand growth. These regulatory and

¹⁰ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

¹¹ Energy Consumers Australia, *Energy Consumer Sentiment Survey Findings: June 2018*, 2018

¹² In 2017-18, ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

forecasting driven changes have now ceased and the outlook for network charges is flat or declining.

Given the expected decline in wholesale prices over the medium term, as well as the fact that network charges are expected to remain flat or decrease slightly in most networks in coming years, the outlook is rated as improving to Moderate.

Retail bills are complex and consumers' ability to engage with the electricity industry is limited. The ACCC's *Retail Electricity Pricing Inquiry* recommended that all retail bill discounts be made with reference to a comparison rate to ensure offers and discounts are directly comparable. Other measures to help consumers identify the best offer for their circumstances were also recommended.

In the light of the recent Royal Commission that investigated the banking and financial industry and their treatment of customers, the retail electricity companies need to examine the way they behave toward their customers. Offering an opaque 'standard offer' with a 'discount' that ends after a period of time (that customers are not notified about as it occurs), and a 'discount' for paying your bill on time (with onerous charges if you do not) cannot be regarded as appropriate. While less than 10% of customers are now on such standard offers it remains 10% too many and other poor features of retail behaviour toward their customers remains.

On a more positive note the Finkel Review recognised that all customers should be able to share in the benefits of new technologies. Hence, consumers should be rewarded for improving reliability and security from the provision of demand response and governments should accelerate the rollout of broader energy efficiency measures. Work is also underway in this regard to facilitate the efficient integration of new technologies into the system and reward consumers for managing their demand. However, work on accelerating broader energy efficiency measures has lapsed as a focus. Energy efficiency and energy management remains an important solution to delivering consumer benefits and work in 2019 must focus on delivering this low hanging fruit for improving productivity.

Both the AER and ACCC have also identified that there are deficiencies in how retailers treat customers on hardship provisions. The AEMC's recent rule change allowing the AER to make binding Customer Hardship Policy Guidelines should go some way to improving the current status from Critical to Moderate. Consequently, the outlook is for some improvement.

A significant number of reforms are underway to help consumers navigate the market. Since April 2017, there have been at least 25 new rules, policies and programs introduced by governments and market bodies that are intended to assist energy consumers. Combined with the implementation of many of the recommendations from the ACCC's *Retail Electricity Pricing Inquiry* and its ongoing role monitoring and reporting on the supply of retail and wholesale electricity across the NEM, the overall outlook for Affordability and Satisfied Consumers is improving to Moderate.

TABLE 2: AFFORDABILITY AND SATISFIED CONSUMERS – STATUS AND OUTLOOK

	Current Status	Outlook
Affordable energy for all consumers	Critical	Moderate
Consumers are able to easily identify and secure the best deal	Critical	Moderate
Consumers are empowered to manage their demand and can access distributed energy and energy efficiency solutions	Critical	Moderate
Consumers with vulnerabilities are protected	Critical	Moderate
Overall	Critical	Moderate

Emerging issues include:

- Reinvigorating the national policy discussion on supporting energy efficiency through the National Energy Productivity Plan implemented by COAG in 2015.

3.1.2. Affordability

As has been widely reported, the cost of electricity in the NEM has increased steeply over the past 10 years. The ACCC estimates that NEM-wide average residential prices have increased from 19.0c/kWh in 2007-08 to 29.6c/kWh in 2017-18 in real terms.¹³ The cost of electricity¹⁴ has grown at an average annualised rate of 8.3% compared to consumer price index inflation of 2.3% from September 2007 – June 2018 (see Figure 7).

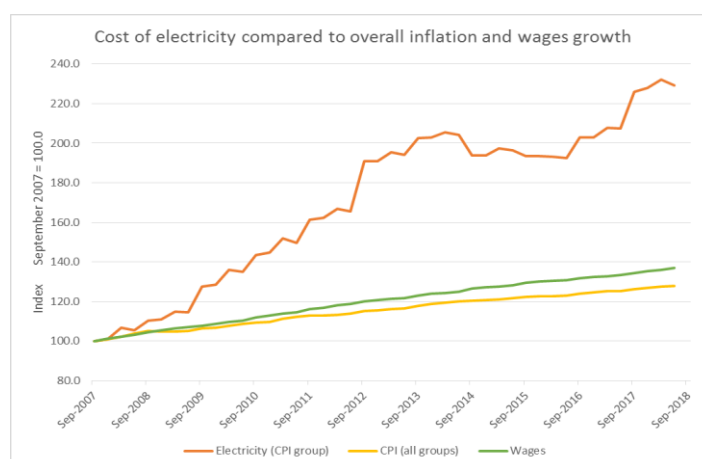


FIGURE 7: COST OF ELECTRICITY (CPI GROUP). SOURCE ABS 6401.0 CONSUMER PRICE INDEX, AUSTRALIA

¹³ Excluding GST, in real \$2016-17, ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

¹⁴ As measured by CPI category

The rapid increase in the cost of electricity has also affected commercial and industrial (C&I) sectors. The ACCC estimates that the average C&I effective price has increased from 10.0c/kWh in 2007-08 to 15.7c/kWh in 2017-18, in real terms.^{15,16}

These rapid cost increases affect household budgets and business profitability and have implications for economic growth and prosperity more broadly. It is clear that significant further price increases are unsustainable.

While energy costs are estimated to account for around 2.5% of average household expenditure in 2018,¹⁷ cost increases disproportionately impact some sectors of society. Low income households spend more than four times as much of their income on electricity and gas as high-income households, despite using less energy overall.¹⁸ A quarter of those on low incomes are spending more than 8.8% of their income on electricity and gas, and a quarter of people receiving Newstart and similar allowances are spending more than 9.7% of their income on energy.¹⁹

Surveys regarding community concerns and expectations consistently place electricity affordability as a priority issue. In terms of value for money, households and small businesses continue to rate electricity behind gas, internet, mobile phone, insurance, banking and water services.²⁰ Choice's Consumer Pulse survey reported that from 2014-2017 electricity was the number one household cost concern for thirteen consecutive quarters.²¹

Figure 8 below shows that electricity as a proportion of total input costs to industry has risen over time for major sectors. This is at a time when overall energy intensity for these industries has been relatively flat or even declining,²² suggesting that price increases are outstripping energy productivity gains. This is a major concern.

¹⁵ Real \$2016-17 excluding GST, ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

¹⁶ Although it is important to note that there is large variability across C&I and there is no 'typical' C&I customer, so this estimate is indicative only.

¹⁷ Australian Council of Social Services and Brotherhood of St Laurence, *Energy Stressed in Australia*, 2018

¹⁸ Ibid, low income defined as households with income in the lowest quintile, high income as households in the top quintile

¹⁹ Ibid

²⁰ Energy Consumers Australia, *Energy Consumer Sentiment Survey Findings: June 2018*, 2018

²¹ Choice, *Consumer Pulse: Australians' Attitudes to Cost of Living 2014-2017*, 2017

²² In GJ/gross value-added terms. 4604.0 - Energy Account, Australia, 2015-16

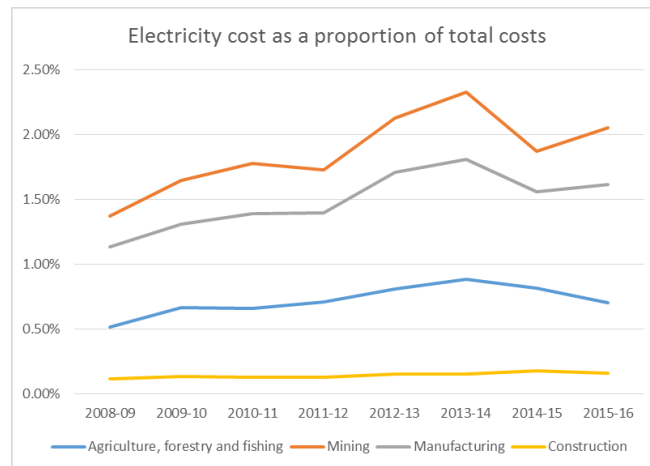
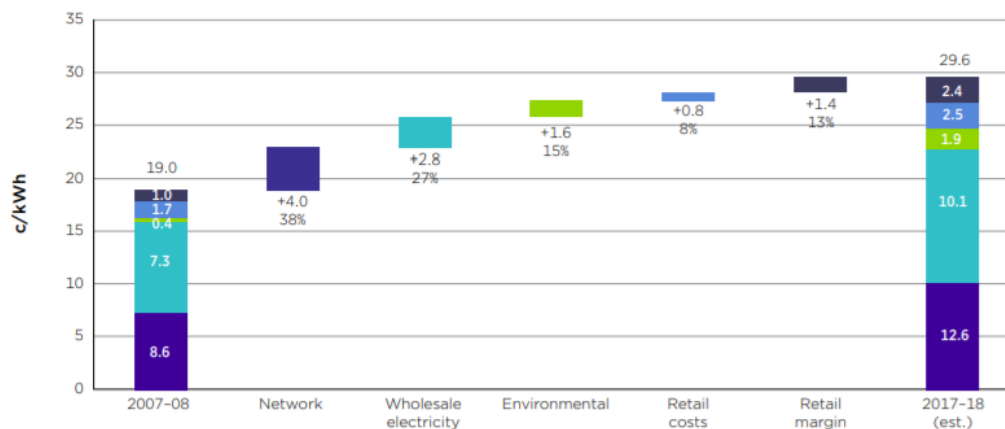


FIGURE 8: ELECTRICITY COST AS A PROPORTION OF TOTAL COSTS. SOURCE: ABS ENERGY ACCOUNT (4604.0) AND AUSTRALIAN INDUSTRY (8155.0) DATA

As shown in Figure 9, the contribution to household prices of all elements of the supply chain have grown in real terms over the past decade. Growth in network costs contributed most to this uplift, accounting for 38% of the increase in bills over the period. As noted in *Health of the NEM 2017*, most of the increase in network costs occurred between 2008 and 2013 as a result of higher network reliability standards in New South Wales and Queensland in response to concerns expressed about the performance of the distribution systems during the 2004 summer, and to meet continued growth in electricity demand which did not eventuate. The cost and performance of networks over time are discussed further in Section 3.5.



Note: The percentages show each components' contribution to the total increase between 2007-08 and 2017-18.

FIGURE 9: CHANGE IN AVERAGE RESIDENTIAL CUSTOMER EFFECTIVE PRICES (C/KWH) FROM 2007-08 TO 2017-18, NEM-WIDE, REAL \$2016-17, EXCLUDING GST. SOURCE ACCC RETAIL ELECTRICITY PRICING INQUIRY 2018

The increases in retail electricity prices since 2016 are largely attributable to increased wholesale electricity costs. The exit of the Northern (May 2016) and Hazelwood (March 2017) power stations tightened the supply-demand balance in South Australia and Victoria

considerably. Hazelwood alone supplied around 5% of total output across the NEM.²³ This has led to more expensive gas powered generation, as well as New South Wales black coal and hydro generation, playing a more influential role in setting spot prices. It has coincided with a period of rising gas and coal prices due to movements in global markets. The role of fuel and its impact on the market are further discussed in section 3.4.5.

Average household electricity use has also been declining over the past ten years, as consumers have sought out ways to reduce their electricity consumption through energy efficiency measures and increased rates of self-generation through rooftop solar PV.²⁴ This reduced consumption has offset the impact of increased prices for some while lowering the utilisation of some network assets. Non-solar households are also currently cross-subsidising solar households through the Small-Scale Renewable Energy Scheme (SRES) and through state-based premium feed in tariffs. These schemes make rooftop PV more economically attractive for households, but the cost is borne by other consumers. The average residential customer paid an estimated \$17 to \$90 in 2017-18, depending on the state, in costs associated with the SRES and feed in tariffs.²⁵

3.1.2.1. *Market impact on the price and availability of retail contracts*

The outlook for wholesale electricity prices across the NEM is for a projected decline from the middle of 2019. Despite this, the availability of hedge contracts for the near term remains thin and some market participants indicate that when hedging more than a standard parcel of volume for the coming summer (e.g. 5-10 MW in peak demand), a premium is usually applied due to the limited availability of contracts.

In contrast, the ability to access longer term contracts is improving, reflecting the continued uptake of renewable power purchase agreements by the corporate sector but also a willingness of sellers to mitigate risk in a market that has a significant amount of new supply coming online. The increased role for firming arrangements continues to gain momentum as variable renewable energy increases its penetration in the NEM. Despite this, there are currently limited observable measures for pricing firming products.

3.1.3. *Work underway*

Making electricity more affordable

All components of the electricity supply chain contribute to consumers' bills. Specific measures underway across the supply chain to improve the efficiency with which electricity is produced and delivered are discussed in following sections. Overall, the expected outlook is for modest price declines in most NEM-regions through to 2020-21 (see Figure 10).

²³ ACCC, *Retail Electricity Price Enquiry*, 2018, p. 60

²⁴ Energy Consumers Australia, *Energy Consumer Sentiment Survey Findings: June 2018*, 2018

²⁵ ACCC, *Retail Electricity Price Enquiry*, 2018, p. 215

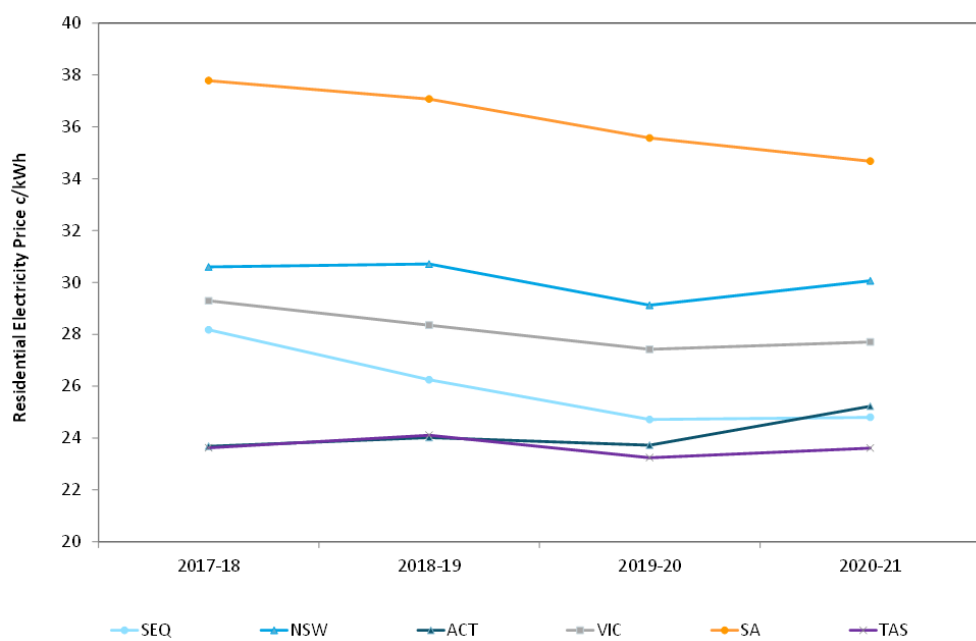


FIGURE 10: FORECAST RETAIL PRICES BY JURISDICTION. SOURCE: AEMC, RESIDENTIAL ELECTRICITY PRICE TRENDS, 2018

The ACCC has been tasked with an ongoing monitoring and reporting role to monitor competition in retail and wholesale electricity markets in Queensland, New South Wales, Victoria, South Australia, Tasmania, and the ACT, until 2025. It will have a focus on monitoring prices, profits and margins, including the effect of policy changes in the NEM.

The Retailer Reliability Obligation will place downward pressure on electricity prices, by requiring retailers to increase their contracting with generators and stimulating increased levels of demand response. Greater levels of contracting is expected to result in more competitive bidding by generators in the wholesale market and reduce price volatility. Residential prices are estimated to be \$110 lower on average over the period 2020-21 to 2029-30 under the Retailer Reliability Obligation compared to a business as usual scenario.²⁶

Help identifying the best deal

A significant number of reforms are underway to help consumers navigate the market. Since April 2017, there have been at least 25 new rules, policies and programs introduced by governments and market bodies that are intended to assist energy consumers.²⁷ This includes rule changes which will:

- Prevent discounts on inflated energy rates
- Notify consumers of the end of a fixed benefit period
- Provide consumers with advanced notice of price changes
- Introduce strengthened life support obligations

²⁶ Energy Security Board, *Retailer Reliability Obligation Impact Analysis*, 2018

²⁷ AEMC, *Retail Energy Competition Review*, 2018

- Notify long-term standing offer customers of better deals in the market
- Make retailers offer better hardship programs for vulnerable customers.

The ACCC also found that many customers are having trouble engaging in the electricity retail market. It is especially difficult for consumers to compare offers and identify the best offer due to the complexity of various retail tariffs. This has negatively affected competition and reduced downward pressure on prices.

The ACCC made a number of recommendations in this area to make it easier for consumers to identify the best offer. Key areas of reform include:

- A regulated 'default offer' at or below the price determined by the AER
- Development of a 'reference bill' (based on the default offer) against which all advertised discounts must be made, so that discounts can be easily compared
- The size of conditional discounts must be related to the value of the activity being incentivised
- A mandatory code of conduct for third party comparison services to ensure recommendations are made based on benefits to the consumer, not the size of the commission paid to the third party.

In response to these recommendations and discussions with the Commonwealth Government, energy retailers have committed to provide customers with a better deal from January 2019, including the development of a reference price, increased discounts for standing offer customers and undertaking actions to encourage customers to switch to better deals.

In response to a request from the Commonwealth Treasurer and Minister for Energy, the AER has recently released a position paper in relation to the setting of a Default Market Offer price, to be determined by 30 April 2019 for implementation from 1 July 2019, for New South Wales, South Australia and South-East Queensland. Care is needed with this initiative to ensure unintended consequences do not result in increased prices.

Empowering consumers to manage their demand

There is also a broad range of work that looks to empower consumers so that they can choose to manage their demand and access distributed energy and energy efficiency solutions.

- AEMO is establishing a register of distributed energy resources, enhancing the connection framework and technical standards for distributed energy resources, and working with the Energy Networks Association on models that enable distributed energy resource integration and optimisation, considering both transmission and network constraints.
- The AEMC considered a wholesale demand response mechanism in its Reliability Frameworks Review and is now undertaking consultation in response to three rule change requests that relate to wholesale demand response.
- The AER continues to facilitate tariff reform through work with distribution networks on tariff structure statements for the regulatory period commencing July 2019.

- The ESB began consultation on a NEM Data Strategy that looks to enhance the availability of data and information and address any barriers to effective access.
- The COAG Energy Council is considering a number of energy efficiency measures to further improve the energy performance of equipment and appliances at the December COAG meeting.

Vulnerable customers

In relation to vulnerable customers, the ACCC recommended COAG improve concession schemes across the NEM to ensure that, to the extent possible, there is a uniform, national approach to electricity concessions. They concluded that concession schemes should:

- be means tested to ensure that they are targeted at those most in need;
- include a fixed dollar amount to offset daily supply charges and a percentage discount to offset variable usage charges; and
- only require consumers to reapply for concessions where this is necessary for the administration of the concession scheme.

The AER also carried out an in-depth review in 2017 of the hardship programs of nine selected retailers.²⁸ Its review concluded that most retailers were deficient in at least one aspect of their policy and that there were discrepancies between policies and what occurs in practice. As a result, the AER submitted a rule change proposal to the AEMC for a rule that would enable the AER to develop new Customer Hardship Policy Guidelines. The AER considered that the guidelines will improve the consistency of hardship policies between retailers, increase the clarity of information available and strengthen the AER's ability to monitor and enforce hardship policies. The AEMC issued its final determination of the new rule on 15 November, providing for the development of the guidelines, which must be published by 1 April 2019.

3.1.4. Long-term outlook

The ongoing transformation of the energy market is creating new challenges and requiring changes to existing practices to ensure the system remains reliable and secure. These developments need to be carefully monitored and existing practices adjusted in a timely manner to ensure the operation of the market remains efficient and customers pay no more than necessary. The large wave of investment in variable renewable energy is expected to reduce wholesale prices in the medium-term because wind and solar generate electricity with no fuel costs, lowering the wholesale spot price when they generate. But, in the longer term, this will likely cause the economic exit of thermal generation, which will have implications for the availability of dispatchable generation, system security and financial risk management products. The Retailer Reliability Obligation will go some way to mitigating the risk of early exit, however, a continued lack of policy confidence that would support long term investment undermines this.

²⁸ AER, *Hardship Policy Review*, 2017

Rooftop solar PV has presented opportunities for individual consumers to reduce their electricity costs but tends to increase system-wide costs borne by non-solar customers. The average NEM household with solar PV saves approximately \$538 or 33% per year in electricity costs²⁹ and the payback period for residential solar PV is now generally below 5 years.³⁰ The ACCC's *Retail Electricity Pricing Inquiry* identified that solar consumers on average pay a much lower effective unit price in each region across the NEM (See Figure 11) and recommend scrapping subsidies.

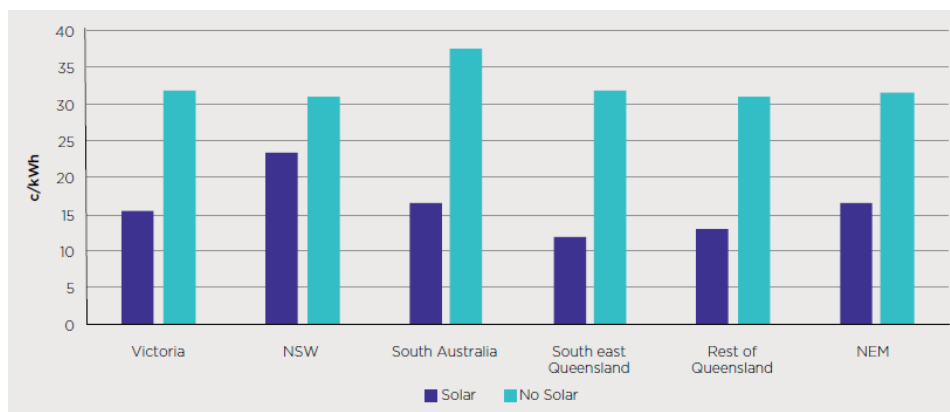


FIGURE 11 SOLAR AND NON-SOLAR AVERAGE EFFECTIVE PRICE COMPARISON. SOURCE: ACCC RETAIL ELECTRICITY PRICING INQUIRY, 2018

Because of these cost savings and the desire of consumers to take control of their own energy bills, the penetration of rooftop PV is expected to grow. AEMO estimates that there will be 27,000 MW of distributed storage and rooftop PV in the NEM by 2040,³¹ relative to the current system wide generation capacity of 49,990 MW.³²

As the proportion of rooftop PV and batteries increases, it remains essential that system costs are shared equitably so that consumers can make informed decisions around the investment in distributed energy resources. Reform towards more cost reflective network tariffs is one area which the AEMC has identified as particularly important.³³ Without ongoing tariff reform across all customers, there is a risk that those without distributed energy resources will continue to bear a greater share of the costs of delivering the network or that investment in opportunities to minimise future network costs via distributed energy resources will be lost. The impacts of greater amounts of distributed energy resources connecting to the NEM on system security and the implications for network regulation are discussed in Section 3.2.5.2 and Section 3.5.4, respectively.

²⁹ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

³⁰ CSIRO, *Projections for small-scale embedded technologies: Report for AEMO*, 2018

³¹ Under the neutral case, AEMO, *Integrated System Plan*, 2018

³² AEMO, *Electricity Statement of Opportunities*, 2018

³³ AEMC, *Economic Regulatory Framework Review – Promoting Efficient Investment in the Grid of the Future*, 2018

3.2. Secure electricity system

3.2.1. Overall assessment

The Finkel Review highlighted that the rules and market frameworks of the NEM were largely premised on system security parameters being managed through services provided by large, centralised synchronous generators. The energy transformation underway in the NEM is leading to a system made up of many small, distributed and non-synchronous generators. Without appropriate changes to the rules and market frameworks, there will be diminished capability to maintain power system security.

As a result of the changes already underway, the NEM no longer responds to everyday disruptions in the same way that it used to. Changes in the generation mix and patterns of consumption affect the ability of the system to remain in a secure state in the event of credible disruptive events. While some risks have been identified and changes implemented, many issues, and the best way in which they should be managed in the longer-term, are yet to be resolved.

The number and average duration of directions from AEMO has increased relative to previous years. This action has been required by AEMO to manage system strength concerns in South Australia. It has been driven by the very high proportion of variable renewable energy generation connected within the region. AEMO's response has been effective in managing security concerns, with the number of times the NEM was outside a secure operating state for more than 30 minutes much lower in 2017-18 than in previous years (Figure 12). However, these interventions come at a significant cost to consumers. During Quarter 2 and Quarter 3 of 2018, the cost of AEMO directions in South Australia has totalled almost \$14.45 million³⁴.

The ongoing integration of variable renewable energy and distributed energy resources into the NEM will continue to present challenges to maintaining a secure operating state. AEMO and the AEMC have delivered on Finkel Review recommendations concerning the review of, and rule changes to address, system security issues. These changes are adequate in the near term; however, in the longer term the AEMC and AEMO will continue to work towards more efficient solutions that meet power system needs. This work will help inform advice from the ESB, requested by the COAG Energy Council in October 2018, on a long-term, fit-for-purpose market design to support reliability that could apply from the mid 2020's as the market transitions.

Security risks associated with cyber-attacks and the emergence of more extreme weather events related to climate change are an ongoing threat. Going forward these risks are likely to worsen; however, AEMO continues to play a critical role in ensuring the risks are understood and mitigated.

As a consequence of the challenges that the system faces today, this report rates the current status of both system security and system planning in regard to security as Critical (see Table 3). While many of the immediate challenges that the system faces are being addressed, a comprehensive understanding of risks in the near and longer term still requires work. To improve this status, a clear plan for how to reward flexibility and essential system

³⁴ AEMO, *Quarterly Energy Dynamics – Q3 2018*, 2018.

services is necessary in order to reduce AEMO's requirement to direct or intervene in the market.

TABLE 3 SECURE ELECTRICITY SYSTEM – STATUS AND OUTLOOK

	Current Status	Outlook
Market operates safely, securely and efficiently	Critical	Critical
System planning and development is informed by clear and transparent rules	Critical	Critical
Overall	Critical	Critical

3.2.2. System security requirements

The operation of the NEM requires the system be maintained within defined limits in order to deliver electricity to consumers that is safe and of a consistent quality. The parameters that are important for the operation of the system include frequency, voltage, inertia, and system strength.

Frequency refers to the number of cycles of current and voltage made per second in an AC system. The operational frequency of the NEM is 50 cycles per second (Hertz). The frequency of the power system varies whenever the supply from generation does not precisely match customer demand. Frequency control performance in the NEM has been declining over recent years.³⁵

Voltage is the electrical force or electric potential between two points that gives rise to the flow of electricity. The voltage across the network is increased or decreased at various points using transformers to reduce losses during transmission and distribution and to lower voltage to a usable level.

Inertia refers to the rotating mass of a turbine and alternator of a generating unit. Synchronous generators such as coal, gas and hydro are so called because their rotation is synchronised with the frequency of the system (i.e. 50 cycles per second). If the frequency of the system deviates, the physical inertia embodied in the spinning mass of the generators resists the change. With less synchronous generation online there is lower inertia and a higher Rate of Change of Frequency when a disturbance occurs. Higher frequency swings are apparent with a higher risk of tripping of generation (or load) and a higher risk to the security of the system.

System strength is an umbrella term that refers to a suite of interrelated factors which together contribute to power system stability. It reflects the sensitivity of the power system to disturbance and indicates system robustness with respect to properties other than inertia. System strength can affect control systems and the ability of the power system to

³⁵ AEMC, *Frequency Control Frameworks Review*, 2018

both remain stable under normal conditions and return to steady-state conditions following a disturbance. Reduced levels of synchronous generation are resulting in areas with below acceptable system strength, requiring AEMO to either constrain or dispatch generation out of merit order.

Failure to maintain these characteristics can damage power system assets and can lead to supply interruptions. Increasing penetration of variable renewable energy resources and distributed energy resources is making it more difficult to maintain these parameters.

3.2.3. Recent Trends for System Security

Over the past four years, maintaining system security has become more challenging and required a higher degree of monitoring and management by AEMO. The number of times the NEM was not in a secure state for more than 30 minutes was just two in 2017-18 (see Figure 12).

The power system is secure when it is operating within defined technical limits and can return to within those limits after a disruptive event occurs, such as failure of a power station or major powerline. When the power system is not in a secure state it means it is more susceptible to a disruptive event causing major issues.

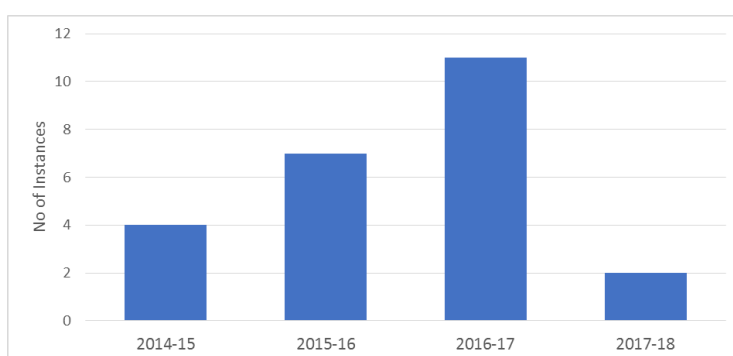


FIGURE 12: NUMBER OF TIMES THE OPERATING SYSTEM WAS NOT IN A SECURE OPERATING STATE FOR GREATER THAN 30 MINUTES. SOURCE: AEMO

AEMO has been using its direction powers to manage system strength in South Australia, to ensure there are sufficient synchronous machines online at all times.³⁶ This has meant the number of directions increased significantly in 2017-18, with a direction required to be issued in South Australia for around 1 in 3 dispatch intervals,³⁷ as seen in Figure 13.

³⁶ For further explanation of the system strength issues in South Australia see AEMO, *South Australia System Strength Assessment*, 2017

³⁷ Based on AER analysis

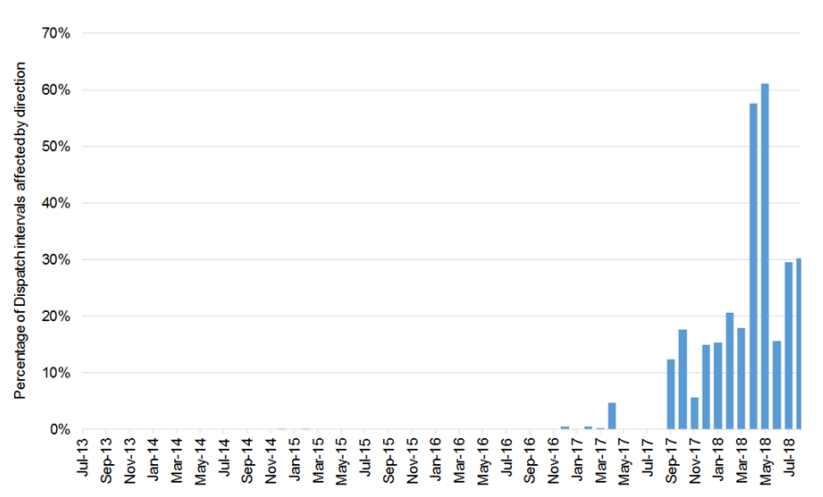


FIGURE 13: PERCENTAGE OF DISPATCH INTERVALS AFFECTED BY DIRECTION. SOURCE: AER

All interventions in 2017-18, except one, were related to system strength in South Australia (see Figure 14). The duration of each intervention has also increased substantially, with directions between 2007-08 and 2016-17 lasting on average less than 7 hours, while in 2017-18 they lasted on average 62 hours.

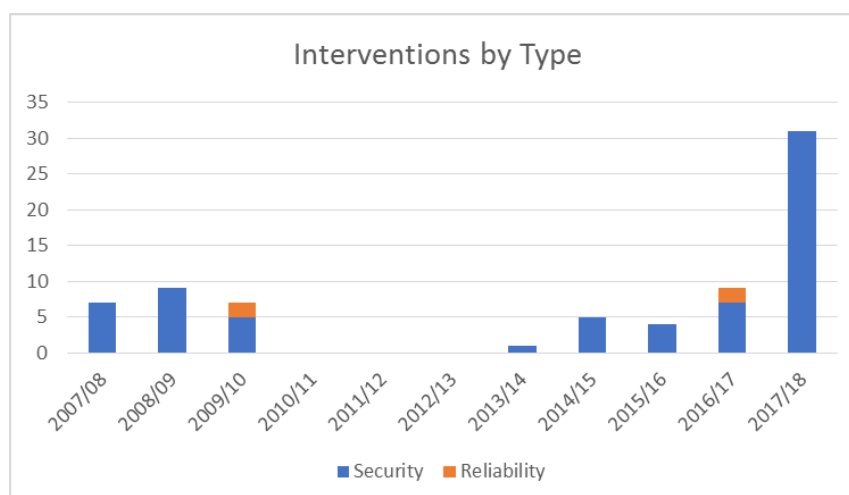


FIGURE 14: AEMO INTERVENTIONS BY TYPE. SOURCE: DATA PROVIDED BY AEMO

The recent increase in system security directions relates to the increasing proportion of non-synchronous generation in South Australia. This is a sign of what could come in other regions as variable renewable energy penetration increases. Many of the system services needed for power system security, such as inertia and system strength, are not inherently provided by non-synchronous generators like wind, solar PV and batteries.

Directions by AEMO in the market inherently distort the price signals that are needed to encourage the right investment. During Q2 and Q3 2018 the cost of directions in South

Australia amounted to \$14.45m³⁸. Changes to the rules discussed in the section on work underway (below) begin to address the risk that AEMO will need to intervene in the future. However, more efficient solutions to delivering system security requirements in the future will need to continue to be considered as a part of a broader solution to the right market design to deliver the power system needs of the future.

Another emerging challenge is voltage management due to increased rooftop PV reducing demand in the middle of the day or low demand overnight. As the penetration of non-synchronous technologies increases and as the system continues to evolve, system security challenges become more significant and complex. It is important to note that technical solutions do exist to these challenges³⁹.

3.2.4. Work underway

Both the Finkel Review and the AEMC's *System Security Market Frameworks Review 2017* assessed system security challenges associated with the transformation of the electricity sector. There are two immediate priority system security challenges in the NEM: ⁴⁰

- System strength
- Frequency control

The AEMC has now addressed the Finkel Review recommendations for system security.⁴¹ Progress against the full list of Finkel Review recommendations is attached in Appendix 1.

The AER's report into the South Australia Black System Event of 28 September 2016 provides a review of compliance by various NEM participants against the applicable National Electricity Rules (the Rules) regarding the operation of the South Australia region of the NEM in the period surrounding the state-wide blackout. In the report, the AER deals with the Pre-event period, System Restoration and Market Suspension. The AER's review of the events immediately preceding the state-wide blackout is ongoing.

System strength

In relation to the issue of low system strength, the AEMC has made a rule obliging transmission companies to maintain minimum levels of system strength.⁴² These obligations came into effect on 1 July 2018.

The infrastructure required to meet these minimum levels of system strength (such as synchronous condensers) is expected to take 1-2 years to put in place. To manage system strength concerns in South Australia in the interim, AEMO will continue to use its directions powers as required.

³⁸ AEMO, *Quarterly Energy Dynamics – Q3 2018*, 2018.

³⁹ See AEMO, *Power system requirements reference paper*, 2018, pp.20-22

⁴⁰ AEMC, *Frequency Control Frameworks Review*, 2018

⁴¹ See AEMC, *Frequency Control Frameworks Review*, 2018, Table 1

⁴² See AEMC, *Managing Power System Fault Levels* rule change completed 19 September 2017

The AEMC has noted that the required increase in the level of directions by AEMO in the South Australian market can interrupt generators' maintenance schedules, which can lead to reliability issues, and is potentially leading to inefficient market outcomes. The AEMC and AEMO are continuing to work together to investigate the issues.⁴³

In September 2018, the AEMC also made a rule to change the way levels of technical performance are negotiated for equipment connecting to the power system and improve the technical requirements for new generating systems at the request of AEMO. Under the rule, generators that connect are required to have a level of performance that maintains system security and quality of supply at the lowest cost.

Frequency control

In relation to frequency control, a recent rule change requires transmission companies to also maintain minimum required levels of inertia.⁴⁴ Inertia dampens the rate of change of frequency and is currently an important tool to maintain stable frequency in the NEM. Requirements to maintain inertia came into effect on 1 July 2018. Where a shortfall in inertia is identified by AEMO, transmission companies will have until 1 July 2019 to meet the minimum requirements.

The AEMC also finalised an in-depth review into frequency control in the NEM in July 2018, through its *Frequency Control Frameworks Review*. The review set out a spectrum of potential frameworks for frequency management in the future but did not recommend any changes to existing arrangements at this time. AEMO advised that current regulatory tools are expected to be adequate to manage frequency performance in the immediate-term and should not be changed until the results of its short-term actions are better understood. However, the AEMC also noted that the existing regulatory arrangements would not adequately incentivise the provision of frequency control in the long-term and that there was a need to find a more permanent solution.

3.2.5. Long-term outlook

3.2.5.1. *Frequency and system strength*

The AEMC has noted that frequency performance has deteriorated in the NEM in recent years and that existing regulatory arrangements do not adequately incentivise the provision of a primary regulating response. The AEMC recommended,⁴⁵ in the long-term, an explicit mechanism be developed to appropriately value and incentivise the provision of primary regulating services for frequency.

The AEMC canvassed a possible approach in the *Frequency Control Frameworks Review*, referred to as a deviation pricing model. Under such an approach, market participants would be paid if their actions assist in moving the frequency towards the target level or charged if their actions contribute to frequency deviation away from the target. The AEMC has proposed to explore this and other possible long-term market-based mechanisms over the

⁴³ AEMC, *Reliability Frameworks Review, Final Report*, 2018, p. viii

⁴⁴ See the Managing the rate of change of power system frequency rule change made 19 September 2017

⁴⁵ AEMC, *Frequency Control Frameworks Review, Final Report*, 2018

coming year, and to further refine a long-term mechanism in consultation with AEMO and stakeholders over 2019 and 2020.

Regarding system strength, transmission companies now have an obligation to maintain system strength at various sub-regions (as determined by AEMO) in the network. Transmission companies are considered most suitable to manage this requirement in the near-term because they have a holistic perspective of their network. Once these obligations come into force it is expected to reduce the number of interventions required by AEMO in South Australia, which should improve the efficiency of market outcomes in the region. However, further monitoring will be required to ensure transmission companies have a strong enough incentive to maintain a suitable level of system strength and inertia before a problem arises. The suitability of a capacity charge to maintain inertia is an area that warrants further investigation. Work needs to continue to better understand the tools and systems needed to accurately measure and manage system security.

3.2.5.2. *Distributed Energy Resources*

Through the *Frequency Control Frameworks Review* the AEMC also recommended that AEMO submit a rule change request which would enable the aggregation of distributed energy resources to participate in ancillary service markets. The AEMC additionally recommended AEMO facilitate trialling the use of distributed energy resources to provide ancillary services and to conduct a broader review to address any unnecessary barriers to participation.

In the longer-term, maintaining a secure system will require increasingly sophisticated coordination of distributed energy resources. The amount of residential battery capacity in the NEM is projected to increase exponentially over the coming decades (see Figure 15).⁴⁶ This will create new challenges for network service providers and for AEMO. For network businesses, reverse flows (i.e. households exporting into the grid) tend to raise voltages in the network and create other system security issues, which can stress the capabilities of existing equipment used to manage voltage.⁴⁷ The distributed nature and lack of visibility of distributed energy resources also makes it more challenging for AEMO to balance system demand and maintain system strength. The response of distributed energy resources to disturbances may also have significant implications for system stability. The implications for distribution network regulation, and possible approaches to managing these concerns, are discussed in Section 3.5.4.

⁴⁶ CSIRO, *Projections for small-scale embedded technologies: Report for AEMO*, 2018

⁴⁷ AEMO and Energy Networks Australia, *Open Energy Networks: Consultation on how best to transition to a two-way grid that allows better integration of Distributed Energy Resources for the benefit of all consumers*, 2018

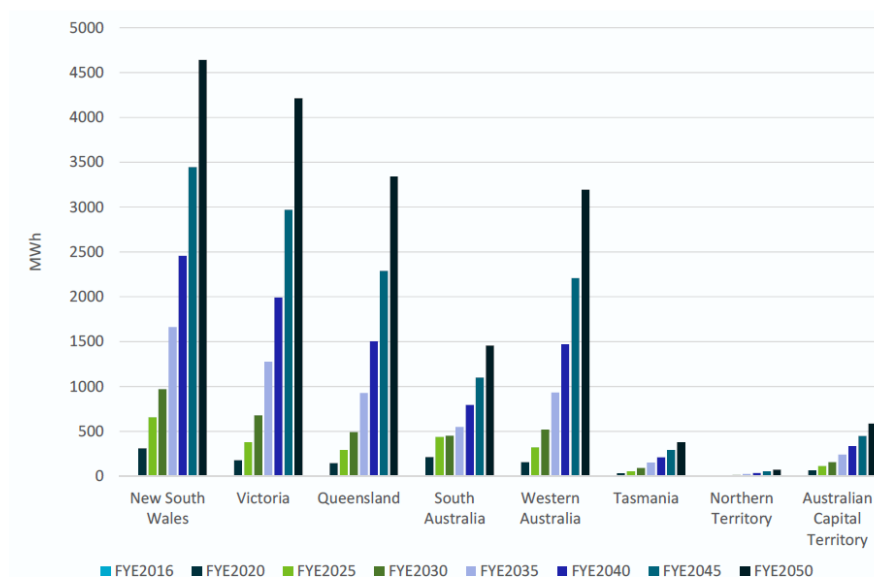


FIGURE 15: PROJECTIONS FOR SMALL-SCALE EMBEDDED TECHNOLOGIES. SOURCE: REPORT FOR AEMO 2018, CSIRO

Following a rule change by the AEMC in September 2018, AEMO is now required to establish, maintain and update a register of distributed energy resources in the NEM. This will allow AEMO and network service providers to plan and operate the power system more efficiently. It will also allow for increased accuracy in AEMO's load forecasting and modelling, improving the operation of the power system overall. The final rule will commence operation on 1 December 2019, with AEMO to outline and publish the first distributed energy resources register information guidelines by 1 June 2019.

3.2.5.3. Cyber security

International security agencies have reported an increase in the number of groups with the intent and capability to compromise industrial control systems networks, including those associated with energy sector utilities.

AEMO is leading the development of the Australian Energy Sector Cyber Security Framework. The framework is based upon the US Electricity Subsector Cybersecurity Capability Maturity model and will assess the maturity of cyber security practices across 11 domains.

Highly critical organisations will undergo a facilitated assessment, while lower criticality organisations will receive training on how to undertake a self-assessment. Assessment results will be aggregated and included in the annual report being produced in response to recommendations made by the Finkel Review.

3.2.5.4. Increasing impact of extreme weather events

AEMO has highlighted the challenges presented by climate change due to an increasing reliance on generation that is dependent on the weather and the increasing frequency of

extreme weather events.⁴⁸ Increasing temperatures and prolonged heat events impact the reliability of the system in several ways:

- Managing coincident peaks across multiple regions (in the past the NEM has benefited through diversity of peaks and interconnection)
- Prolonged heatwaves impacting on grid resilience (increased system stress increasing likelihood of plant failures)
- Increased bushfire risk impacting network availability.

The Bureau of Meteorology (BoM) reported⁴⁹ that 2017 was the third warmest year on record. Figure 16 highlights the increasing incidence of mean temperature anomalies over the past 30 years. The BoM predicts that over the next 10 years average temperatures will continue to increase and that there will be more frequent and more extreme hot days.

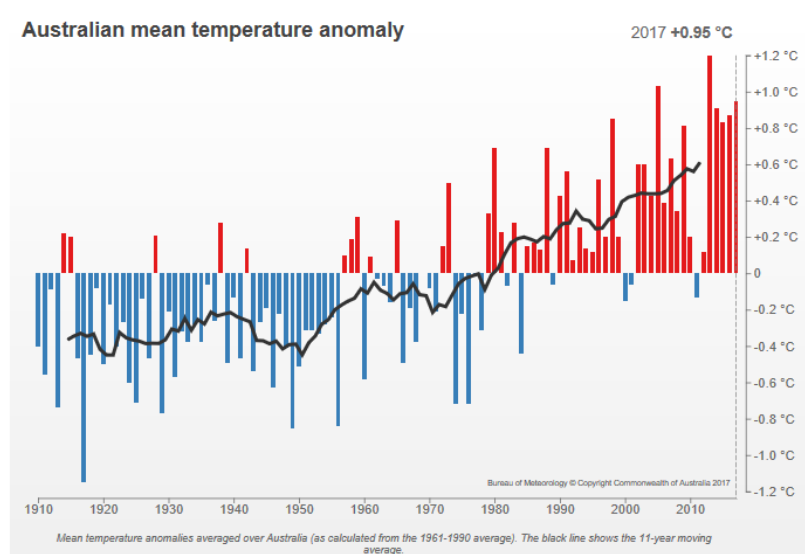


FIGURE 16: AUSTRALIAN MEAN TEMPERATURE ANOMALY. SOURCE: AUSTRALIAN BUREAU OF METEOROLOGY , ANNUAL CLIMATE STATEMENT 2017

AEMO, in collaboration with the Department of the Environment and Energy, BoM and CSIRO is currently scoping requirements for provision of climate information and services to help analyse long-term climate risk in the electricity sector.

The project will improve information on likely future changes to extreme weather events such as heatwaves, wind, bushfires and maximum temperature thresholds, to inform analysis of long-term climate risk. A focus should be on concurrent and/or compounding extreme events. This three-year project will support planning and investment decisions for the electricity network by improving understanding of the impact of climate change on infrastructure.

⁴⁸ AEMO, *AEMO Observations: Operational and market challenges to reliability and security in the NEM*, 2018

⁴⁹ Australian Bureau of Meteorology , *Annual Climate Statement 2017*, 2018.

3.3. Reliable and low emissions electricity supply

3.3.1. Overall assessment

The current status of reliable and low emissions electricity supply is rated Moderate. The 2018 ESOO identifies clear shortfalls in Victoria, New South Wales and South Australia in the medium-term but the ESOO does not identify any immediate gaps in the supply-demand balance except in Victoria for the 2018-19 summer. The NEM is also broadly on track to meet its share of Australia's emissions reduction commitment.

However, more than 15 years of uncertainty around the integration of energy and climate policy has reduced policy confidence in the NEM and distorted generation investment and disinvestment decisions in the sector. Government schemes have encouraged investment in renewable generation irrespective of demand for electricity and price signals from the spot and contract markets. The design of these schemes has broken the link between the physical needs of a reliable power system and the economic incentives on market participants that keep wholesale energy costs as low as possible.

The NEM is designed to leave market risks with investors, but ongoing market distortions (such as renewable energy targets or other mechanisms that subsidise one technology over another), continue to lead to inefficient decision making. This results in lower capital cost investments from those who do not benefit from distortions and leaves the risks of inefficient outcomes with those funding the schemes (i.e. consumers or taxpayers).

During 2018, the Energy Security Board developed the National Energy Guarantee (Guarantee) to bring together climate and energy policy for the first time in Australia. The objective of the Guarantee was to address concerns about future reliability outcomes while delivering on emissions reduction targets. The Australian Government's rejection of the Guarantee in August 2018 was unexpected and disappointing. Nevertheless, in October 2018, COAG Energy Council agreed to progress the Retailer Reliability Obligation part of the Guarantee. At its December meeting COAG Energy Council reached agreement on the National Electricity Law (NEL) amendments required to give effect to the obligation.

The Retailer Reliability Obligation will go some way to mitigating the risk of reliability issues over the medium term but an ongoing lack of clarity around long-term emissions reduction policies will continue to weigh on the outlook. The ESB has now prepared a forward work program for COAG Energy Council to provide advice on a long term, fit-for-purpose market design and framework to support reliability that could apply from the mid 2020's to support the continued transition.

Without a clear, modern, integrated and achievable electricity market design and climate policy, ad hoc government policies will continue to enter the policy and regulatory landscape at an unpredictable rate. As a result, investment in new or existing dispatchable generation will continue to be challenged by this uncertainty. Without change, the outlook for a reliable and low emissions electricity supply is expected to worsen to Critical. The risk of government intervention and distortion of the drivers for future investment remain real, which in turn increases the likelihood of negative impacts on competition, reliability, pricing and investment decisions.

TABLE 4 RELIABLE AND LOW EMISSIONS ELECTRICITY SUPPLY – STATUS AND OUTLOOK

	Current Status	Outlook
Emissions reduction target/s achieved efficiently while ensuring reliable supply	Moderate	Critical
Investors efficiently manage risk to support investment, operation, retirement and innovation decisions	Moderate	Critical
Overall	Moderate	Critical

Emerging issues include:

- The need to monitor the impacts of continued policy uncertainty on investment risk which may lead to lessening of competition, lower reliability, higher long-term pricing through inefficient investment decisions and the requirement for increased Government support for future investment.
- The need to ensure that future workforce requirements for the electricity sector are assessed to ensure a properly skilled workforce is available to support the continued rapid uptake of variable renewable energy and distributed energy resources.

3.3.2. Reliability

A reliable system is one with adequate generation, demand side participation and network capacity to supply customers with the energy they demand.

Historically, the level of unserved energy as a result of inadequate supply has been a rare occurrence in the NEM (see Figure 17). From 2007-08 to 2016-17 over 95% of supply interruptions were related to the distribution system (e.g. trees falling on power lines) and only 0.23% of interruptions were related to lack of generation capacity.⁵⁰ The reliability standard for the NEM sets a target that at least 99.998% of demand should be met. The standard was met in 2017-18, with no unserved energy (USE) occurring as a result of insufficient capacity. However, historical outcomes do not provide a good guide for future outcomes for USE, as the risk of extreme events resulting in USE remains.

⁵⁰ AEMC, *Reliability Frameworks Review – Final Report*, 2018

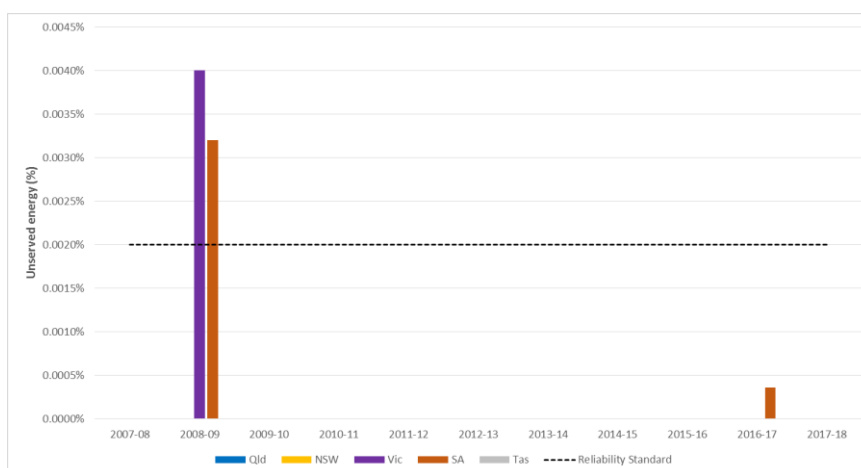


FIGURE 17: UNSERVED ENERGY IN THE NEM. SOURCE: AEMO

The number of lack of reserve notices issued in the past two years has been higher than previous periods (see Figure 18). Lack of reserve notices are issued by AEMO when there is insufficient spare capacity to provide an adequate buffer and balance the system to signal that more capacity needs to be made available if possible. The three stages of notice (LOR 1, 2, 3) indicate an increasing lack of reserve capacity. The higher number of lack of reserve notices in recent years, along with rising wholesale prices, are an indication that the supply-demand balance remains tight.

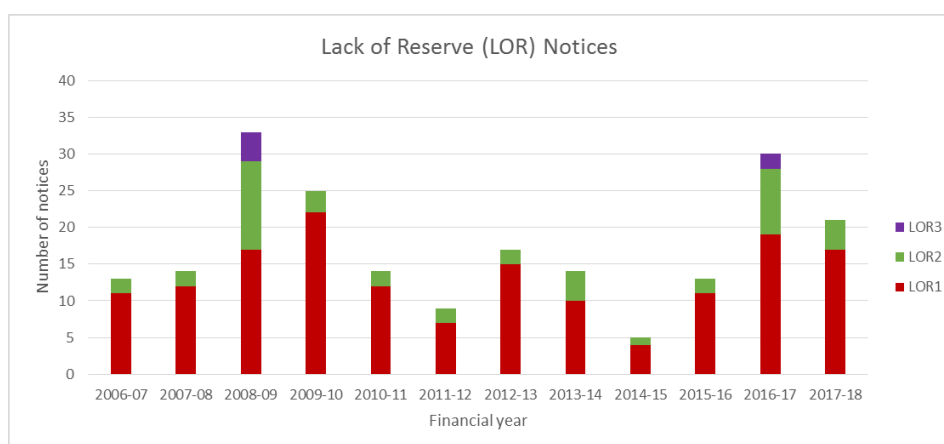


FIGURE 18 LACK OF RESERVE NOTICES 2006-07 – 2017-18. SOURCE: AEMO

Over the 2017-18 summer, AEMO used the Reliability and Emergency Reserve Trader Mechanism (RERT) to manage the risk of load shedding. The use of this mechanism avoided the need to involuntarily disconnect customers and the costs associated with such action. The use of RERT is costly. AEMO estimates that the total cost of having the RERT

on call and activated twice over the 2017-18 summer was \$51.99 million⁵¹ – a cost which is ultimately borne by consumers.

Further increases in the proportion of variable renewable energy in the system will create challenges for system management. Over 6,000 MW of large-scale renewable generation is expected to be built over the next two years⁵². The Clean Energy Council estimates that over 14,000 MW of large-scale renewable projects are ready to be built in the NEM⁵³ and AEMO projects over 65,000 MW of Hydro, Wind, Solar, Biomass and Storage will be built by 2040,⁵⁴ which equates to almost 3,300 MW per annum.

As mentioned in Section 3.2, non-synchronous variable renewable energy generators have different characteristics from synchronous generators such as coal, gas and hydro. As it relates to reliability, these differences include:

- the dependence of wind and solar PV on weather conditions can make it considerably harder to accurately forecast their output ahead of time
- variable renewable energy is not dispatchable and makes balancing supply and demand in systems with high variable renewable energy more challenging
- to date, variable renewable energy has typically been contracted through long-term power purchase agreements (PPAs) rather than relying on selling firm hedge products in the contract market which makes proponents largely indifferent to the times when they are not operating.

In the longer term, AEMO projects that wind and solar PV will account for more than 50% of installed capacity by the mid-2030s and by 2040 the generation mix will include approximately 60,000 MW of utility-scale variable renewable energy and 27,000 MW of distributed storage and rooftop PV.⁵⁵

In December 2018, the COAG Energy Council reached agreement on the final draft bill of National Electricity Law (NEL) amendments which will give effect to the Retailer Reliability Obligation. The Retailer Reliability Obligation requires retailers and other market customers, to support the reliability of the NEM through their contracting and investment in resources. Increased long-term contracting is expected to lower prices as market customers must have a reliable level of firm contracts in place at key times. Generators with high levels of long-term contracts in place face strong financial incentives to be able to generate when needed.

The incentives and structures created by the Retailer Reliability Obligation are also expected to accelerate the development of the demand-side response market. This will give the NEM additional, potentially-lower cost, ways to respond to peaks in demand.

⁵¹ AEMO, https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/RERT-Update---cost-of-RERT-2017-18.pdf, accessed 12 November 2018

⁵² Clean Energy Regulator, *Large-scale Renewable Energy Target market data*, 18 October 2018

⁵³ If committed, this level of investment will create over 12,700 direct jobs - Clean Energy Council, <https://www.cleanenergycouncil.org.au/policy-advocacy/jobs-and-investment.html>, accessed, 30 November 2018

⁵⁴ AEMO, *Integrated System Plan*, 2018, neutral case

⁵⁵ Under the neutral case, AEMO, *Integrated System Plan*, 2018

3.3.3. Lower Emissions

The Australian Government committed in 2015 to an economy-wide emissions reduction target of 26-28% below 2005 levels by 2030. Agreement on the electricity sector's contribution to achieving this target, and a long-term trajectory to do so, is critical to an orderly transition in the NEM. A measured entry of variable renewable energy would be supported by an adequate level of dispatchable energy to firm renewables.

During 2018, the ESB developed the National Energy Guarantee, a mechanism to integrate energy and climate policy. The Guarantee was developed with significant support across a broad range of stakeholders and was intended to deliver long-term policy confidence and stability that would reduce investment risk and bring down electricity prices. Critically, this investor confidence would have come through the use of existing market arrangements in the NEM. As noted above, the Australian Government decided not to proceed with implementing the emissions requirement of the National Energy Guarantee.

The NEM is broadly on track to meet the lower end of the current national emissions reduction target due to State and Commonwealth Government renewable energy targets and support from a range of large customers. The absence of an agreed national policy, combined with ad hoc state policies, will not provide the coordinated approach required to drive efficient investment in the right mix of generation over the longer term. Ultimately this will make the cost of other interventions that are required to drive investment in dispatchable generation much higher.

In the absence of a NEM-wide emissions reduction mechanism, various state governments are pursuing renewable energy and/or emissions targets. These include:

- Victoria: 25% renewable energy by 2020, 40% renewable energy by 2025 and 50% by 2030.
- Queensland: 50% renewable energy by 2030
- ACT: 100% renewable energy by 2020 and net-zero emissions economy-wide by 2045

Figure 19 below shows historic emissions and forward projections for the NEM that resulted from the modelling produced for the Guarantee⁵⁶. Overall emissions are tracking downwards but are forecast to plateau in the 2020s as the large-scale renewable energy target and current momentum stalls. Continued delivery of State Government renewable energy targets will contribute to further reductions in emissions than what are currently presented in Figure 19.

⁵⁶ Modelling for the Guarantee assumed only stage 1 of the Queensland Renewable Energy Target and Victorian Renewable Energy Target were included.

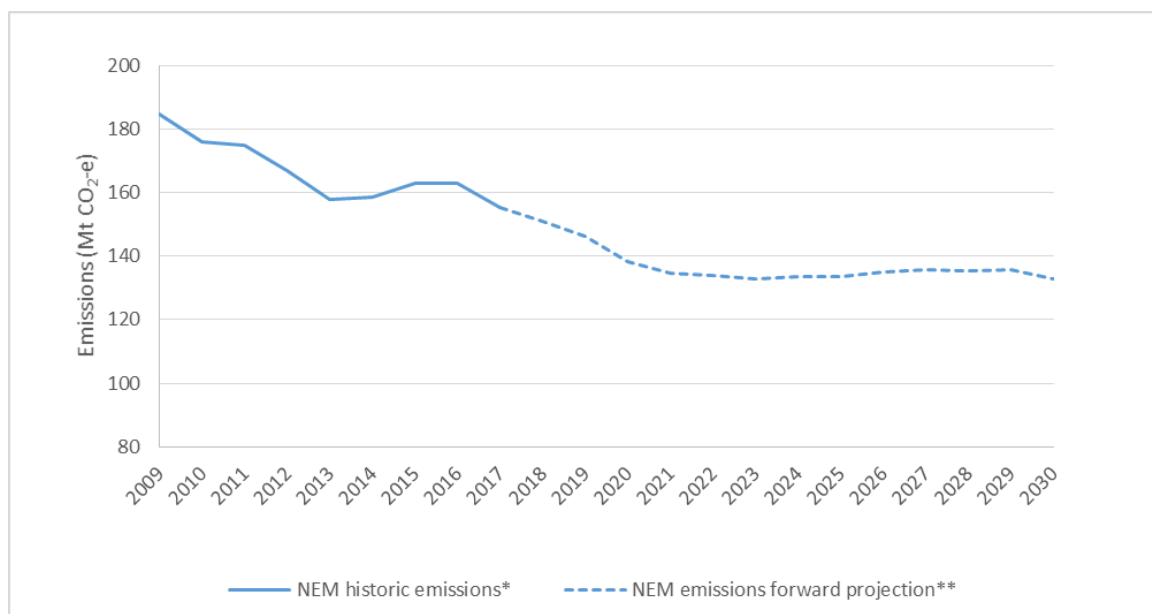


FIGURE 19: NEM EMISSIONS - HISTORIC AND FORWARD PROJECTION⁵⁷.

3.3.4. Work underway

Retailer Reliability Obligation

The Retailer Reliability Obligation requires retailers and other market customers to support reliability through their contracting and investment in resources.

AEMO will forecast annually whether the reliability standard is likely to be met (or not) in each NEM region over a 10-year period. Where a reliability gap is identified, the market will have the opportunity to invest to close that gap. However, if a material gap persists or emerges three years from the period in question, then AEMO will apply to the AER to trigger the reliability obligation.

When the reliability obligation is triggered, liable entities may be required to demonstrate future compliance by entering into sufficient qualifying contracts for dispatchable capacity (including demand response) to cover their share of peak demand at the time of the gap.

RERT mechanism

The suitability of the existing intervention framework, including the RERT and other directions powers, in the context of a changing system is the subject of ongoing analysis and discussion. AEMO has highlighted that the transition towards more variable and distributed generation technologies, in combination with an ageing thermal generation fleet and

⁵⁷ Historic NEM emissions seasonally adjusted (calendar year) based on Australian National Greenhouse Accounts Data. Forward projections based on 'business as usual' scenario (financial year) modelled for the National Energy Guarantee Final Detailed Design. Source: Department of the Environment and Energy 2018; Energy Security Board 2018

increasingly extreme weather events, is creating an increased 'tail risk' of relatively unlikely but very high consequence reliability shortfalls. AEMO has advocated⁵⁸ for using the RERT to insure against this tail risk. This requires a number of changes to the existing RERT framework. The AEMC is currently developing a consultation paper on the broader interventions framework, scheduled to be published in early 2019. The AEMC is expecting five rule change requests from AEMO on improving the mechanics of intervention pricing that will be progressed concurrently. The AEMC is also assessing a rule change request from AEMO to increase the scope of the RERT mechanism (the 'enhanced RERT') as a stronger safety net to mitigate against the risks associated with unanticipated reliability shortfalls in excess of the reliability standard.

Assessment of a 'day-ahead' market

The Finkel Review recommended AEMO and the AEMC assess the merits of a 'day-ahead' market which would provide better forward vision of supply conditions and could help address short-term reliability concerns around scheduling of plant. The AEMC assessed a day-ahead market through the Reliability Frameworks Review and concluded that there may be benefits in a short-term forward market which would allow participant-to-participant trading of financial contracts closer to real time. The AEMC did not, however, recommend changes to settlement in the wholesale market at an earlier point ahead of dispatch, as it was of the view such a change would impose large costs for little benefit. This issue will be further considered in the context of the post-2025 review of the market design.

Improved forecasting

Coordination across the market to maintain a reliable system relies on the availability of accurate information. In the NEM, this especially relates to supply and demand forecasts made by AEMO over various timeframes, which report on forecast conditions and signal the need for additional capacity in each NEM-region. The AEMC's *Reliability Frameworks Review* found that there has been no observable worsening in the accuracy of AEMO's forecasting over time but made a number of recommendations to improve the information available to the market in the context of a changing energy mix. The AEMC recommended that:

- AEMO be required to continuously provide forecast deviation data
- Rule changes be requested that would require guidelines relating to how:
 - AEMO develops and amends its forecasting methodology
 - The AER reports on differences between forecast and actual values in the Medium Term Projected Assessment of Supply Adequacy, Short Term Projected Assessment of Supply Adequacy and pre-dispatch forecast processes.

AEMO's Forecasting Improvement Program comprises 4 key areas:

1. Enhancing AEMO's cloud-based analytics and modelling capability.

⁵⁸ AEMO, *The NEM Reliability Framework: Additional information from AEMO to support its Enhanced RERT rule change proposal*, November 2018

2. Increasing transparency and accountability of forecasting.
3. Improving understanding of consumer behaviour and the rate of uptake of new technologies.
4. Extending capability to forecast gas and electricity demand in Western Australia

AEMO has commenced its stakeholder consultation process for inputs and assumptions to be used in publications for 2019, including the Integrated System Plan. Stakeholder engagement has been through various forums, including the Forecasting Reference Group, Market Modelling Working Group, an open Forecasting Methodology consultation, and direct consultation with key stakeholders. This includes surveys with gas stakeholders for the 2019 Gas Statement of Opportunities. AEMO is also conducting a joint undertaking with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to review and revise generation technology costs across the NEM over the planning horizon to 2040 and beyond.

Over a longer timeframe AEMO is working with the Bureau of Meteorology, CSIRO and Department of the Environment and Energy on a three-year project to improve long term climate information to assist electricity sector risk planning. This will enable AEMO to better assess the impacts of future extreme weather events on demand and supply, and plan for changes in the likelihood of concurrent impacts.

Generator three year notice of closure

To assist market participants in making informed and timely investment decisions, the Finkel Review also recommended that large electricity generators be required to give at least three years' notice of their intention to close. The AEMC made this rule change in November 2018. It requires scheduled and semi-scheduled generating units to give notice of closure. and captures units above 30 MW and includes coal, gas, hydro, wind and solar generation.

3.3.5. Long-term outlook

AEMO forecasts electricity reliability in the NEM over a ten year period through its ESOO publication. The 2018 ESOO identified that New South Wales, Victoria and South Australia are all expected to breach the reliability standard in the medium term without additional investment in capacity (see Figure 20). This outlook represents a change from the 2017 ESOO, where the reliability standard was not forecast to be breached in the medium to long-term in any NEM region.

The change in outlook reflects new assumptions around generator and network performance, an up to date assessment of new capacity entering the market, and revisions to statistical methodology. Importantly, the outlook is based on committed generation, and does not take into account other investment that is being considered and developed. No capacity issues are forecast in Queensland or Tasmania over the ten year assessment period.

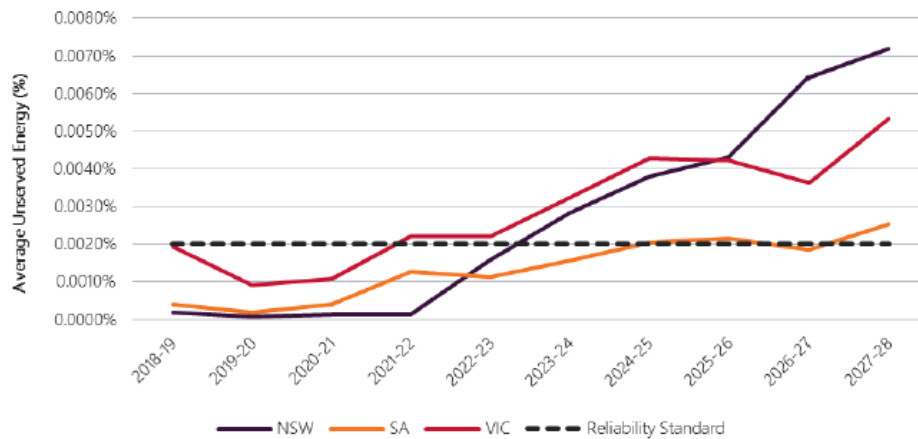


FIGURE 20: FORECAST USE OUTCOMES – NEUTRAL DEMAND, ONLY EXISTING AND COMMITTED PROJECTS. SOURCE: AEMO, *ELECTRICITY STATEMENT OF OPPORTUNITIES*, 2018

It is important to note that forward projections of a breach of the reliability standard do not imply that a reliability problem will occur. The ESOO is primarily a planning document, intended to signal to market participants that additional supply will be required in these NEM-regions. This information indicates that tight supply-demand conditions and associated high wholesale prices should be expected in these regions. These high wholesale prices should encourage new entrants into the market, thereby closing the forecast reliability gap.

A major risk to ensuring future reliability requirements and emissions reduction commitments is that the investment environment in the NEM is currently challenged by uncertain policy and rapidly changing technology costs. Domestic energy policy continues to lack a clear bipartisan mechanism to integrate emissions reductions with energy policy objectives. Without such a mechanism, policy interventions will continue to encourage variable renewable energy to connect in an ad hoc and unpredictable rate, while investment in new or existing thermal generation will continue to be challenging.

The rapid rate at which renewable and storage technology is advancing also creates risk for investors. It is likely that entrant costs for future new participants are likely to be lower than at present. These factors have the potential to hold back investment, even in the presence of relatively strong incentives. This lack of investment increases costs and is a potential risk to reliability.

Figure 21 shows the large amount of existing coal capacity which will reach 50 years of operations and leading up to that be approaching the end of its expected operating life. Much of this capacity may in fact retire before the end of its technical life, as low-cost variable renewable energy enters the market and undercuts economically viable coal capacity in the wholesale market. This challenges the economics of maintaining this plant and necessitating more flexible complementary dispatchable capacity entering.

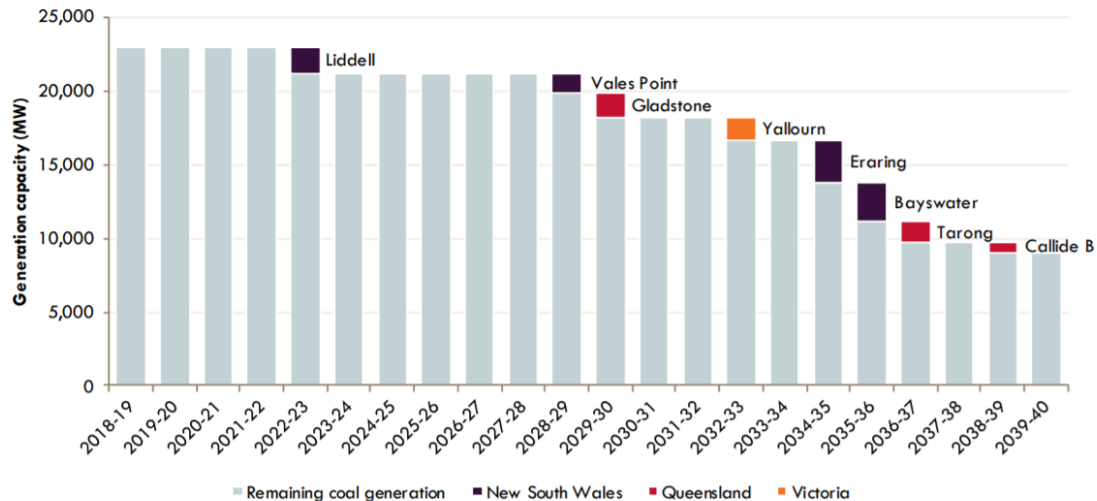


FIGURE 21: NEM COAL-FIRED GENERATION OPERATING LIFT TO 2040, BY 50TH YEAR FROM FULL OPERATION OR ANNOUNCED RETIREMENT. SOURCE: AEMO, *INTEGRATED SYSTEM PLAN*, 2018

Greater utilisation of demand response presents opportunities to maintain reliability and increase the economic efficiency of the NEM. The AEMC noted in the *Reliability Frameworks Review* that integrating demand response into the wholesale market will be a critical component of facilitating the uptake and management of more distributed and variable energy resources. To increase participation of demand response in the wholesale market, the AEMC recommended:

- A voluntary, contracts based forward market which would encourage demand response by giving greater price certainty, in addition to having other benefits.
- A rule change request be submitted to implement a wholesale demand response mechanism. The AEMC received this request from the Public Interest Advocacy Centre, the Total Environment Centre and The Australia Institute on 31 August 2018, and an alternative request from the Australian Energy Council on 18 October 2018.
- AEMO to submit a rule change request which would enable consumers to engage multiple retailers/aggregators at the same connection point to promote greater access to and competition between demand response facilitators.

The design of the Retailer Reliability Obligation specifically recognised the development of demand response contracts as central to ensuring the reliability requirement of the Guarantee is met at least-cost.

Having enough flexible capacity in the NEM available to ‘ramp up’ quickly is also a consideration that will need monitoring. The AEMC concluded⁵⁹ that existing market signals are sufficient to maintain sufficient flexible generation in the immediate future, but that this is an area that requires ongoing consideration. Flexible capacity will be encouraged when the settlement period for wholesale prices changes from 30 minutes to five minutes to align with dispatch and bidding in 2021. This will create stronger economic incentives for fast ramping, flexible generation and demand side technologies in the NEM. While some industry

⁵⁹ AEMC, *Reliability Frameworks Review*, Final Report, 201, p. viii

participants have raised concerns about the costs of systems and that the change may impact the availability of cap products, it is expected to make the system more capable of balancing short-term variability in generation output.

3.3.5.1. *Delivering the energy transformation*

The rapid energy transformation in the NEM is underway. This will have implications for how the system is managed and where the skills will need to come from to deliver the transformation. The Australian Bureau of Statistics⁶⁰ estimated that 14,820 people were employed in renewable energy activities in 2016-17. With a continued trend in the uptake of distributed energy resources, the demand for appropriately qualified resources to install and maintain solar PV and storage will increase. Further, as many of the panels and inverters that have been installed over the last 10 years come to the end of their life, these systems may need to be replaced and the associated waste appropriately disposed of.

New approaches to engineering and data science are also likely to be needed to operate a highly decentralised electricity system in the future. NEM regions such as South Australia already have extremely high penetration of variable renewable energy relative to international electricity systems, so there are few examples to follow. An emerging challenge will be to identify precisely what skills are required and how these skill gaps can be closed.

The Finkel Review recommended that by mid-2019 the COAG Energy Council should facilitate the development of a national assessment of the future workforce requirements for the electricity sector to ensure a properly skilled workforce is available. In delivering this transformation of the NEM, it is critical that market bodies and governments remain informed about the workforce and operational needs of the future. Steps need to be taken ahead of time to build a pipeline of appropriately qualified professionals and systems to avoid skills shortages which could increase risks and costs.

⁶⁰ ABS, *Employment in Renewable Energy Activities, Australia, 2016-17*

3.4. Effective development of open and competitive markets

3.4.1. Overall assessment

The Finkel Review recognised that to achieve an effective retail electricity market, the consumer needs to be confident that the retail sector is meeting their needs. The Finkel Review also highlighted that effective competition is a key driver of productive, efficient and innovative markets. Delivering effective competition in the NEM relies on efficient access to fuel, financial markets that encourage investment and support participation, and frameworks that drive innovation in emerging technologies.

This report rates the current state of competition in wholesale and retail markets as moderate to critical (see Table 5). The ACCC's *Retail Electricity Pricing Inquiry* found that high and entrenched levels of concentration in the NEM may be contributing to elevated prices and that the current market structure is not conducive to vigorous competition.

Wholesale markets in the NEM are concentrated, with the largest three retailers controlling approximately 45% of generation capacity. Recent analysis⁶¹ by the AER notes that concentration provides a number of participants with greater potential to exercise market power; however, it did not identify short term behaviour as a significant factor contributing to recent energy price rises. Longer term trends will require ongoing monitoring.

The rapid entry of variable renewable energy and the impact this is having on the outlook for forward prices suggests that concentration is not a significant barrier to new entry for competitive sources of energy although much of this new investment has been driven by government subsidies. Concerns about concentration and control of dispatchable resources in the NEM remain and will need to be monitored.

Retail markets in the NEM are also concentrated, with the largest three retailers controlling approximately 70% of the retail market. The ACCC found that large retailers enjoy significant advantages over smaller competitors, including inactive customers who don't seek competitive offers, economies of scale and a greater ability to take advantage of vertical integration.⁶² It is quite clear that retail markets have not been delivering for consumers.

Reforms underway to help customers navigate the market and recommendations made by the ACCC are expected to prevent further deterioration and should improve the situation in the medium term. The outlook for competition is therefore rated as improving.

The financial markets that support the NEM are generally sufficient in supporting retail activity in most regions, despite suggestions that contract markets are relatively thin as the coming summer approaches. More specific concerns around the low level of liquidity of financial contracts in South Australia and the challenges faced by small retailers in accessing hedge markets more generally require further investigation.

The systemic challenges for liquidity in South Australia including the size of the market, the importance of interconnection, the changing role of dispatchable generation and high variable renewable energy penetration require further analysis. The outlook for financial markets for electricity is considered stable although a more thorough understanding of the potential changes to the contract market as a result of the ongoing energy transformation

⁶¹ AER, *Wholesale electricity market performance report*, December 2018.

⁶² ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

across the NEM will be important and should be an ongoing area of consideration by the ESB and market bodies in 2019.

Access to efficiently priced fuel is considered moderate. While coal and gas prices in 2017-18 were well above long-term averages, the increase in fuel costs largely reflects an increased linkage of marginal coal and gas costs of some generators within the NEM to global markets. The outlook is considered stable.

TABLE 5 EFFECTIVE DEVELOPMENT OF OPEN AND COMPETITIVE MARKETS – STATUS AND OUTLOOK

	Current Status	Outlook
Competition in wholesale and retail markets	Moderate-critical	Good
Deep, liquid and transparent financial markets for electricity	Moderate	Moderate
Access to efficiently priced fuel and transport	Moderate	Moderate
Innovation is incentivised and enables value from new technologies	Moderate	Good
Overall	Moderate	Good-Moderate

Emerging issues include:

- Understanding the changing role of financial contracts in the NEM as the operating profiles and generation mix transforms and the impact this has on the competitive dynamics at a wholesale and retail level.

3.4.2. Wholesale Markets

Markets with effective competition drive innovation and lead to better outcomes for consumers. The ACCC's *Retail Electricity Pricing Inquiry* revealed a number of concerns around how competition is functioning in practice in the NEM.

There are relatively high levels of market concentration in both the wholesale and retail markets in the NEM, though this is not unusual for capital intensive industries. In New South Wales, Queensland and Victoria, the three largest company portfolios account for around 70% of generation capacity (see Figure 22) and more than 80% of electricity dispatched.⁶³

To date, the entry of new generation capacity held by smaller companies has had relatively little impact on an overall trend towards market concentration in the generation sector. The generation market share of the 'big three' retailers (AGL Energy, Origin Energy and EnergyAustralia) has increased from 17% in 2011 to 45% in 2018 due to the consolidation of

⁶³ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

generation assets across New South Wales and Victoria. However, this is likely to change with the rapid entry of variable renewable energy over the coming years.

The following events have had a particular impact:⁶⁴

- Consolidation of state-owned generators in Queensland in 2011
- AGL's acquisition of full control of Loy Yang A in Victoria in 2012 and Macquarie Generation (which included the Bayswater and Liddell power stations) in 2014
- Closure of Playford B and Northern power stations in South Australia in 2015 and 2016 respectively
- Closure of Hazelwood in Victoria in 2017

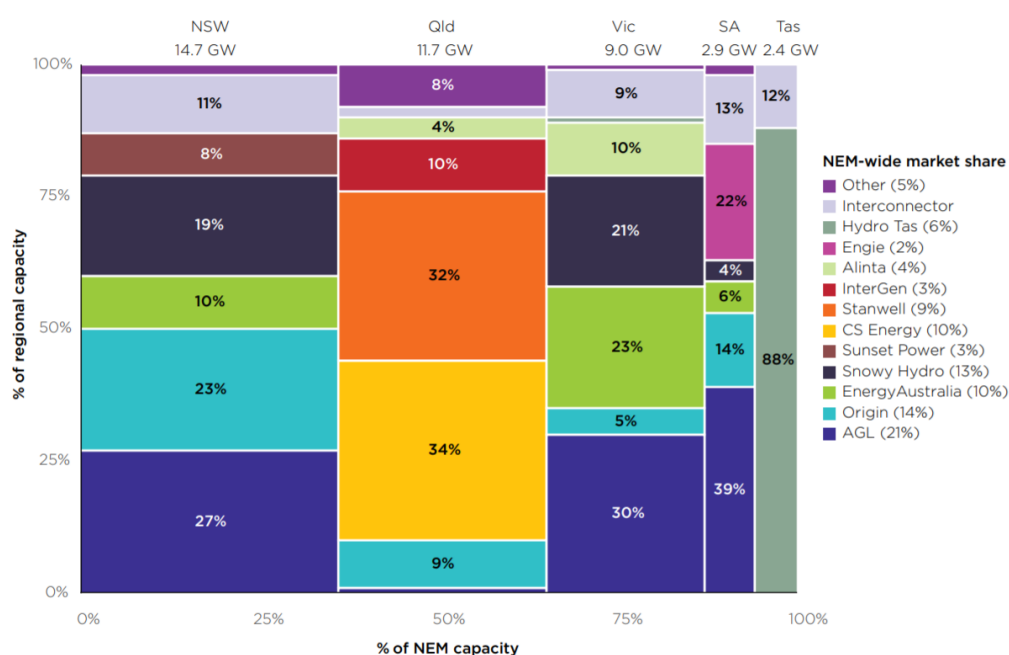


FIGURE 22 MARKET SHARE BY GENERATION CAPACITY BY REGION, JANUARY 2018. SOURCE: ACCC, RETAIL ELECTRICITY PRICING INQUIRY – FINAL REPORT, 2018

Until recently, wholesale spot prices have averaged close to or under \$50 per MWh, even after factoring in the effects of the 2007 drought and a price on carbon. More recently following the closure of Hazelwood Power station, wholesale prices have been much higher, averaging around \$100/MWh or above across most of the regions.

Over the past two years, in response to higher wholesale prices and falling technology costs for variable renewable energy, the NEM has seen a rapid commitment of new projects, with forward prices from the middle of 2019 onwards reflecting this entry. By 2021 wholesale prices are predicted to be between \$55 and \$75 per MWh across the NEM.

⁶⁴ AER, *State of the Energy Market*, May 2017, p. 48

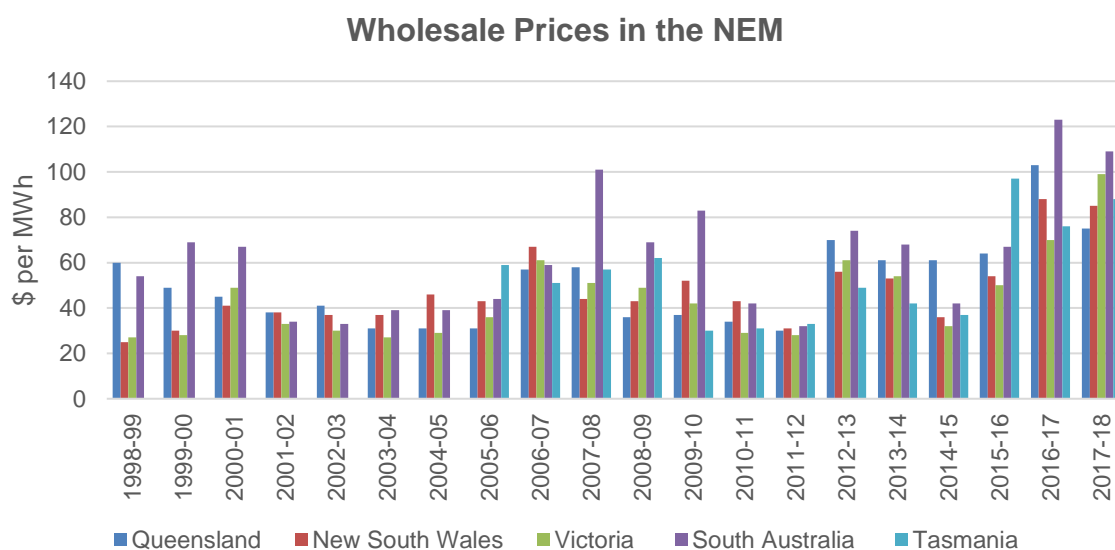


FIGURE 23: WHOLESALE PRICES ACROSS THE NEM SOURCE: AEMO

Market concentration in the NEM can cause problems because it reduces competitive bidding pressure between market participants. The ACCC reported that in some cases generation portfolios use their market power to drive up prices and maximise returns across the portfolio.⁶⁵ They also found that concentration may alter investment incentives for existing generation businesses, given that new investment is likely to lower prices paid to their existing generators.⁶⁶

In September 2018, the AEMC released a report that explored the impact of gaming in the market in response to a request from the Commonwealth Minister for the Environment and Energy. The AEMC found that earlier estimates of gaming were too broad and that the impact of generator rebidding was materially lower. The AEMC indicated that the impacts of generator rebidding had fallen since 2015 and were largely attributed to the activities of generators in Queensland^{67,68}. Consistent with the conclusions of the ACCC, the AEMC found that bidding or rebidding behaviour that is seen to be a problem is predominantly a result of high levels of market concentration and less related to specific instances of spiking the wholesale price with the use of market power. The AEMC recommended that these issues should be addressed by policies to lower barriers to entry and promoting efficient new investment.⁶⁹

In its recent wholesale electricity market performance monitoring report, the AER noted that while concentrations are high there is no evidence at this stage of sustained abuse of market power.

⁶⁵ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018, p. 88

⁶⁶ *Ibid.*

⁶⁷ AEMC, *Gaming in rebidding assessment (Grattan Response)*, September 2018, p. 35

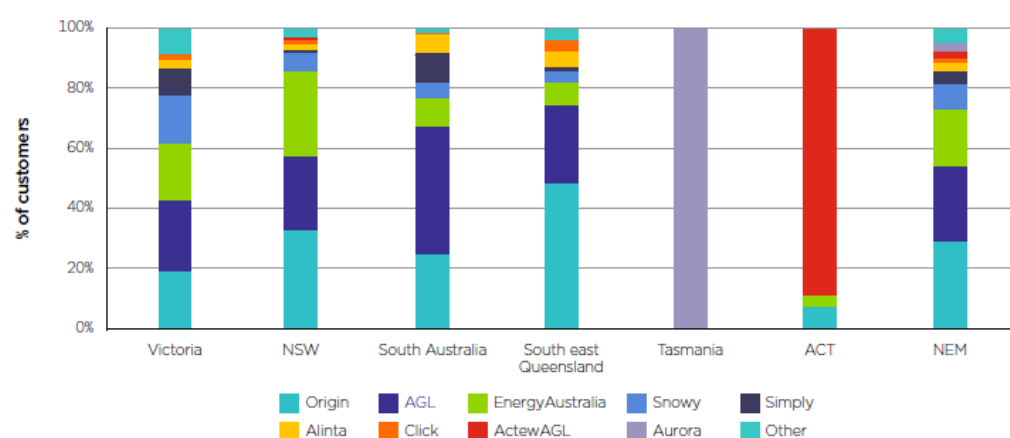
⁶⁸ In August 2018, the Queensland Government announced that it had begun work on establishing a third publicly owned electricity generator, CleanCo, that would have a strategic portfolio of low and no emission power generation assets, and will build, construct, own and maintain renewable energy generation.

⁶⁹ AEMC, *Gaming in rebidding assessment (Grattan Response)*, September 2018, p. 35

While concentration remains a concern, evidence of the rapid entry of variable renewable energy and the impact this is having on the outlook for forward prices suggests that this is not presenting as a significant barrier to new entry for competitive sources of energy. Concerns about concentration, and the impact this might have on wholesale energy prices, remain at the times throughout the year when variable renewable energy is not operating at high levels. Although the declining costs for battery technology both at a utility scale and behind the meter is undoubtedly going to influence this outlook significantly.

3.4.3. Retail Markets

In the retail sector, the market is also concentrated (see Figure 24), largely as a result of how customer bases were sold when the retail sector was deregulated.⁷⁰ The ACCC found that large retailers enjoy significant advantages over smaller competitors, including inactive customers who don't seek competitive offers, economies of scale and a greater ability to take advantage of vertical integration.⁷¹



Source: Queensland, NSW, South Australia, Tasmania and ACT: AER data, March 2018; Victoria: ESC Victoria, *Victorian energy market report 2016-17*.

Notes: * Victorian data is for June 2017.

** South east Queensland data has been calculated by subtracting Ergon Energy customers from Queensland market share figures and rebasing percentages.

FIGURE 24: RETAIL ELECTRICITY MARKET SHARE (RESIDENTIAL CUSTOMERS). SOURCE: ACCC, RETAIL ELECTRICITY PRICING INQUIRY, 2018

The AEMC's *Retail Energy Competition Review 2018*⁷² reported a total of 33 retail brands across NEM-regions, with two retailers entering and one leaving the market in the preceding year. There has been a slight decrease in retail market concentration over time, with the big

⁷⁰ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

⁷¹ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018

⁷² One new retailer (Energy Locals) and one new brand (amaysim Energy) entered and one retailer (Online Power and Gas) exited. The exit was not a *retailer of last resort* event, which may suggest that this retailer has sold its retailer book of around 10,350 customers to another retailer (AEMC 2018, *Retail Energy Competition Review*, p. 20 and Essential Services Commission 2017, *Victoria Energy Market Report*, pp. 18-19).

three's share decreasing by 9.2% between 2012 and 2018. However, they continue to dominate the retail market, maintaining an aggregate market share of over 70%.

While there are signs of competition between retailers – for example the AEMC found electricity switching rates had increased in the last year in all mainland jurisdictions⁷³ – there are ongoing concerns that the retail market is not delivering for consumers. The ACCC's analysis suggests that competitive pressure on the largest 'tier 1' retailers (the big three) comes primarily from the smallest 'tier 3' retailers, who have higher per customer fixed costs, own little or no generation assets and generally operate on thin margins. Earnings (before interest, tax, depreciation and amortization) as a percentage of revenue shows an upward trend for the big three since 2013-14 and was more than double that of tier 3 retailers in 2016-17, as reported by the ACCC.⁷⁴

3.4.4. Contract Markets

Vertical integration between generation and retail provides a natural hedge to price risk in the wholesale market and gives rise to competitive advantages. But increased incidences of vertical integration generally reduce the volume of contracts trading in the market which can limit the ability of stand-alone retailers to access contracts and therefore has further negative implications for competition.

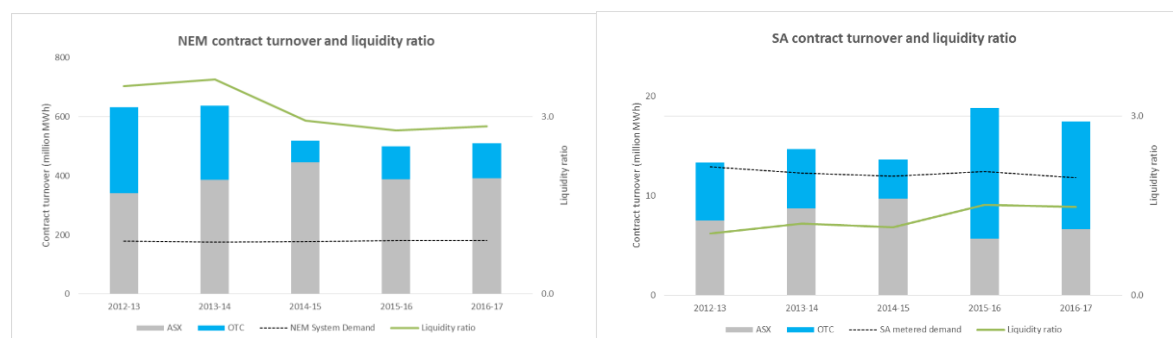


FIGURE 25: CONTRACT MARKET TURNOVER AND LIQUIDITY RATIO, NEM AND SOUTH AUSTRALIA. SOURCE: RECREATED USING AFMA, ASX AND NEM REVIEW-V6 DATASETS

Contract market liquidity, as measured by calculating the turnover of exchange traded and 'Over the Counter' contracts relative to underlying NEM demand, has decreased since 2013-14. Figure 25 shows that total contract turnover has declined moderately over time but remains at close to three times the level of operational demand. However, this is not the case in South Australia, where the liquidity ratio is estimated at 1.0-1.6 over the period between 2012-13 and 2016-17. Understanding the reasons for lower liquidity in South Australia is complicated by the multitude of contributing factors which include:

- the small size of the South Australian market and its location within the NEM,
- the ongoing reliance on interconnector flows,
- the changing role of dispatchable generation in a region dominated by variable renewable energy, and

⁷³ AEMC, *Retail Competition Review*, 2018, p.97.

⁷⁴ ACCC, *Retail Electricity Pricing Inquiry – Final Report*, 2018, p. 146

- the increased long term contracting with variable renewable energy under Power Purchase Agreements and the resulting residual exposures that are needed to be managed.

While it is difficult to be strict in defining what is adequate, the liquidity observed across Queensland, New South Wales and Victoria appear to sustain a relatively healthy level of retail activity. The AEMC identified that some retailers consider low liquidity as a barrier to entry and expansion.⁷⁵ The ACCC's *Retail Electricity Pricing Inquiry* also noted stakeholders' concerns about the ability of small retailers to access reasonably priced hedge contracts, especially in South Australia. Further, the report also highlighted that the ability of small retailers to access hedge markets were likely diminished by their creditworthiness and access to collateral. It is unclear at this stage to what extent this fact is disadvantaging small retailers.⁷⁶

In response to contract market transparency and liquidity, the ACCC *Retail Electricity Pricing Inquiry* recommended two actions to increase contract market transparency and liquidity:

- A mandatory trade reporting of all over the counter trades should be created (Recommendation 6)
- Large, vertically integrated retailers should be required to make offers to buy and sell hedge contracts (make markets) in South Australia, under certain conditions, to boost market liquidity (Recommendation 7)

In November 2018, COAG Energy Council requested the ESB advise on the need for and suitability of a number of ACCC recommendations. The ESB will provide advice at the December 2018 COAG Energy Council meeting.

The AEMC has also received a rule change request to consider market making obligations in the NEM. It is expected that this will be complete in the first half of 2019.

3.4.5. Access to Reliable and Affordable Fuel

Fuel costs are a major factor in the pricing of bids that generators submit to the market. Bidding behaviour in the NEM is influenced by the fuel costs or the opportunity cost of production for the marginal generator supplying a region.

The price of coal and gas as an input to electricity generation is determined by multiple factors including whether the fuel source is owned or contracted, the cost of extraction, transport costs and any opportunity cost associated with export to international markets. Maintaining access to efficiently priced fuel is essential to delivering electricity in the NEM at least cost.

3.4.5.1. Gas

AEMO's latest projections are that east coast gas supply will be adequate to meet demand until at least 2030 under expected market conditions.⁷⁷ Confidence in the availability of gas for generators in the NEM has also been enhanced through the Gas Supply Guarantee

⁷⁵ AEMC, *Retail Competition Review*, 2018, p.xv

⁷⁶ ACCC, *Retail Electricity Pricing Inquiry*, 2018, p.112-113.

⁷⁷ AEMO, 2018 Gas Statement of Opportunities, June 2018, p.3

mechanism, under which gas producers and pipeline operators have made a commitment that gas will be available during peak demand periods in the NEM. The Australian Domestic Gas Supply Mechanism is an additional measure to ensure availability, which gives the Commonwealth Minister for Resources the ability to impose restrictions on gas exports to avoid any potential shortfall in meeting domestic demand for gas more broadly.

With regard to price, the commissioning of the last of the six liquefied natural gas (LNG) trains at Curtis Island in Gladstone during 2015-16 has had a significant impact on the east coast markets. Until this point, the east coast gas markets were disconnected from global markets, with fuel costs largely reflecting costs of production from conventional gas fields located in the Cooper and Gippsland basins and then later through the emerging unconventional gas industry. Since 2015-16 east coast gas pricing has tended to be driven by international pricing with shorter term fluctuations reflecting the demand (or lack thereof) from generators (see Figure 26). As a result, prices have moved from below \$5/GJ prior to the development of LNG export facilities on the east coast, up to \$10.50- \$11.00/GJ.

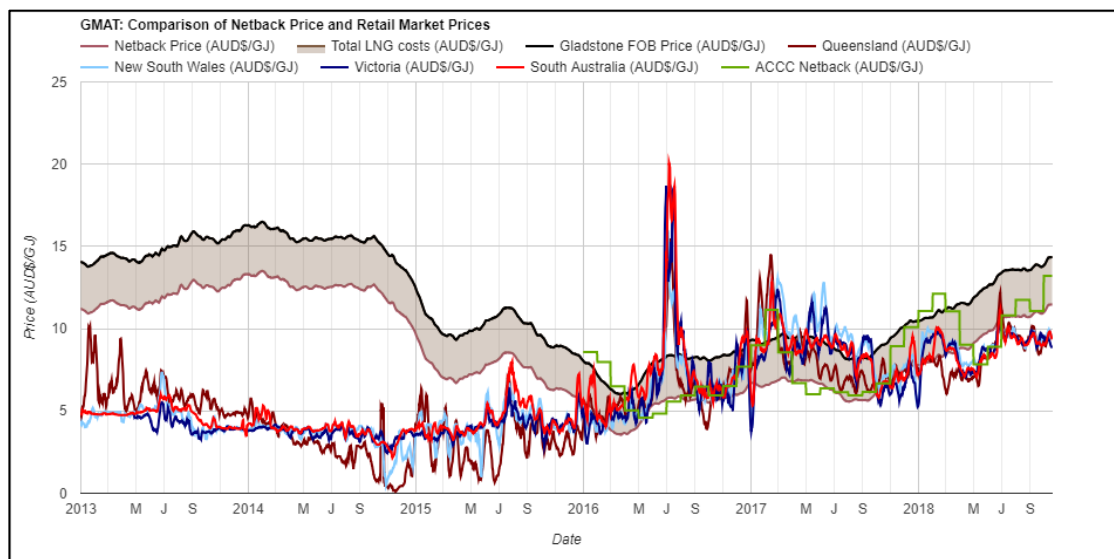


FIGURE 26: LNG NETBACK PRICE AND RETAIL MARKET PRICES, 2013-2018. SOURCE: ENERGYEDGE GMAT

The outlook for gas prices in the NEM remains significantly above historical levels. Low global oil prices relative to the levels experienced between 2011 and 2015 have meant that the current levels of exploration and development reflect the need to maintain current gas production levels rather than target additional discretionary increases in production (see Figure 27). The marginal production costs in Queensland are also rising as the LNG projects progressively focus efforts on less productive fields.

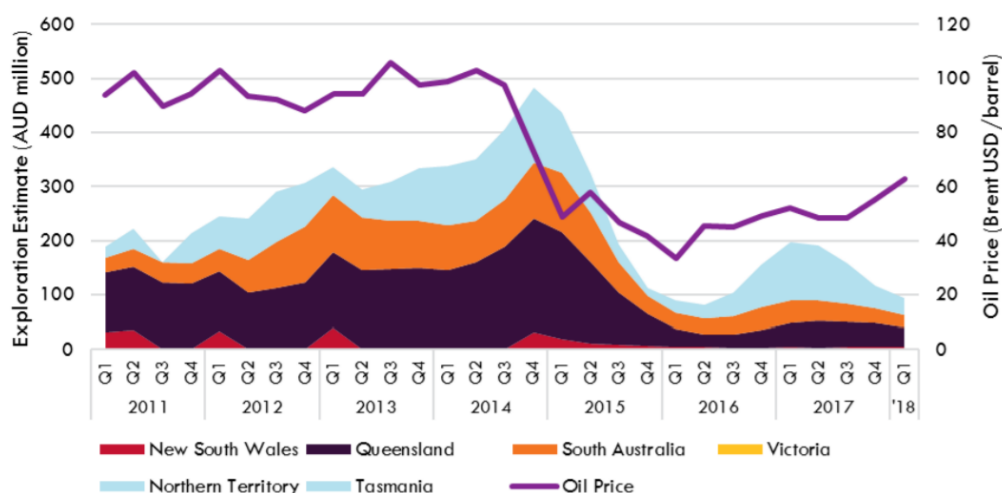


FIGURE 27: OIL AND GAS EXPLORATION EXPENDITURE ESTIMATE, AND BRENT OIL PRICE, 2011-18. SOURCE: AEMO, GAS STATEMENT OF OPPORTUNITIES, 2018

AEMO expects gas production from southern states (New South Wales, Victoria and South Australia) to be mostly sufficient to meet southern demand, but some imports from the north will still be required.⁷⁸ As a result, the cost of gas that will influence fuel prices in the NEM is expected to continue to remain around current levels and be set with reference to the opportunity cost of exporting to international markets (see Figure 28).

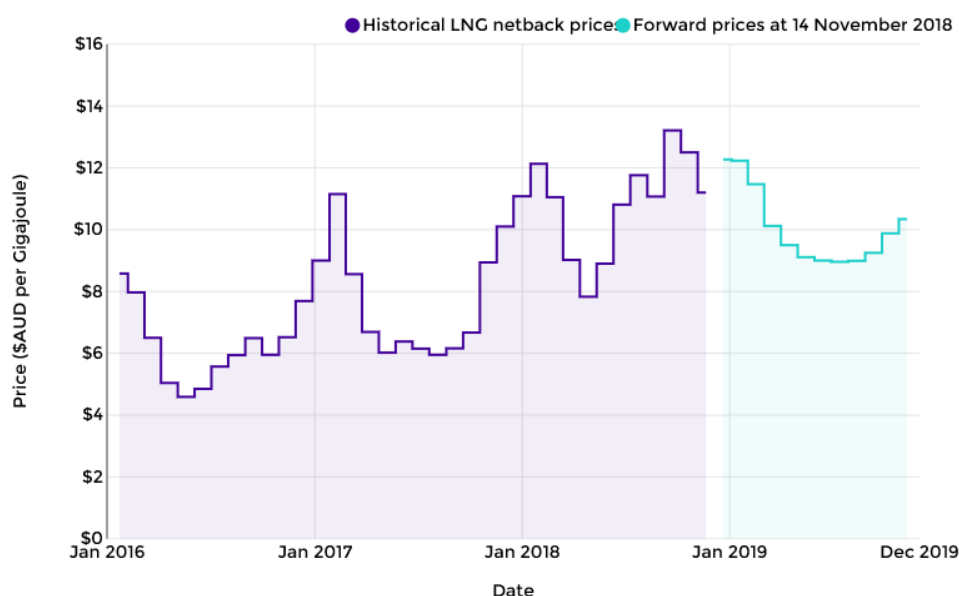


FIGURE 28: ACCC LNG NETBACK PRICE SERIES

⁷⁸ AEMO, Gas Statement of Opportunities, June 2018, p. 24

3.4.5.2. Coal

Many coal fired generators in the NEM own and operate their own mines (e.g. Yallourn, Loy Yang A, Millmerran, Kogan Creek, Tarong). While other coal fired power stations (e.g. Loy Yang B, Gladstone, Callide, Stanwell, Bayswater, Liddell, Eraring, Vales Point, Mt Piper) are supplied coal via rail or conveyor. Some (but not all) of these generators also face pricing on some coal supplies that is linked to export pricing.

This shift away from legacy long term contracts has progressively increased since 2010 with a large share of these contract volumes being renegotiated between 2014-15 and 2017-18 (Figure 29). The ACCC⁷⁹ *Retail Electricity Pricing Inquiry* found that over the period from 2015 to 2018 New South Wales black coal generator fuel costs rose by 73% while the price of Newcastle spot coal rose 71%, indicating a strong linkage. The ACCC also found that some generators sought to limit dispatch so that sufficient coal reserves could be maintained for the peak summer period. This was further detailed by AGL⁸⁰ in its supplementary submission to the ACCC on 21 February 2018 which discussed its low stockpiles coming into summer and the logistical challenges associated with coal deliveries.

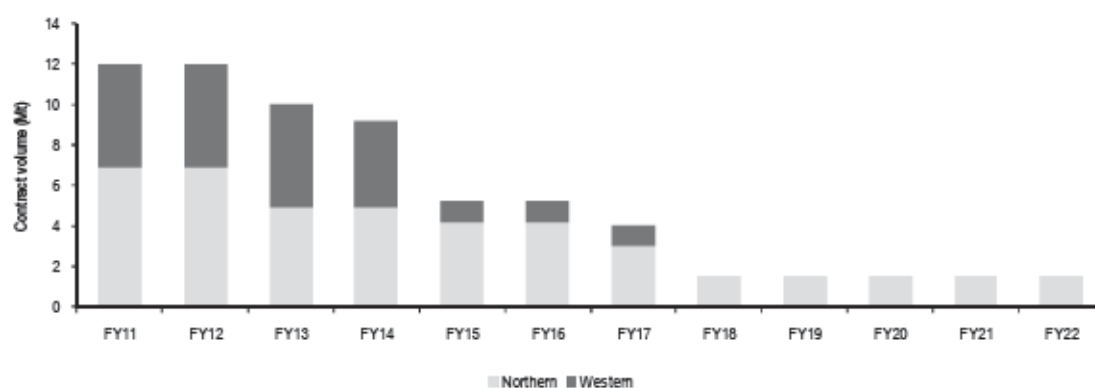


FIGURE 29: CENTENNIAL DOMESTIC COAL CONTRACT VOLUMES IN 2010 SOURCE: CENTENNIAL COAL'S TARGET STATEMENT ON BANPU ACQUISITION

3.4.6. Innovation in the market

It is essential that innovation in the NEM is facilitated, and barriers to innovation identified and resolved. Innovation drives productivity improvements, and so improves consumer outcomes.

An example of innovation underway is in system security markets. Towards the end of 2017, the Hornsdale Power Reserve (battery) and EnerNOC (demand response) entered the frequency control ancillary services (FCAS) market in the NEM. This increase in FCAS provision, which displaced higher-priced supply from existing technologies, led to a 57% reduction in the FCAS costs between Q4 2017 and Q1 2018. FCAS requirements between

⁷⁹ ACCC, *Retail Electricity Pricing Inquiry*, 2018, pp. 67-68.

⁸⁰ https://www.accc.gov.au/system/files/AGL%20%28supplementary%20submission%29_0.pdf

quarters were steady, with the large price decrease attributable to the entry of new providers able to supply FCAS using new technologies at lower cost (see Figure 30).

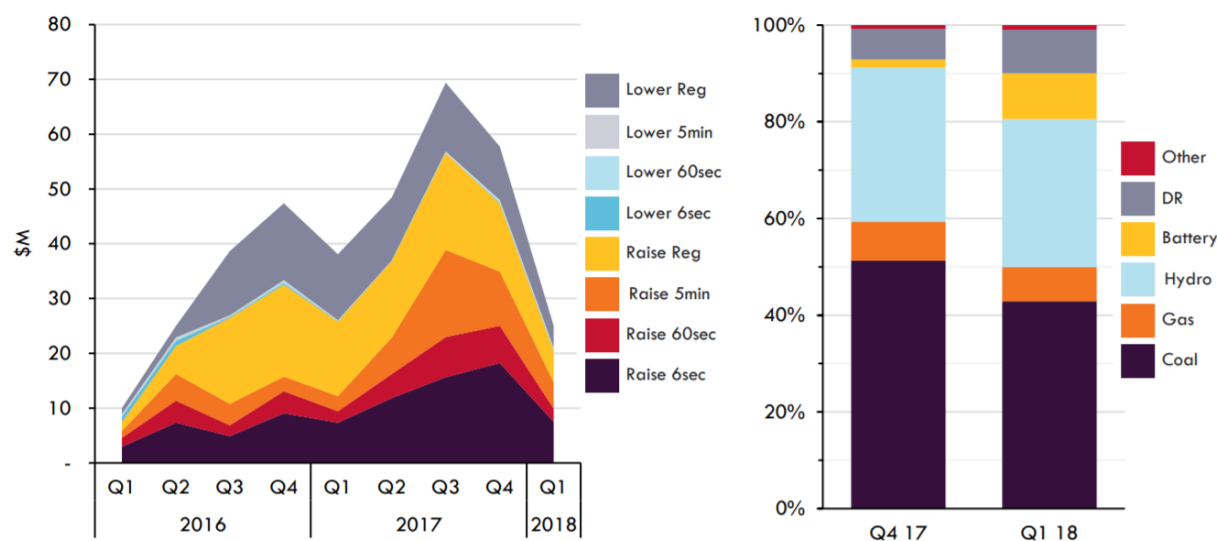


FIGURE 30: QUARTERLY FCAS COST BY SERVICE AND RAISE FCAS SUPPLY BY FUEL TYPE. SOURCE: AEMO QUARTERLY ENERGY DYNAMICS Q1 2018

3.4.7. Work underway

Competition in the wholesale market

In its *Retail Electricity Pricing Inquiry*, the ACCC made a number of recommendations to improve competitive outcomes in the NEM. To increase competition in the wholesale market, the ACCC recommended:

- Acquisitions should be prevented that would result in a market participant owning or controlling the dispatch of more than 20% of generation capacity in any NEM-region or across the NEM as a whole. This excludes growing market share through investment in new capacity (Recommendation 1)
- The Queensland government should divide its generation assets into three generation portfolios to reduce concentration in the region (Recommendation 2)⁸¹
- The AER should have the powers to address behaviour which manipulates the proper functioning of the wholesale market (Recommendation 3)
- The Australian Government should underwrite low priced energy offtake agreements to help secure debt financing for certain new generation projects which would increase competition (Recommendation 4)

⁸¹ In August 2018, the Queensland Government announced that it had begun work on establishing a third publicly owned electricity generator, CleanCo, that would have a strategic portfolio of low and no emission power generation assets, and will build, construct, own and maintain renewable energy generation.

- The AER's wholesale market monitoring functions should be expanded and appropriately funded to include monitoring, analysing and reporting on the contract market (Recommendation 41)

Competition in the retail market

With regard to competition in the retail space, the ACCC concluded there were few direct actions that would address existing market concentration directly and that it was better to focus on promoting effective competition.⁸² The ACCC made a number of recommendations to improve competitive pressure on prices, including:

- Changes to the customer transfer process to limit the opportunity for anti-competitive 'save' and 'win-back' behaviour (Recommendations 8 and 9)
- All advertised discounts to be made with reference to a default offer so customers can compare deals more effectively (Recommendation 32)

Gas markets

In addition to the recent *Retail Electricity Pricing Inquiry* the ACCC was also tasked by the Commonwealth Government, on 19 April 2017, to conduct a wide-ranging inquiry into the supply of and demand for wholesale gas in Australia, as well as to publish regular information on the supply and pricing of gas for the next three years. In August 2018, the Commonwealth Treasurer directed the ACCC to hold a public inquiry that will monitor the prices, profits and margins in the supply of electricity in the NEM. The inquiry will provide its first report by 31 March 2019 and at least every six months thereafter until the conclusion of the inquiry on 31 August 2025.

In July 2017, the Australian Domestic Gas Security Mechanism (ADGSM) came into effect. The ADGSM was put in place by the Commonwealth Government to ensure there is enough supply of natural gas to meet the forecast needs of domestic energy users. In 2018, the AEMO Gas Statement of Opportunities⁸³ reported that under the current production and demand scenarios, there will be no shortfall in the Australian east coast gas market till 2030. The ACCC has also reported there would be sufficient supply in the east coast gas market for 2019⁸⁴.

The AEMC has also been directed by the COAG Energy Council to report on a biennial basis on the growth in trading liquidity in the wholesale gas market and pipeline capacity trading, with the first report published in August 2018.⁸⁵ The AEMC found that liquidity at the gas supply hub at Wallumbilla has increased over the past two years. This positive change was reflected in almost all metrics of liquidity that formed part of the analysis. The AER is now publishing these quantitative liquidity indicators on its industry statistics webpage on a regular basis to promote market transparency.⁸⁶

⁸² ACCC, *Retail Electricity Pricing Inquiry*, 2018, p.149.

⁸³ AEMO, *Gas Statement of Opportunities*, 2018

⁸⁴ ACCC, *Gas Inquiry 2017-2020 – Interim Report*, July 2018

⁸⁵ AEMC, *Gas market liquidity review, Final report*, 2018

⁸⁶ AER, <https://www.aer.gov.au/industry-information/industry-statistics?page=1>, accessed 31 October 2018

3.4.8. Long-term outlook

Over the medium-term, continued investment in variable renewable energy combined with the expected closure of thermal generation and the build of new dispatchable resources will continue to reshape the NEM and the competitive dynamics. As variable renewable energy increasingly influences the supply of day to day demand, the ownership or control of dispatchable resources is likely to play a greater role in influencing the competitive outlook.

In the longer-term, the NEM is projected to develop into a system built around variable renewable energy and distributed energy resources which will need to be increasingly firmed by demand response, storage and other dispatchable capacity (see Figure 31). This transition is likely to reduce the sensitivity of the NEM to global prices for coal and gas that has contributed to recent wholesale price increases. However, this transformation in the NEM will also continue to change the role and type of contracts that are used to manage risk. The impact that the changing shape of the NEM will have on the contract market will be an area of review for the ESB and market bodies in 2019.

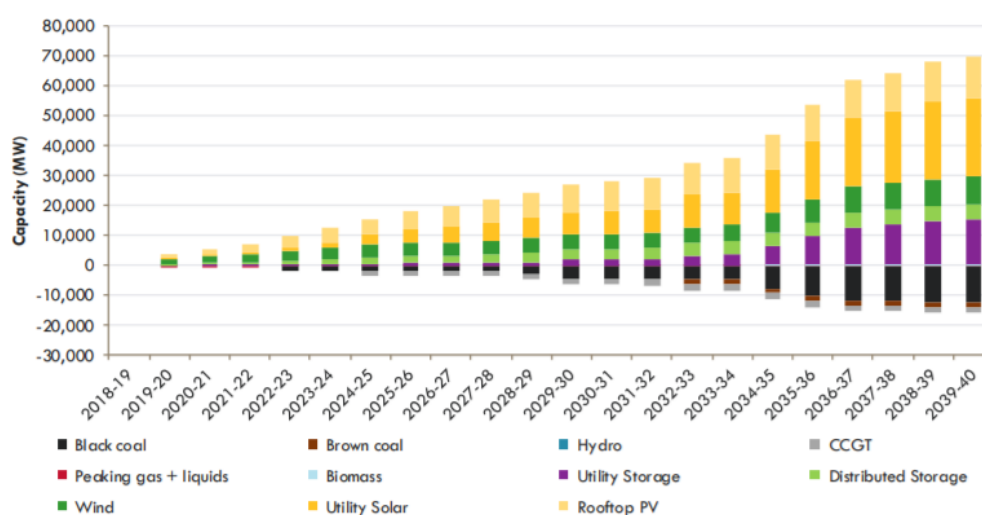


FIGURE 31: FORECAST CHANGE IN NEM CAPACITY 2018-19 TO 2039-40. SOURCE: AEMO, INTEGRATED SYSTEM PLAN, 2018

3.5. Efficient and timely investment in networks

3.5.1. Overall assessment

The Finkel Review identified that, through better system planning, security will be preserved, and costs managed as the generation mix evolves. The Finkel Review called for a long-term, integrated plan to establish the transmission network needed to access the future resources that will supply customers. As the Finkel Review highlights, the long-lived nature of investment in the electricity system means that investments made today will significantly shape the network of the future along with costs faced by customers. Proactively planning key elements of the network now in order to create the flexibility to respond to changing technologies and preferences has the potential to reduce the cost of the system over the longer term.

The status of Investment in Networks is rated Moderate-Critical (see Table 6), however the launch of AEMO's Integrated System Plan (ISP) represents an important step in enhancing system planning and fulfils a key Finkel Review recommendation. The ISP delivers an integrated approach to transmission planning which will improve the ability to manage reliability and security across the NEM, while supporting access to key renewable energy zones.

A major focus of work for the ESB and market bodies in 2018 has been on delivering an actionable ISP. This involves understanding and ensuring that the ISP provides the foundation needed to support the ongoing transformation of the NEM. Critical to improving the outlook will be the progression of this work in a way that the benefits and costs to consumers are well understood while the importance of system wide benefits are also recognised. As a consequence, the outlook for optimal investment in networks is improving.

In 2018 the AEMC concluded that incentive regulation remains the appropriate fundamental principle for the economic regulation of electricity networks and that the current framework provides sufficient flexibility to support the evolving role of network service providers in the electricity sector's transformation. However, the current approach may not lead to the most efficient outcomes in a high distributed energy resources future. An area of focus for the AEMC in 2019 will therefore be how to best incentivise efficient network investment in the context of an increasingly distributed system.

Also, critical to integrating distributed energy resources is the continued move towards cost reflective network tariffs. Without tariff reform, inefficient utilisation of the network will prevail and the continued risk of inequitable allocation of costs to consumers will threaten affordability. The challenge of avoiding system security issues will require either static caps on distributed energy resource exports to the grid, more dynamic management of distributed energy resources, or further distribution network augmentation. This is an area of ongoing discussion between AEMO, Energy Networks Australia and the AEMC.

Following the increase in investment in distribution networks during the 2009-14 regulatory period, distribution network prices have begun to fall and the outlook for costs remain relatively flat decline slightly in the near term. However, distribution networks face unprecedented challenges with the rapid uptake of distributed energy resources. The capacity of distributed energy resources connected to the NEM is expanding rapidly, increasing the two way flows of electricity on the network, challenging network operations and system planning, and creating the need to redefine the way that network delivery is regulated and priced.

Transmission costs currently represent between 5 and 12 percent of a typical residential electricity bill⁸⁷, however with a critical focus on the transformation of the NEM, transmission will play a crucial role in connecting geographically dispersed variable renewable energy to load. This will require coordination to ensure that the integrated system is connected efficiently. Much of this work is being facilitated through the ISP and the work that the ESB and other market bodies are doing to implement an actionable ISP.

The outlook for Efficient and timely investment in networks remains stable at Moderate-Critical, while all the market bodies and the ESB are focused on delivering an actionable ISP. Improving the outlook for network investment more broadly requires a clear plan for the operation and regulation of networks under high levels of distributed energy resource penetration.

TABLE 6 EFFICIENT AND TIMELY INVESTMENT IN NETWORKS – STATUS AND OUTLOOK

	Current Status	Outlook
Investment in networks are optimal	Moderate-critical	Moderate
Efficient regulation	Moderate-critical	Moderate
Networks incentivised to be efficient platforms for energy services	Moderate-critical	Moderate-critical
Overall	Moderate-critical	Moderate-critical

Emerging issues include:

- The future of the ISP will also need to start considering integrated planning of gas development, hydrogen development and more immediately infrastructure to support the rollout of electric vehicles.

3.5.2. Network planning

As the national transmission planner, the AEMO is required to publish advice on the development of the transmission system across the NEM and to provide a national strategic perspective for transmission planning and coordination.

In July 2018, AEMO provided this advice as part of its inaugural ISP rather than in a National Transmission Network Development Plan as it has in previous years. As regulatory frameworks develop, the ISP will form an integral part of transmission planning.

The ISP provides a whole of system optimisation plan that forecasts the overall transmission system requirements for the NEM until 2040 in the context of an integrated system. This new approach was recommended by the Finkel Review in the context of an increasing need to balance variable renewable energy and system security service across regions, and to facilitate access to renewable energy zones with high quality renewable energy resources.

⁸⁷ AEMC, *2017 Residential Electricity Price Trends*, 2017.

The modelling undertaken for the ISP estimates that a more integrated approach to transmission investment could yield system cost savings in the range of \$1.2 - \$2 billion. In particular, it demonstrates how a portfolio of resources - including generation, storage and transmission - can be leveraged to deliver reliable, secure and low emissions electricity supply in the NEM at least cost. AEMO's 2018 *Electricity Statement of Opportunities*, for example, illustrates how ISP investments can deliver a substantial reduction in the level of unserved energy in regions in which the reliability standard is at risk over the next decade.

The ISP identified a number of renewable energy zones with good access to existing transmission but noted that connecting renewable projects beyond the current transmission capacity will require further action. Three groups of projects were identified in the ISP for construction in the near, medium and long term to support the development of the power system.

While a more planned approach to transmission investment has the potential to enable efficient access to renewable energy zones and manage reliability and security concerns, it is consumers who ultimately pay for transmission assets. In the face of considerable technological uncertainty – in terms of future uptake, cost and availability – decisions to invest in long-lived network assets need to be made with caution whilst balancing the needs for greater system integration.

During the latter part of 2018 the ESB and all market bodies have been coordinating work to focus on implementing the Group 1 projects, facilitating Group 2 projects and converting the ISP into an actionable plan.

3.5.3. Network regulation

Electricity networks are natural monopolies, so well-designed regulation is essential to keep charges at efficient levels. Network charges are currently the most significant portion of customers' bills, representing 43% of residential bills in 2018.⁸⁸ Investment in networks increased steeply over the 2009-2014 regulatory period which was a key driver of bill increases in recent years. This growth was due to a combination of factors including increased reliability standards in New South Wales and Queensland and investment decisions made in anticipation of growth in demand that did not eventuate.⁸⁹

Capital expenditure (capex) in both the transmission and distribution networks has decreased since 2012. In real terms, the level of network capex in 2017 was lower than levels generally observed over the previous 10 years. Operational expenditure (opex) has remained relatively constant over the same period (see Figure 32).

⁸⁸ ACCC, *Retail Electricity Pricing Inquiry*, 2018

⁸⁹ Finkel et al., *Independent Review into the Future Security of the National Electricity Market*, 2017, p. 134

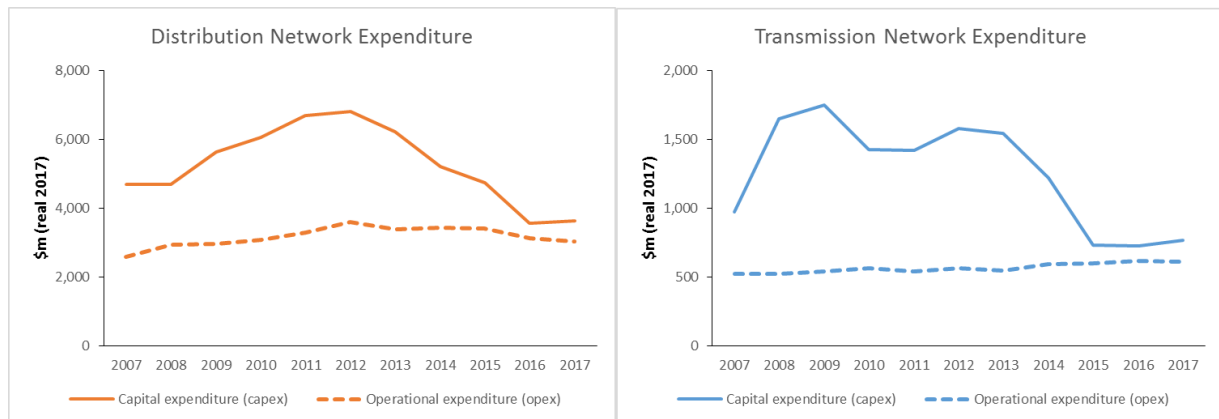


FIGURE 32 CAPITAL AND OPERATIONAL EXPENDITURE IN DISTRIBUTION AND TRANSMISSION NETWORKS. SOURCE: AER

Capex accumulates as a regulated asset base (RAB) on which network service providers earn a regulated rate of return. The size of the RAB is therefore a significant determinant of customer charges. As a result of declining capex in recent years, the distribution and transmission RABs have plateaued over the past three years, after large increases during 2006 - 2014 period (see Figure 33). Network costs are expected to remain stable or decrease slightly over the coming regulatory period in most networks⁹⁰, however the transformation of the NEM will drive the need for more investment in transmission networks to access low cost variable renewable energy and the impact of distributed energy resources may change the way in which distribution networks need to recover costs and may also present the opportunity for reducing the future costs of upgrading or maintaining the network.

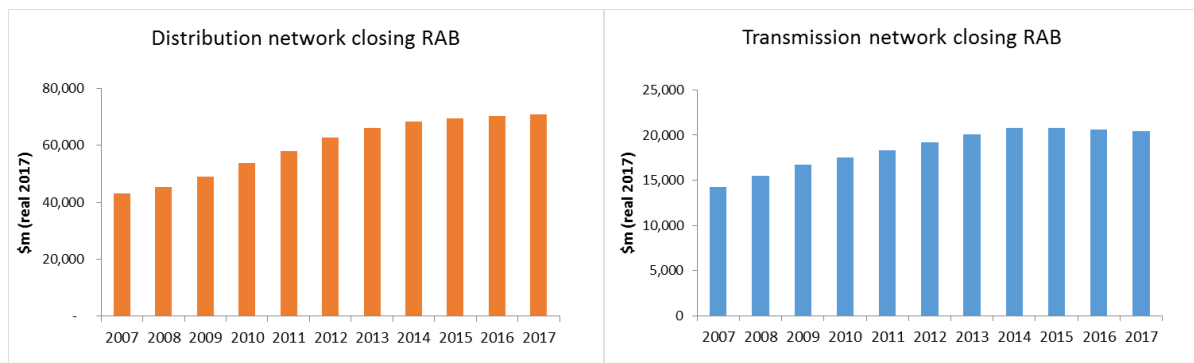


FIGURE 33: REGULATED ASSET BASE FOR DISTRIBUTION AND TRANSMISSION NETWORKS, 2007-2017. SOURCE: AER

In 2018 the AEMC conducted a review into incentives for network service providers to invest in capex over opex. This review was in response to a recommendation of the Finkel Review, which identified that such a bias could increase long-term costs and act as a barrier to investment in non-network solutions such as demand response and storage. The AEMC did not find conclusive empirical evidence of a bias for capex over opex in all cases, as incentives vary depending on circumstances, but it did find a strong bias towards capex in

⁹⁰ ACCC, *Retail Electricity Pricing Inquiry*, 2018

cases where the regulated rate of return is higher than the network service providers actual financing costs.

The AEMC concluded that the current differential treatment of capex and opex is unlikely to be suitable for a future with high distributed energy resource penetration. This is because with more distributed energy resources connected to the NEM, opex-based non-network solutions will increasingly be the most efficient investment option. If the regulatory regime over-incentivises capex in some cases, as has been shown to be the case, this may lead to sub-optimal outcomes for consumers.

The continued move towards cost reflective network tariffs also remains critical. This move will see networks imposing costs on retailers (not households directly) which are more aligned with the actual costs of providing electricity at that time. The AEMC identified⁹¹ the importance of tariff reform in providing a foundation for efficient usage and investment in networks and investment decisions by consumers that will also create incentives for distributed energy resources to be available when they are most valued. A lack of cost reflective network prices will ultimately lead to inefficient utilisation of the network and risk the inequitable allocation of costs to different classes of consumers.

To date, customers' take up of cost reflective pricing has been slow, with about one in 10 residential customers now on cost reflective network tariffs across the NEM. The AEMC concluded⁹² that this slow uptake is reflected by the 'Opt-in' approach historically adopted by network service providers.

The AER has undertaken a number of steps to encourage distribution network service providers to increase uptake, including:

- Better integration between network pricing, network planning and demand management strategies
- tariff assignment policies which require new customers' connections, or existing customers who upgrade their connections characteristics, to be automatically placed on a cost reflective network tariff, including opt-out policies for new tariffs
- consideration of demand as the basis for charging customers, is to be measured — daily, monthly, top three demand events, maximum of 30 minutes, co-incident peak demand
- refinements to charging windows and the methods used to develop charging windows, such that customers will have an incentive to use electricity when it is cheapest to do so
- improving long run marginal cost estimation method, including replacement capital within estimates, to ensure genuine pricing signals are being included in network service providers' tariff proposals

⁹¹ AEMC, *Economic Regulatory Framework Review – Promoting Efficient Investment in the Grid of the Future*, 2018

⁹² *Ibid.*

- simplifying tariff offerings.

From July 2019 onwards the AEMC⁹³ indicated that all non-Victorian distribution network service providers are moving towards an 'Opt-out' approach to implementing time of use or demand tariffs and that Victorian distribution network service providers were yet to be determined.

TABLE 7: EXPECTED CUSTOMERS ON COST REFLECTIVE NETWORK TARIFFS IN THE NEM 2018/19 – AUSTRALIAN ENERGY REGULATOR

	Residential	Business	Overall customers
Australian Capital Territory	18%	27%	19%
New South Wales	14%	37%	17%
Victoria⁹⁴	9%	50%	13%
South Australia	0%	39%	4%
Queensland	2%	20%	3%
Tasmania	3%	3%	3%

3.5.4. A platform for energy services

Electricity networks were designed and traditionally operated around a one-way delivery of electricity, from large generators to end-users. However, the role of networks is changing with distributed energy resources such as rooftop PV and battery storage now exporting electricity back into the distribution system. The flow of electricity is becoming two-way, and networks are becoming a platform for the trading of electricity services, rather than just a means of delivery. As consumers continue to adopt new energy technologies, the opportunities for consumers to provide and earn a return for services increases. Distributed energy resources enable consumers to contribute to non-network solutions to maintain the network by reducing peak demand (see Figure 34), participate in wholesale and ancillary services markets and trade energy through peer to peer platforms.

⁹³ *Ibid.*

⁹⁴ *Victorian figures are forecast for calendar year 2019.*

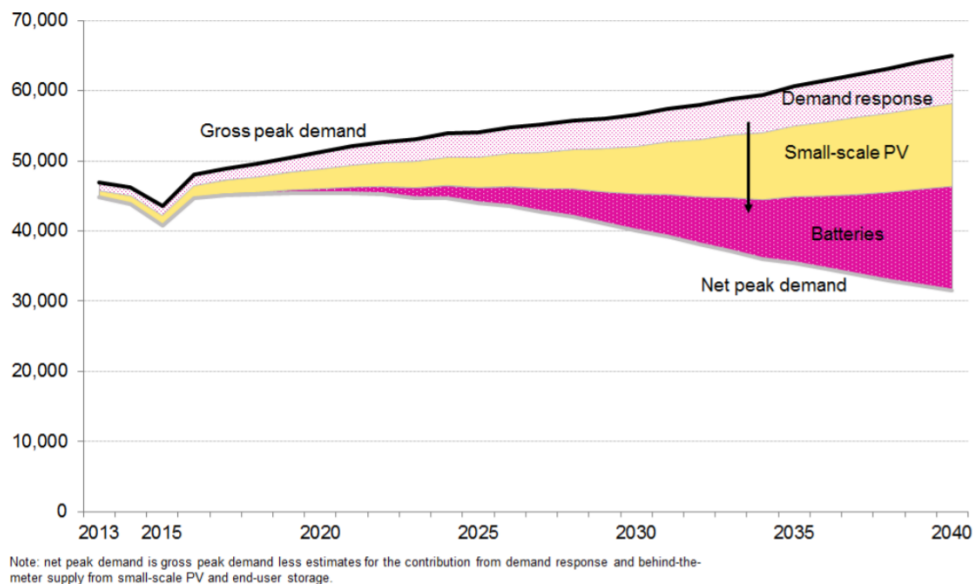


FIGURE 34 BEHIND THE METER CAPACITY RELATIVE TO NATIONAL AGGREGATE PEAK SUMMER DEMAND. SOURCE: AEMC, DISTRIBUTION MARKET MODEL REPORT, 2017

High penetration of rooftop PV in some areas of the distribution network is already creating technical challenges relating to the management of voltage and thermal loading.⁹⁵ The system security concerns created by increasing levels of distributed energy resources are discussed in more detail in Section 3.2.5.2. Going forward, with the expected growth in distributed energy resources, the challenges will increase as battery systems and home energy management systems alter the way in which households and businesses supply and consume from the grid.⁹⁶ This can present both an opportunity and risk to future network costs as investment is required to facilitate exports while greater understanding and use of distributed energy resources may reduce future peak load needs. The efficient integration of these technologies is likely to require continued changes to the way distribution networks operate and the regulatory frameworks that they operate within.

Distribution network service providers have stated that to maintain the reliability and quality of supply of electricity in the future, there will need to be either:

- Static caps on exports from distributed energy resources once a certain threshold of connections is reached in an area
- Augmentation to networks to allow for increased exports from distributed energy resources, or
- More advanced monitoring, planning and operation to enable dynamic management of distributed energy resource output.

⁹⁵ AEMO and ENA, *Open Energy Networks: Consultation on how best to transition to a two-way grid that allows better integration of Distributed Energy Resources for the benefit of all consumers*, 2018

⁹⁶ AEMC, *Promoting efficient investment in the grid of the future*, 2018. See box 2.1 in the *Distribution Market Model* final report for a description of the range of technical impacts distributed energy resources can cause.

The AEMC has indicated⁹⁷ a preference for a more dynamic management of distributed energy resources, as network augmentation will increase costs to consumers and static caps on energy exports will restrict consumer choice and therefore will be unlikely to meet community expectations. The AEMC considers that the current rules are sufficiently flexible to allow distribution network service providers to recover spending on developing the technological capability to manage distributed energy resources dynamically. This is an area of ongoing analysis and is discussed below.

3.5.5. Work underway

Regulated rate of return

The AER has recently released its final decision on its methodology for determining the regulated rate of return to apply to network businesses. Subject to forthcoming changes to the national electricity and gas laws and rules developed by COAG Energy Council, this methodology will be binding on networks in revenue determinations over a four year period. The rate of return is a major driver of network revenues and is an important input in providing appropriate incentives for efficient investment in regulated networks.

Making the ISP actionable

COAG Energy Council has requested⁹⁸ advice from the ESB on how to deliver on the recommended transmission investments in the ISP. Specifically, it has been asked to advise Energy Council on how Group 1 and 2 projects identified in the ISP can be assessed and progressed, and what modifications may be needed to existing processes for these projects to be delivered. In December 2018, the ESB will provide COAG Energy Council with the options for delivering Group 1 projects and the key principles and objectives that are required for delivering an actionable Integrated System Plan for the future.

The AEMC's *Coordination of Generation and Transmission Investment Review* is a key input into this work, which presents five potential options for making AEMO's ISP actionable. The options are intended to create stronger links between the ISP and actual investments in transmission to improve overall confidence in the regulatory investment process.

Regulatory investment test and value of customer reliability

The AER is currently undertaking a large scale review of the application guidelines for the regulatory investment tests (RITs) for transmission and distribution networks. The RITs are cost-benefit analyses that network businesses must perform and consult on before making major investments in their networks. They serve an important role in ensuring that major investments maximise the net economic benefits of investment to market participants that produce, consume and transport electricity in the relevant market.

The AER is also conducting a review of the value customers place on having a reliable electricity supply (the VCR). The VCR links efficiency and reliability and plays an important role in network planning and investment, as well as informing the design of network reliability

⁹⁷ AEMC, *Economic Regulatory Framework Review – Promoting Efficient Investment in the Grid of the Future*, 2018

⁹⁸ COAG Energy Council, *Meeting Communique Friday 10 August 2018*, 2018

incentives and market reliability settings. The AER is due to finalise this review in December 2019.

Network frameworks to accommodate increasing distributed energy resources

The AEMC has commenced work on the *Economic Regulatory Framework Review 2019*, with a key area of focus being how to best incentivise efficient network investment in the context of an increasingly distributed system. The AEMC has stated that the current assessment and remuneration of capex and opex is not likely to support the ongoing transformation of the electricity sector.

The AEMC has also noted that changes beyond the remuneration framework are also likely to be required. Additional areas the AEMC will examine include:

- Whether the AER requires improved expenditure review powers so that it can review the efficiency of all capex from the previous regulatory period. At present, the AER can only review the efficiency of overspend above a network service provider's allowance.
- Whether a move to a regulatory regime based more on output/performance measures and less on estimates of efficient costs may be required.
- How consumers can better engage with the market.
- Whether the current allocation of risk between network service providers and consumers remains appropriate.
- How regulatory 'sandboxes' might be used to encourage innovation.
- How to progress a range of network related recommendations from the ACCC's *Retail Electricity Pricing Inquiry*.

There is also an ongoing assessment amongst market bodies and stakeholders as to the future role of network service providers as the NEM moves to a more decentralised system. In 2018, AEMO and Energy Networks Australia launched the *Open Energy Networks* joint initiative. They published a consultation paper⁹⁹ which detailed the technical challenges for system operation presented by greater levels of distributed energy resources, as well as some of the opportunities to lower costs for consumers. The paper outlined the requirements of a future regulatory framework to coordinate distributed energy resources and a forward work program including increased information sharing between AEMO and distribution network service providers, piloting and testing, and regulatory review. A final rule was also made in September 2018 for AEMO to establish and maintain a register of distributed energy resources. The register will help AEMO and network service providers better plan for and manage these emerging challenges.

3.5.6. Long-Term Outlook

By 2050, some stakeholder forecasts suggest that Australia's power system will be one of the most decentralised in the world, with residential solar PV and behind-the-meter storage representing an estimated 44% of all capacity.¹⁰⁰

⁹⁹ AEMO and ENA, *Open Energy Networks: Consultation on how best to transition to a two-way grid that allows better integration of Distributed Energy Resources for the benefit of all consumers*, 2018

¹⁰⁰ Bloomberg New Energy Finance, *New Energy Outlook*, 2018

The disruption caused by the uptake of new technologies such as rooftop solar PV and battery storage will change the network flows on transmission and distribution systems. The uncertainty caused by this continued disruption in the coming years will make forecasting the future requirements of the transmission system increasingly challenging.

In a future where a significant share of generation and storage is located behind the meter within distribution networks, the role of network companies and the regulatory environment will need to be markedly different. Network Service Providers will increasingly need to manage and optimise the increasing amount of variable renewable energy, utility scale storage and distributed energy resources in the system, this is likely to change the nature of network utilisation and challenge the current pricing regimes.

Some areas of the system that service large energy intensive users will not be able to supply all their energy needs from behind the meter technologies and will still draw from the grid. However, the change underway demonstrates the need for a flexible, fit-for-purpose regulatory framework that can deliver reliable services for consumers, while also having the capability to adapt to rapidly changing consumption patterns.

The market bodies will need to continue to monitor the uptake of distributed energy resources, as well as the changing flows within the transmission system to ensure the risks for consumers and network service providers are effectively managed over the longer term.

3.6. Strong but agile governance

3.6.1. Overall assessment

The Finkel Review identified that a strong system of governance is central to delivering a secure and reliable low emissions future at least cost. A coordinated response to the rapid changes faced by the NEM is required. This response should be guided by a clear strategic direction from the COAG Energy Council supported and implemented by an agile governance framework that meets the evolving needs of the system. This means that as the power system continues to change rapidly the policy, regulation and rules will need to keep up. It is only through a coordinated response that this will be possible.

Three areas of governance were identified in the Finkel Review as most needing attention to support the energy market transition:

- Coordination between market bodies, and between market bodies and the COAG Energy Council
- A greater sense of shared accountability for energy outcomes, and
- Timing of the rule change process.

While 2018 has seen considerable efforts to improve the coordination between the market bodies and the COAG Energy Council, policy and its implementation is fragmented and politically charged. This partly reflects government anxiety about affordability, reliability, security and the achievement of lower emissions. The pace of change in the NEM presents a significant risk and without the continued commitment by all parties to a coherent and coordinated approach to both policy and implementation, the NEM may not achieve the outcomes required.

With much underway, ad-hoc policy commitments without regard to the broader impact only makes achieving emissions reductions while managing security, reliability and affordability much harder in the long run. Further, an increasingly complex and risky regulatory environment is likely to both deter investment and increase the costs of doing business.

This report rates the current status of Governance within the NEM as Critical (see Table 8). The risks to delivering a coherent and coordinated approach to energy policy in the NEM have heightened during 2018. The outlook for Governance would improve if COAG Energy Council commits to a new Australian Energy Market Agreement and focuses on achieving the agreed outcomes and objectives in the Strategic Energy Plan – both key recommendations from the Finkel Review. Similarly the market bodies need to remain committed to working together.

TABLE 8: FIT FOR PURPOSE GOVERNANCE – STATUS AND OUTLOOK

	Current Status	Outlook
Overall	Critical	Moderate-critical

3.6.2. Governance in the NEM

The ESB was established in 2017 to assist coordination between market bodies and the Energy Council, and some progress has occurred. For example, the ESB led the development of the National Energy Guarantee, which reflected a high level of collaboration between market bodies, the energy sector and the community, along with energy market

officials from all NEM-jurisdictions. The ESB has also led the development of a Strategic Energy Plan for COAG (discussed in work underway) and recently an action plan for AEMO's Integrated System Plan.

The Finkel Review recommended that a new Australian Energy Market Agreement be developed. The intention was to develop a nationally consistent approach to energy policy; and to notify the COAG Energy Council of any unilateral action that falls within the scope of the Australian Energy Market Agreement. This has not yet been adopted.

Market bodies have responded to the recommendation for stronger governance through increased coordination of their interdependent workstreams. For example, the AER and AEMO are now developing procedures and guidelines in parallel with associated rule change processes, so that new rules and guidelines can commence simultaneously. This reduces the time before rule changes can come into force. Similarly all market bodies have worked well with the ESB to put a plan of action in place to deliver AEMO's Integrated System Plan. A key role of the ESB has been to facilitate a whole-of-system perspective across market bodies and Energy Council.

3.6.3. Work underway

The Energy Council agreed to the outcomes and objectives of the Strategic Energy Plan covering 2019 to 2024 at its October 2018 Council meeting. The plan establishes six outcomes for the NEM which will guide action plans by the ESB and market bodies to manage the energy transition. In particular, it is intended to foster a shared sense of direction and accountability. Work is currently underway in consulting on tangible metrics that will enable the success (or otherwise) of the Strategic Energy Plan to be measured and articulated.

The Energy Council is expected to further agree to and issue statements of expectation to the market bodies, which establish priorities and outcome-based performance indicators based on the Strategic Energy Plan to support the delivery of these goals.

3.6.4. Long-term outlook

The agreement by COAG Energy Council to a Strategic Energy Plan should be an important step towards better governance arrangements in the NEM. Commitment to a credible long-term vision is required to create shared sense of direction and purpose for the NEM. This will set the direction and guide decisions by market participants and market bodies. The Statement of Expectations, expected to be issued to market bodies in 2019, will improve accountability for outcomes and help deliver the long-term direction set by energy ministers.

Given the complexity and rate of change underway in the energy sector, there is a need to more objectively measure market developments. Progress against the objectives should be measured and reported on a year on year basis so that emerging problems can be clearly identified, and appropriate solutions agreed.

The ESB has proposed a series of metrics with which progress in achieving the Strategic Energy Plan objectives will be measured. The ESB has undertaken initial consultation and will develop draft metrics for Energy Council's consideration. Metrics are not intended to act as implicit goals or targets in and of themselves. Rather, they are intended to act as a transparent and independent set of measures by which progress (or otherwise) can be measured and reported on a consistent and replicable basis. It is intended that the ESB's

annual Health of the National Electricity Market report will report against the agreed metrics in 2019.

A credible long-term vision is also necessary to act as a guiding force in a rapidly changing market. The lack of a strategic direction has led to stakeholders deferring investment in maintaining or constructing new generation, especially with regard to dispatchable generation. This has increased reliability risks, undermined affordability and slowed progress on emissions reduction. It has also raised barriers to entry and constrained competition in the market, resulting in prices being sustained at elevated levels for longer than would occur in the absence of policy uncertainty.

In 2019 the ESB will begin coordination of a comprehensive review of the National Electricity Rules to be delivered by the end of 2020. The work will be guided by a view to streamlining the Rules in light of changing technologies and conditions and in light of the work that the ESB will also undertake at the request of COAG Energy Council on a long-term, fit-for-purpose market framework to support reliability that could apply from the mid 2020's as the market transitions.

Appendix

	FINKEL RECOMMENDATIONS	Who	Year	Status	comment
1	Preparing for next summer				
1.1	AEMO should publish an independent third party review of its: Short-term demand forecast methodology.	AEMO	2017	Complete	Completed as part of summer readiness program
1.1	AEMO should publish an independent third party review of its: FY2018 summer forecast.	AEMO	2017	Complete	Completed as part of summer readiness program
1.1	AEMO should publish an independent third party review of its: Preparedness for the FY2018 summer.	AEMO	2017	Complete	Completed as part of summer readiness program
2	Increased security				
2.1	AEMC should: Require TNSPs to provide and maintain a sufficient level of inertia, including a portion that could be substituted by FFR.	AEMC / AEMO	2018	Complete	New rules to maintain minimum system strength and inertia in the power system were made by the AEMC in September 2017. In July 2018, AEMO published the Guidelines as required by the rules, as well as system strength and inertia requirements for all regions in the NEM. No gap was identified in either system strength or inertia in the entire NEM. The only exception was to reiterate the current system strength shortfall in South Australia. AEMO is reviewing the requisite system strength and inertia in each region regularly. Where gaps are identified AEMO will declare these in the annual ISP.
2.1	AEMC should require full disclosure (for new generators) of any software or physical parameters that could affect security or reliability.	AEMC	2018	Complete	Generator system model guidelines rule change was made in September 2017 to address this matter.

2.1	AEMC should review and update the connection standards in their entirety to: address system strength, reactive power and voltage control capabilities, the performance of generators during and subsequent to contingency events, and active power control capabilities.	AEMC	2018	Complete	The AEMC has reviewed and made new rules that update Generator technical performance standards and improve the process for negotiating these. The new rules commenced on 5 October 2018 with transitional arrangements in place for generators that started the connection application process before the new rule commenced.
2.1	AEMC should require new generators to have fast frequency response capability.	AEMC	2018	Complete	As part of its review and making of new rules that update generator technical performance standards, the AEMC concluded that it would not be in the long term interests of consumers to impose this requirement and cost on generators especially given there was no clear evidence of a shortfall in the supply of FCAS across the power system in the medium to long term. Instead, the updated generator technical performance standards match the technical requirements (such as the need to have fast frequency response capability) to local power system needs so new generators can join the power system at the lowest possible cost while maintaining system security.
2.1	A comprehensive review of the connection standards should be undertaken every three years.	AEMC	2018	Complete	The AEMC made new rules to update Generator technical performance standards and improve the process for negotiating these. The new rules, which commenced on 5 October 2018, requires AEMO to review the access standards at least once every five years with the ability to do so more often.
2.2	Move towards a market-based mechanism for FFR if there is a demonstrated benefit.	ESB / AEMC / AEMO	2020	Complete	AEMC's frequency control frameworks review (FCFR) found that there is no immediate need for rule changes to develop an FFR market at this time. The AEMC and AEMO will continue to assess the need for fast frequency response and, if there is a need, the most efficient means to procure that service. If there is a need, the FCFR final report sets out a spectrum of potential frameworks for the procurement and dispatch of frequency control and other services. It concludes that the best approach to the procurement of frequency services in the longer-term is one that is performance-based, dynamic and transparent

2.3	AEMO and AEMC should: Investigate governor and deadband settings.	ESB / AEMC / AEMO	2018	Complete	The Frequency control frameworks review explored and consulted on a range of options to address the deterioration of frequency performance under normal operation, including generators tightening dead bands and a tightening of the FOS. The final report concludes that the more appropriate mechanism to procure the frequency services the system needs is one that is incentive-based. The AEMC and AEMO will continue to work together to develop such a mechanism.
2.3	AEMO and AEMC should: Consider tightening the frequency operating standard.	AEMC / AEMO	2018	On track	The AEMC set a new frequency operating standard in November 2017 that gives clearer guidance on how frequency should be controlled during extreme events. Further updates relating to the settings of the frequency bands and time requirements for maintenance and restoration of system frequency are currently being considered by the Reliability Panel. A final report concluding the review of the frequency operating standard is expected by 31 March 2019.
2.4	AEMO should make sure black system restart plans clearly identify roles at each stage and includes regular testing of equipment and processes.	AEMO	2018	Complete	System restart procedures for the NEM were approved on 29 June 2018. This task is now complete.
2.5	AEMC to review regulatory framework for how DER can help system security. AEMC should propose draft rule changes that incentivise DER participation in frequency and voltage control.	ESB / AEMC / AEMO	2018	Complete	The AEMC published the final report on Frequency control frameworks review with a joint AEMC/AER/AEMO work program. The program includes a review of the MASS initiated by AEMO in August 2018 and the establishment of a NEM virtual power plant trial program to support an understanding of the technical and regulatory requirements associated with virtual power plants providing FCAS.
2.6	The COAG Energy Council should develop a data collection framework for all forms of distributed energy resources at a suitable level of aggregation.	COAG Energy Council / AEMO	2018	Complete	In September 2018 the AEMC made a new rule for AEMO to establish a register of distributed energy resources (DER). AEMO is working with DNSPs to establish a data collection framework and must publish the first information guidelines for the register by 1 June 2019. The new register must be in place by 1 December 2019. The Commonwealth Government provided over \$0.5 million of funding in the 2018-19 budget to assist AEMO with the initial set up of the register. barriers to distributed energy resources providing system services, including FCAS, and makes recommendations, including proposed rule changes, on how they could be addressed.

2.7	The Australian Government should regularly assess the NEM's resilience to human and environmental threats.	Australian Government	2019	Under consideration	The liquid fuel security review is expected to be considered by Australian Government in late 2018 and will contribute to the broader 2019 National Energy Security Assessment (NESA). The Department of the Environment and Energy continues to consult widely across Government, the energy market bodies and with key industry stakeholders. Public consultation on the broader NESA framework is expected to commence in in early 2019.
2.8	AEMC should review and update the regulatory framework to facilitate proof-of-concept testing of innovative approaches and technologies.	AEMC	2019	On track	The COAG Energy Council asked the AEMC on 24 October 2018 to provide interim advice on this issue by February 2019 as part of the AEMC's 2019 economic regulatory framework review. The AEMC will publish a consultation paper for this review in December 2018.
2.9	A long-term funding source for trials by the AEMO and ARENA should be assured	COAG Energy Council	2018	Under consideration	In October 2017, ARENA and AEMO launched 10 pilot projects under a joint initiative to trial demand response under the RERT mechanism. The \$35.7 million initiative will deliver 203 MW of capacity by 2020. AEMO and ARENA are exploring the potential for new trials under an expanded demand response program, which will require further funding. AEMO and ARENA plan to launch this program in early FY2018-2019, working collaboratively with other stakeholders on the design of the program.
2.10	An annual report into the cyber security preparedness of the NEM should be developed by the Energy Security Board	ESB / AEMO	2018	On track	The Australian Energy Sector Cyber Security Framework has been developed that includes Criticality Assessment Tool and a capability maturity based on the US DoE Electricity Subsector Cyber Security Capability Maturity Model with input and endorsement from the Critical Infrastructure Centre and the Australian Cyber Security Centre. Assessments of market participants against the framework are underway in a criticality prioritised manner. The results of these assessments are being captured and collated to form the basis of the annual report on the state of cyber security in the NEM.
2.11	COAG Energy Council should develop a strategy to improve the integrity of energy infrastructure and the accuracy of supply and demand forecasting (extreme weather).	ESB / AEMO	2018	On track	The Integrated Forecasting and Planning project will implement AEMO's first cloud-technology analytic system to significantly uplift forecasting and planning data management and modelling capability. The project is due to be finalised in the first half of 2019. The first deliverables have been used to support AEMO's 2018 ESOO demand forecasts and is scheduled to support AEMO's 2019 GSOO demand forecasts.

2.12	COAG Energy Council should do a national assessment of the future workforce requirements for the electricity sector	COAG Energy Council	2019	On track	<p>The COAG Energy Council is engaging with the COAG Industry and Skills Council (CISC) on this topic. The CISC met on 3 October 2018 and agreed to contribute existing skills needs mapping to a workforce assessment under the Australian Industry and Skills Committee and for the Department of Education and Training (DET) to offer direct assistance in progressing the remaining and broader elements. DET will continue to work with the Department of the Environment and Energy to progress elements which fall outside of the AISC work stream.</p> <p>The ESB highlights the importance of this workstream. Where the ESB can assist in this process it will cooperate with COAG Energy Council to do so.</p>
3	A reliable and low emissions future – the need for an orderly transition				
3.1	The Australian Government should develop a whole-of-economy emissions reduction strategy for 2050.	Australian Government	2020	On track	The Australian Government published its review of climate change policies on 19 December 2017. As noted in the Report, consistent with the Government's response to the Finkel Review, the Government is developing a long-term emissions reduction strategy by 2020.
3.2	AEMO should publish a register of long-term expected closure dates for large generators.	AEMO	2017	Complete	AEMOs Generation Information Page has been updated with AEMOs latest information on generator closures. AEMO has also set out information including announced closures in the Integrated System Plan Consultation Paper which was published in Dec 2017.
3.2	The Australian State and Territory governments agree to an emissions reduction trajectory for the NEM.	COAG Energy Council	2018	On Hold	COAG Energy Council agreed to the final draft bill of National Electricity Law (NEL) amendments which will give effect to the Retailer Reliability Obligation in December 2018. The Commonwealth has announced that it will not progress amendments to implement the emission target component at this stage.
3.2	Clean Energy Target should be adopted.	COAG Energy Council	2018	NOT AGREED	COAG Energy Council agreed to the final draft bill of National Electricity Law (NEL) amendments which will give effect to the Retailer Reliability Obligation in December 2018. The Commonwealth has announced that it will not progress amendments to implement the emission target component at this stage.

3.2	New requirement for all large generators to provide at least three years' notice prior to closure.	ESB / AEMC / AEMO	2017	Complete	The AEMC published a final determination and rule on 8 November 2018 requiring all scheduled and semi-scheduled generators larger than 30MW to provide three years notice before closing.
3.3	AEMC and AEMO should develop and implement a Generator Reliability Obligation (include a forward looking regional reliability assessment, taking into account emerging system needs, to inform requirements on new generators to ensure adequate dispatchable capacity in each region.)	ESB	2018	Under consideration	The Retailer Reliability Obligation replaces the need for a Generator Reliability Obligation. COAG Energy Council agreed to the final draft bill of National Electricity Law (NEL) amendments which will give effect to the Retailer Reliability Obligation in December 2018.
3.4	AEMC and AEMO should assess: The suitability of a 'day-ahead' market.	AEMO / AEMC	2018	Complete	In its reliability frameworks review, the AEMC concluded that a US- style day-ahead market would not be suitable in the NEM to manage reliability outcomes. However, the Commission considers that there would be benefits to the introduction of a voluntary, contract-based short-term forward market, particularly for demand response. A rule change request to implement this short term forward market is expected to be submitted by AEMO to the AEMC by December 2018.
3.4	AEMC and AEMO should assess whether SA licencing arrangements should be applied elsewhere.	AEMO / AEMC	2018	Complete	In August 2017 ESCOSA determined the need to continue to apply transitional technical conditions within licences for new electricity generators which are to be connected to the NEM. In September 2018, the AEMC made new rules that update Generator technical performance standards and improve to the process for negotiating these. The new rules apply across the NEM and will commence on 5 October 2018 with transitional arrangements in place for generators that have already started the connection application process.

3.4	AEMC and AEMO should assess: The need for a Strategic Reserve as an enhancement or replacement to RERT.	ESB / AEMO / AEMC	2018	On track	On 21 June, the AEMC made an urgent rule to reinstate the long notice RERT to allow AEMO to contract for reserves up to nine months in advance of a forecast shortfall. The rule was expedited to allow changes to be applied in readiness for next summer. Broader enhancements to the RERT framework including consideration of whether there should be a standing reserve to address the long term needs of the evolving power system are being considered through a separate rule change process. The rule change will be completed in early 2019.
4	More efficient gas markets				
4.1	AEMO should require generators to provide information on their fuel resource adequacy and fuel supply contracts, to enable it to better assess fuel availability.	AEMO	2017	Complete	This has been completed and launched at the Summer Readiness forum, with AER featuring the information in its quarterly compliance report.
4.2	AEMO should be given a last resort power to procure or enter into commercial arrangements to have gas-fired generators available to maintain reliability of electricity supply in emergency situations.	AEMO	2018	Under consideration	This recommendation has given rise to the Electricity Generation-Gas Supply Guarantee, and also includes the Australian Domestic Gas Supply Mechanism.
4.3	Governments should adopt evidence based regulatory regimes to manage the risk of individual gas projects on a case-by-case basis. (including landholders receiving fair compensation).	COAG Energy Council	2020	On track	A review of Gas Supply Strategy implementation was completed in the first half of 2018. COAG Energy Council agreed in August 2018 the need for continued collaborative action on upstream gas supply, related to regulatory, scientific research and information issues as part of broader gas market reform priorities and agreed to recommendations contained in the Gas Supply Strategic Implementation Review Steering Committee's Report.

4.4	COAG Energy Council should bring together relevant data on gas in an accessible format.	COAG Energy Council	2019	On track	<p>A Gas Supply Strategy FAQ document has been completed and was published on the COAG Energy Council website on 27 June 2018.</p> <p>COAG Energy Council agreed to a new collaborative action to develop and implement a communication strategy to inform communities about the onshore gas industry. This work is ongoing until 30 June 2021.</p>
5	Improved system planning				
5.1	AEMO should develop an integrated grid plan to facilitate the efficient development and connection of renewable energy zones across the NEM.	AEMO	2018	Complete	<p>ESB is providing advice to COAG Energy Council in December 2018 on how to convert the Integrated System Plan into an actionable plan. The AEMC published an options paper in September 2018 setting out five options for linking AEMO's role as national transmission planner more strongly to the individual investments undertaken by network businesses.</p>
5.2	AEMO should develop a list of potential priority projects in each region that governments could support	AEMO	2019	Complete	<p>In consultation with transmission network service providers, AEMO has provided a list of prioritised transmission and non-transmission projects in each region that governments could support if the market was unable to deliver the investment required to enable the development of renewable energy zones.</p> <p>AEMO has completed the necessary engineering, technical and economic work to identify and prioritise the required investments to support the efficient development of renewables in large clusters as part of a 20-50 year integrated system plan for the NEM. This has been undertaken on an integrated systems approach basis, determining the overall best outcomes based on net market benefits and requirements for reliability and security and operability of the resultant power system. This work was undertaken in consultation with transmission network service providers.</p>

5.2	AEMC (Council changed this to AEMO) should develop a rigorous framework to evaluate the priority projects, including whether governments should intervene to facilitate.	ESB / AEMO	2019	On track	<p>As part of its work for the COAG Energy Council on coordination of generation and transmission investment, the AEMC will be addressing this issue once ESB stakeholder forums are complete.</p> <p>The ESB is further considering this as part of the work on Integrated System Plan – Action Plan.</p>
5.3	The COAG Energy Council and the ESB should review ways for AEMO's role in national transmission planning to be enhanced.	ESB	2020	On track	<p>AEMO has engaged the services of FTI Consulting to review arrangements for integrated multi-regional planning applied internationally in jurisdictions where multi-regional planning is actually undertaken, to hear from practitioners of multi-regional planning what regulatory and planning frameworks apply to enable these outcomes, the challenges, opportunities and needs. The consultant is reviewing arrangements in the UK, Europe, North America, and Australia.</p> <p>The ESB is further considering this as part of the work on Integrated System Plan – Action Plan.</p>
5.4	COAG Energy Council should finalise and implement reforms to LMR.	COAG Energy Council	2017	Complete	The Australian government abolished the limited merits review process in October 2017.

5.5	COAG Energy Council should commission a further review of RIT-T and include RIT-D	COAG Energy Council	2020	Under consideration	<p>The AER is currently reviewing the RIT–T&D application guidelines to explore improvements that</p> <p>(a) were identified in COAG Energy Council's 2017 Review;</p> <p>(b) are needed now the RIT–T&D apply to replacement projects; and</p> <p>(c) that we have identified from our compliance activities.</p> <p>The AER published draft application guidelines on 27 July 2018. The draft application guidelines provide new principles-based guidance on consumer and non-network engagement when applying a RIT. This recognises the value of early, continuous engagement, and understanding that the RITs occur in a broader network planning context; provide guidance on how network businesses can consider the ISP to inform their cost-benefit analysis, so they can more effectively account for system-wide impacts; and guidance on how network businesses can account for option value, policy developments, and the impact of high impact, low probability events within their RIT cost–benefit analysis.</p> <p>The ESB is further considering this as part of the work on Integrated System Plan – Action Plan.</p>
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6	Rewarding consumers				
6.1	ACCC should also consider whether the AER requires further powers to collect and report on retail price data.	AER	2018	Complete	<p>On 20 August 2018, the Commonwealth Treasurer directed the ACCC to hold a public inquiry that will monitor the prices, profits and margins in the supply of electricity in the NEM. The inquiry will provide its first report by 31 March 2019 and at least every six months thereafter until the conclusion of the inquiry on 31 August 2025. The ACCC will also provide information to the market as appropriate.</p> <p>The ACCC has also outlined various recommendations which would give the AER additional powers as part of its inquiry into retail electricity supply that was released publicly on 11 July 2018.</p> <p>Separately the AER is currently considering what other retail market data it should collect. COAG Energy Council is progressing work to give the AER powers to compel oral evidence as well as considering whether penalties should be increased.</p>

6.1	ACCC should make recommendations on improving the transparency and clarity of electricity retail prices to make it easier for customers to: Understand and compare prices; Be aware when the terms of their offer change or their discounts expire; Make more informed decisions about investing in rooftop solar photovoltaic, batteries or energy efficiency measures.	ACCC	2018	Complete	<p>One of the key recommendations from ACCC's <i>Retail Electricity Pricing Inquiry</i> was that a default market offer and reference bill should be established.</p> <p>On 22 October 2018 the Commonwealth Energy Minister and Treasurer wrote to the AER requesting it commence development of a mechanism for determining the price of the default market offer and a reference bill for distribution zones that are not price regulated, in line with ACCC recommendations 30, 32, 49, and 50. The AER has commenced work on this.</p> <p>To support these measures The AEMC have made or is considering a number of rule changes including:</p> <ul style="list-style-type: none"> - the notification of end of benefit period rule and before prices change - preventing retailers from offering discounts off inflated rates - making retailers accept meter reads provided by customers who think their estimated electricity or gas bill is wrong - Strengthening hardship protections for vulnerable customers. <p>Flowing from 2018 retail energy competition review the AEMC will commence work in 2019 to: assess how retailers support customers in financial difficulty; consider whether changes to the NECF are required to protect consumers receiving new energy services; and make data on over-the-counter contracts more transparent.</p> <p>The AEMC will also work with the COAG Energy Council and other appropriate parties to implement its competition review recommendations that the AER separate small business from residential customer data and that comparator services be improved.</p>
6.2	The Energy Security Board's annual Health of the NEM report should include info on the price and availability of long-term retail contracts for commercial and industrials.	ESB	2017	On track	<p>The 2018 Health of the NEM report will provide commentary on the price and availability of long-term retail contracts for commercial and industrial users, based in part on the ACCC's <i>Retail Electricity Pricing Inquiry</i>.</p>

6.3	COAG Energy Council should improve consumers' access to, and rights to share, their energy data.	COAG Energy Council	2017	Underway	The Commonwealth Government (led by Treasury) has decided to legislate a Consumer Data Right (CDR) to give Australians greater control over their data, empowering customers to choose to share their data with trusted recipients only for the purposes that they have authorised. The CDR will be implemented initially in banking, energy, and telco sectors, and then rolled out economy-wide on a sector-by-sector basis. Treasury has completed several rounds of consultation on the draft CDR Bill and expects to pass the legislation in early 2019. The ACCC released the draft Rules framework for consultation in September 2018 and expects to undertake further consultation this year.
6.4	The Energy Security Board's annual Health of the NEM report should report on affordability issues and proactively identify emerging issues.	ESB	2017	Complete	The Health of the NEM 2018 report will report on affordability issues and identify emerging issues.
6.5	COAG Energy Council should accelerate its work on applying consumer protections to new energy services, and also consider safety issues as part of that work.	COAG Energy Council	2018	On track	<p>The AEMC is reviewing regulatory arrangements for standalone power systems (see 6.9) under terms of reference provided by the COAG Energy Council and undertaking a self-initiated review on arrangements for embedded networks (see 6.9). The reviews will encompass consumer protections for these customers. The AEMC will also commence work in March 2019 to consider whether changes to the NECF are required to protect consumers receiving new energy services.</p> <p>The AER has finalised changes to its guidelines on exempt networks and sellers to enable these customers to access energy ombudsman schemes. Access to energy ombudsman schemes will also depend on the concurrent changes being made to scheme arrangements.</p> <p>Voluntary code for behind the meter electricity supply is currently being developed by Energy Consumers Australia and industry. The Department of the Environment and Energy will report on progress to the Energy Council at the December meeting.</p>

6.6	COAG Energy Council should engage with relevant portfolio areas including housing, and with state, territory and local governments, to identify ways to improve access to DER and energy efficiency for low income households.	COAG Energy Council	2017	On track	After consulting with jurisdictions on the proposed approach the Commonwealth will take on a coordinating role working with jurisdictions to develop a consolidated report to the Council for discussion in November. The report would summarise existing jurisdictional measures that support low income consumers investing in energy efficiency and demand management technologies and identify opportunities for further action.
6.7	AEMC should review and recommend a mechanism that facilitates demand response in the wholesale energy market (review followed by a draft rule change proposal).	AEMC	2018	Complete	The AEMC reviewed and recommended (in the reliability frameworks review) a package of measures to facilitate wholesale demand response, including a short-term forward market, a demand response mechanism and multiple trading relationships. It has received three rule change requests: one from Total Environment Centre, Public Interest Advocacy Centre and the Australia Institute, one for the Australian Energy Council and one from the South Australian Government seeking to introduce a demand response mechanism in the wholesale market. The AEMC initiated these rule changes on 15 November 2018.
6.8	COAG Energy Council or AEMC to commission financial modelling to test if there is a preference for capital investments in network assets over operational expenditure on demand-side measures. If modelling demonstrates bias, COAG Energy Council should direct AEMC to look at alternative models such as total expenditure approach.	AEMC	2018	On track	The AEMC undertook modelling on the relative incentives for capital and operating expenditure in its 2018 electricity networks economic regulatory framework review, which was published in July 2018. The Commission's modelling and analysis shows that while the regulatory framework does not create systematic bias for either capital or operating expenditure, the financial incentives for network service providers are not aligned as they vary depending on the circumstances. The Commission is considering alternative models for expenditure assessment and remuneration as part of the 2019 Economic regulatory framework review.

6.9	AEMC should review the regulation of individual power systems and microgrids including draft a proposed rule change.	AEMC	2018	On track	<p>The AEMC is reviewing arrangements for standalone power systems under terms of reference issued by the COAG Energy Council in August 2018. The TORs require the AEMC to provide a series of reports between September 2018 and 31 October 2019 which will include advising on detailed law and rule changes. The first of these reports, a consultation paper, was published in September 2018.</p> <p>The AEMC also self-initiated a review on embedded networks in August 2018. A draft report will be published in December 2018 and a final report in May 2019. This review will also advise on law and rule changes necessary to update the embedded networks regulatory framework. The two reviews are being progressed concurrently due to some overlap of issues.</p>
6.10	Governments should accelerate the roll out of broader energy efficiency measures to complement the reforms recommended in this Review.	COAG Energy Council	2017	Underway	<p>COAG Energy Council endorsed and released the 2017 annual report on the National Energy Productivity Plan (NEPP). This plan highlighted the 2017 achievements.</p> <p>The NEPP captures the cross-jurisdictional collaborative energy efficiency measures, as well as Commonwealth-only measures that are reported on under other recommendations, such as the Energy Use Data Model. All states and territories have energy efficiency measures that are not captured under the NEPP.</p> <p>Some jurisdictions have introduced new energy efficiency measures, though it is not clear if this was as a result of this recommendation.</p>
7	Stronger governance				
7.1	COAG Energy Council should develop and maintain a strategic energy plan.	COAG Energy Council	2018	On track	<p>The ESB briefed COAG Energy Council Ministers in October 2018 on their draft strategic framework. The draft Strategic Energy Plan consists of five high-level outcomes each supported by a number of objectives. The ESB undertook targeted stakeholder consultation on the metrics to deliver the agreed outcomes and objectives of the Plan in November 2018. The ESB will report back to council at the December 2018 COAG Energy Council meeting.</p>

7.2	COAG Energy Council should establish an Energy Security Board to have responsibility for the implementation of the blueprint and for providing whole-of-system oversight for energy security and reliability.	COAG Energy Council	2017	Complete	Established in August 2017
7.2	Energy Security Board should be comprised of an independent Chair, supported by an independent Deputy Chair, three market bodies (chair, Chair, CEO).	COAG Energy Council	2017	Complete	Appointed in August 2017
7.2	Energy Security Board administrative support should be provided by AEMO.	COAG Energy Council	2017	Complete	ESB is being provided with administrative support by each of the market bodies.
7.2	Energy Security Board should be provided with the necessary funding to operate	COAG Energy Council	2017	Complete	The ESB's initial budget has been approved.

7.3	COAG leaders should agree to a new Australian Energy Market Agreement that recommits all parties to taking a nationally consistent approach to energy policy that recognises Australia's commitment in Paris to reduce emissions and governments' commitment to align efforts to meet this target with energy market frameworks. AEMA should require states to notify the COAG Energy Council if they propose to take a unilateral action. AEMA should require, within 28 days, the Energy Security Board to provide advice on the impacts of the proposed action.	COAG Energy Council	2018	Under consideration	This was delayed while work on the National Energy Guarantee was progressed. Further work on this recommendation will commence in 2019.
7.4	COAG Energy Council should commence annual public reporting to COAG leaders on its priorities for the next 12 months and progress against the strategic energy plan.	COAG Energy Council	2018	Underway	First report to COAG First Ministers was provided by Energy Ministers in August 2017 and published in March 2018. Annual updates will be provided, including progress against strategic energy plan once developed.

7.5	COAG Energy Council and Energy Security Board, should issue new Statements of Expectations to AER/AEMC, and a Statement of Role to AEMO containing a comprehensive set of outcomes-based performance indicators.	COAG Energy Council / ESB	2018	Underway	The market bodies and the ESB have commenced a process to develop new Statements of Expectations and a Statements of Role for consideration by officials and COAG Energy Council.
7.6	The Energy Security Board should provide an inaugural, annual Health of the NEM Report to the COAG Energy Council including: The performance of the system.	ESB	2017	Complete	Inaugural Health of the NEM report published December 2017. The 2018 report will be presented to COAG Energy Council in December 2018.
7.6	The Energy Security Board's annual Health of the NEM Report should include: Performance against whole-of-system key performance indicators.	ESB	2017	Complete	Whole-of-system key performance indicators are assessed in this <i>Health of the NEM</i> report.
7.6	The Energy Security Board's annual Health of the NEM Report should include: Opportunities for market development including actual and emerging risks.	ESB	2017	Complete	Opportunities for market development and actual and emerging risks are included in this <i>Health of the NEM</i> report.
7.6	The Energy Security Board's annual Health of the NEM Report should include: Progress against a Statement of Expectations.	ESB	2017	Underway	The market bodies and the ESB have commenced a process to develop new Statements of Expectations and a Statements of Role for consideration by officials and COAG Energy Council.

7.7	Energy Security Board to complete a comprehensive review of the National Electricity Rules with a view to streamlining them in light of changing technologies and conditions.	ESB	2020	Not yet started	The AEMC continually reviews and monitors large parts of the electricity rules through annual and one-off reviews. Whilst the AEMC cannot initiate rule changes but makes recommendations to COAG Energy Council through its reviews if the rules need updating for any reason including in light of changing technologies and conditions. Scope of ESB Review to be determined early in 2019.
7.8	Recommendations of the Vertigan Review to expedite the rule-making process should be implemented by COAG Energy Council.	COAG Energy Council	2017	Complete	Bill has passed the SA parliament and proclamation by the Governor received. The consultation guide is currently with the ESB for review/comment and sign off.
7.9	The Energy Security Board should prioritise work with energy market bodies, the COAG Energy Council, and other relevant stakeholders to further optimise the end-to-end rule change process.	ESB	2018	On track	<p>The ESB is coordinating and prioritising work with the market bodies on an ongoing basis. The 8-week timeframe for the expedited rule-making process will provide more time for the AEMC to consider stakeholder feedback and allow the expedited process to be used for more non-controversial rule changes. The AEMC utilised the fast track and expedited rule change processes for 17 out of 33 rule change projects in the 2017-18 financial year.</p> <p>In addition, the AEMC has been consolidating related rule requests where possible, rule requests related to reviews are being determined as part of the review process, and AER/AEMO are developing procedures and guidelines alongside associated rule change processes so they can commence together.</p>
7.10	COAG Energy Council should issue a Statement of Policy Principles to the AEMC to provide further clarification and policy guidance on applying the National Electricity Objective in the rule-making process.	COAG Energy Council	2018	Under consideration	The AEMC provided advice to Commonwealth officials in May 2018 outlining an approach that could deliver the intent of recommendation 7.10, meet the expectations of Ministers as they evolve over time, and complement the AEMC's decision making framework.

7.11	COAG Energy Council should ensure that the AER and the Energy Security Board are adequately funded	COAG Energy Council	2018	On track	<p>The ESB's initial budget has been approved.</p> <p>AER ongoing funding was significantly increased from 1 July 2017 to resource AER for functions conferred to the AER to that date. Since then the AER's functions have expanded and it is currently awaiting confirmation of funding for a number of its newest functions.</p>
7.12	AEMO should update its Constitution: new skills matrix to ensure power systems engineering or equivalent.	AEMO	2017	Complete	Completed in November 2017. Amendments to AEMO's Constitution approved.
7.13	The three-year cooling off period for independent directors of the AEMO should be reduced to six months.	AEMO	2017	Complete	Reforms were made to AEMO's constitution to reduce the cooling off period to 12 months.
7.14	STAGE 1: The Energy Security Board and AER should develop a data strategy for the NEM. Initial design developed with industry and consumer bodies, consistent with open data principles. First stage report to the COAG Energy Council on costs (design and implementation of initial set-up and indicative ongoing costs).	ESB / AER	2017	Complete	The AER's consultants delivered a draft report with preliminary data catalogue and gap analysis based on input from market institutions and government to the ESB in December 2017.

7.14	STAGE 2 and ongoing: The Energy Security Board and AER should develop a data strategy for the NEM. Functionality of the components of the strategy should be reviewed annually to ensure that they continue to be fit-for-purpose.	ESB / AER	2018	Paused	At the July ESB Board meeting a decision was made to pause this work to accommodate other related data initiatives currently under development, for example: COAG EC-led process to facilitate access to consumer energy data; the Treasury-led process to establish an economy-wide Consumer Data Right starting in banking, telco and energy sectors; the Government's response to the Productivity Commission's Inquiry into Data Availability and Use, including the creation of the National Data Commissioner and the National Data Advisory Council. Further, a Cyber Security Industry Working Group has been established to develop a framework to assess cyber security resilience and maturity of energy market participants, with the first report due by end 2018.
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