The Health of the National Electricity Market

2017 ANNUAL REPORT

ENERGY SECURITY BOARD

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Executive Summary

The National Electricity Market (NEM) is not in the best of health. The immediate symptoms are a power system where reliability risks are increasing, electricity bills are not affordable, and future carbon emissions policy is uncertain.

The Finkel Review recommended that an Energy Security Board be established to oversee the reforms needed to get the NEM back to good health; and that this Board report each year on the Health of the NEM. This is the first such report.

Retail electricity prices have increased by about 80-90% in real terms since 2007-08. Most of this increase was due to higher network costs between 2008 and 2013. Prices then remained stable until 2016 but then increased again mainly due to wholesale cost rises.

Obviously with real price rises of this magnitude affordability for households became a major concern. In 2016 about 37% of customers reported 'bill shock' and residential electricity bill increases since 2016 have exacerbated the difficulties. Low income households have been especially affected.

Business customers use about 60% of the volume of electricity produced, and they have not been spared from the price increases either. In the last two years electricity costs have doubled, or in some cases trebled for business customers. The rapid nature of the increase, and its magnitude, has made business internationally less competitive.

Customers trying to find better retail offers have faced difficulties. If you try to compare your retail offer against others, it is difficult to identify exactly what offer you are on; if you have a benefit (such as a discount) it is difficult to know what that benefit or discount is based on; and independent government comparison sites are not as easy to use as they could be.

Partly driven by bill increases, there has been an uptake in solar PV generation behind the meter and, in some cases, accompanying battery storage. About 20% of households have solar PV and a further 18% report they are likely to take up solar PV in the next two years. Australians are typically early adopters of technology and this technology is likely to be joined in the near future with more batteries, smart meters and energy management systems.

On a large utility scale about 240 MW of solar generation and 1600MW of wind generation has been added to the NEM in the last five years. This generation has free fuel and is relatively low cost to build. The cost of constructing wind and solar plants has been falling substantially and rapidly, and along with the Renewable Energy Target will deliver 5,318MW in committed renewables to the NEM before 2020.

This development is positive for emissions reduction but there has been insufficient recognition that when sun and wind are not available the power system must have dispatchable power. This type of power is provided in the NEM by coal, gas, hydro and diesel generation, and by hydro and battery storage.

In the last decade very few megawatts of dispatchable power have been added to the NEM. This really matters because the aging fleet of (mainly) coal generators is retiring. In recent years Northern, Hazelwood, and Wallerawang generators retired. Liddell is expected to follow in 2022 and many others will go in the decades following. The supply-demand balance in the system is already very tight in some areas at particular times. It is not unusual in Australian summers for severe weather and plant failure to coincide, and the system operator is giving special attention to resources being committed as reserves. This is especially important in the context of load shedding that has occurred over the last year.

One reason for this unwelcome situation is a decade of uncertain policy about emissions reduction and what this means for the NEM in particular. Despite international commitments to emissions reductions, no settled policy has been possible at the federal level. A range of different instruments, subsidies and renewable energy targets have been deployed but none has been settled. This policy uncertainty is limiting the market's response to the price signals from the spot and contracts markets for more dispatchable capacity and inhibiting investment in dispatchable power and storage. Other reasons for the lack of investment in dispatchable power are flat or declining demand for electricity in the NEM, and recent high fuel costs, especially for gas.

The mix of generators in the NEM has changed markedly. The proportion of wind and solar fuelled generators has risen, and the proportion of gas, coal and hydro generators has fallen. This change in mix is a challenge for system security because the different generators have different characteristics. The rules of physics dictate various technical features that are needed for system security - like frequency control, inertia, and voltage parameters.

Coal, gas and hydro generation have spinning generators, motors and other devices that are synchronised to the frequency of the power system. This synchronous generation provides for system security almost as a by-product. Wind and solar powered generators do not provide these features easily though work is going on to see how non synchronous resources and inverter technology can contribute. At present as the proportion of non synchronous generation rises, the security of the power system is becoming more at risk. The increase in solar PV behind the meter adds to this challenge as the demand for grid electricity by households has become more difficult to forecast.

Currently in the NEM the situation is that the operator is not always able to dispatch generators in their price merit order. Lower bids typically get dispatch preference. But this can only occur when the operator is confident that there is sufficient system security. When this is not the case certain generators are directed to come or stay on-line to provide synchronous services. The number of times these directions have to be made is increasing in some NEM jurisdictions, such as South Australia, and adding to customer costs as generators are dispatched out of merit order.

In this context the operator is suggesting to the ESB that more flexibility in supply is needed. Several potential sources for this flexibility have been posited - generation, demand response and a more diverse power system through more interconnectors. New tools and mechanisms may provide more visibility and control and the ESB will address these matters shortly.

Generators, retailers and large customers buy and sell power in the NEM wholesale market. The largest three retailers, Origin, AGL and Energy Australia, supply about 70% of the retail market in the NEM. These same entities are vertically integrated and have about 48% of generation capacity between them. These market share figures vary across States and Territories, but the markets are highly concentrated. The dependency on dispatchable generators has risen in recent years. The ACCC has recently commented that they are concerned there is insufficient competition in generation and their investigations of the electricity market are continuing. The AER has also been examining some facets of bidding behaviour in this market.

In the wholesale market, prices have been volatile since winter 2015. One common cause of this volatility across all States is the tightening supply-demand balance in the NEM. It also appears to be the case that the contract market, where risks can be managed, has become

less liquid. This creates barriers for new entrants and makes expansion less attractive in both the retail and generation markets.

Network businesses in the NEM are regulated monopolies. The transformation occurring in this industry is a huge challenge for the regulator. The changes include solar PV, batteries and energy management systems behind the meter. These developments, and others within the network itself, will transform the way networks operate. The regulator must keep up with the technology and ensure that conventional ways of doing things are not stopping innovations where they should best occur.

In the longer term the pattern of the transmission grid in the NEM will change. It was basically designed in the last century to run from large coal-fired generators to the load in the cities. It must now be reconfigured in an orderly manner so that it runs from renewable energy zones (and dispatchable power resources) to the cities. The renewable energy zones where there are good renewable energy resources have been identified by the CSIRO and they are not where coal generators and their transmission links currently sit. An integrated grid planning exercise is underway and will be completed in 2018. The key will be deciding what changes to make first as priorities.

To manage this transformation in the electricity markets we need governance that is fit for purpose. This responsibility rests with a few bodies. First the COAG Energy Council, to which the Energy Security Board reports, must agree a broad strategy and plan that can be followed. While there is work to do on this matter the path ahead has largely been set by the approval of all the Finkel Review recommendations except one. The implementation of these reforms is being oversighted by the COAG Energy Council and the Energy Security Board.

The three market bodies have interesting times ahead of them. The operator, the Australian Energy Market Operator (AEMO), has the responsibility for keeping the power system reliable and secure. As the penetration of variable renewable generators increases, both in large scale and behind the meter, and as demand response measures become more managed and sophisticated, the operator is at the forefront on a day-to-day basis. Their challenge is immediate and is not going to settle for some years.

The regulator, the rule maker and the operator must work closely together as the system transforms. Changes to the market rules are likely to be needed to address operational concerns. The AER and the AEMC are required to consider and consult widely with stakeholders and market participants on any changes to the market. These must be in the long term interests of consumers, and appropriately balance price, reliability and security. Continued consultation is important but change is upon us and governance must keep in front of it to make sure we keep the system reliable and secure, affordable, and meeting emissions reduction targets.

There are many measures being taken to meet the challenges. One of the most important is the further work on the National Energy Guarantee, being done by the Energy Security Board. This will be discussed at the COAG Energy Council in April 2018. If this policy is adopted during 2018 it will integrate an emissions reduction mechanism with the NEM and provide incentives for investment to underpin reliability. It should also improve liquidity in the wholesale contract market which will place downward pressure on prices.

Under the National Energy Guarantee all retailers are obliged to arrange their acquired load so they meet both an emissions reduction target (set in line with international commitments) and a reliability target that ensures there is always sufficient dispatchable power. The emissions reduction target in the National Energy Guarantee is a national target; and the reliability obligation will vary across regions depending on the need for dispatchable power in

those regions. Because the obligation rests on retailers there is expected to be greater activity in the contract market, leading to more liquidity in that market, more efficiency and downward pressure on wholesale prices. Outside the emissions reduction target of the National Energy Guarantee the States and Territories are able to set more challenging emissions policy in their jurisdiction if they wish, but the reliability obligation in that jurisdiction would change in response so that their State always has enough dispatchable power. The national emissions reduction target is a matter for the Commonwealth. As a nation Australia is obliged to at least meet its agreed international obligations.

The National Energy Guarantee does need further detailed work but it looks like a very promising policy mechanism to integrate emissions reduction with energy policy objectives. It is not designed to solve all the reliability and system security issues in the NEM. Modifications to existing tools may be needed, and new mechanisms may have to be introduced. Day ahead markets and different reserve requirements fall in this category; and the Energy Security Board is also considering these matters as they work on the detailed design of the National Energy Guarantee.

In the regulatory area there have been major reforms aimed at both reducing network costs and prices, and at encouraging innovation. Networks are regulated monopolies and traditionally have been viewed as nothing more than one-way transport providers of power - from generators to customers. The regulatory job has simply been to keep the cost of this service efficient and reasonable. But with the technology now available, many customers with solar PV and energy management systems behind their meter want to export into the network at times when their power supply is exceeding their demand. Generation is becoming widely distributed. Using smart meter information customers also want to manage their energy use in an efficient and least cost way. This is disruption in the traditional network world.

In response to these changes and to encourage them a number of rules in the NEM have been changed. About one quarter of the network is only needed for 40 hours of peak demand each year. Rather than meeting this demand through expensive network upkeep and operation there are non-network alternatives. Consumers can be rewarded for managing their demand, especially in peak periods. The use of smart meters and energy demand systems are being encouraged. The impact of these developments will take time but the cost reductions for network companies and for their customers are likely to be substantial. This transformation is assisted by the entry into the market of competitive energy service providers.

The regulator has also had their role strengthened in a number of ways so they have greater power to ensure that costs in the network are efficient. They have also had their budget increased to (among other things) get more information and data about what is happening behind the meter, and to improve easy access to their EnergyMadeEasy site where retail offers can be compared. There has also been government intervention insisting that the large retailers reform their billing so that offers are clear and can be more easily compared.

On the basis of these measures, and many others, the health of the NEM is improving. The NEM is not out of intensive care yet but we can report that this care is being provided.

1. Introduction

The National Electricity Market (NEM) is experiencing its greatest change since the 1990s when it was developed. The transformation to a more distributed system with substantial increases in variable renewable generation is presenting challenges that are both new and exciting. The situation is not unique to Australia and similar challenges are being faced by electricity markets around the world.

The basic nature of the transformation is clear. Electricity generation, powered by low cost wind, water and sun is increasing rapidly. This is being driven by both emissions reduction requirements and by relatively low costs of construction and operation. Further our society is increasing its dependence on electricity and this is particularly the case in Australia where the population is highly urbanized. Finally, in the context of these two developments, it is critical that power is affordable.

A practical trilemma was recognized by the Finkel Review: to achieve appropriate reductions in carbon emissions; to do so while maintaining a reliable and secure power system; and at a price everyone can afford. This trilemma is at the core of all Energy Security Board work under its direction by the COAG Energy Council.

For progress to be made we need to completely understand the NEM as it is now, what exactly needs to change and will change with outside the system developments. This will mean understanding the impact of increasing variable renewables on the system as well as the effect of increasing household solar PV, energy management systems, and battery storage and use. We must know about the innovations that are occurring, and are on the way, and how they will assist and modify the complex but interesting problems we face. This understanding also needs to include technological change directly outside the power system, like electric vehicles.

The present NEM was designed for another era and its evolution is inevitable. We need to identify what works and what needs adjustment; how we can ensure that any new investment required will occur; and how we can support competitive outcomes that reduce barriers to entry and encourage innovation. Are the current regulated network businesses, and the regulation that supports them, best suited to drive innovation both on the networks and behind the meter. What is the best way to harness Distributed Energy Resources to support decreased investment in the grid? Do networks have a business model where they are rewarded by driving greater value to their customers? Do regulatory conventions stymie this growth? Is the traditional way of doing things counter to consumer benefit?

As more intermittent renewables displace old retiring coal plants the operator of the power system has challenges in maintaining the reliability and security in all regions of the NEM. These are immediate issues.

The rules, authority and accountability of the market bodies need to be examined in the light of coming changes and challenges. Does the operator have the tools to keep the system reliable and secure? Is the rule maker / strategist getting enough time to consider and make the correct decisions while moving fast enough to keep ahead of the changes? Is governance overall fit for purpose and if not what needs to change? Strong institutions with the capacity and accountability to advise the COAG Energy Council and then achieve the policy outcomes chosen are essential.

To address these many issues the Finkel Review[1] recommended that the Energy Security Board report on the Health of the National Electricity Market (NEM) each year. This is the first of the annual Health of the NEM reports.

We examined the Health of the NEM against eight characteristics which a "healthy NEM" would exhibit. These are:

- Efficient prices and affordability
- Consumer confidence
- Decreasing carbon emissions
- Reliability of supply
- Security in system operations
- Competitive wholesale and retail markets
- Robust and responsive regulation and planning
- Fit for purpose governance.

The power system is complex but we have tried to keep the Annual Report accessible. The NEM is essential for households and businesses across the southern and eastern states of Australia; it is important to all of us in our daily lives.

This report begins with a brief explanation of the NEM. The next section discusses the current health of the NEM. There are signs of progress but health is still tenuous. We have rated each of the eight characteristics above on the basis of their "health" - critical, being monitored, or healthy. The fourth section outlines progress being made (or not) in tackling the problems. This work to improve the NEM follows and builds upon the recommendations of the Finkel Review. On the basis of the work underway we rate the health of the characteristic as either deteriorating, unchanged or improving. How the Finkel reform process is going is summarised in Section 5 where each of the fifty recommendations is noted along with action to date. Most of the Recommendations are scheduled to be completed in 2018, and all of them by 2020. This means there is some urgency.

[1] Independent Review into the Future Security of the National Electricity Market – Blueprint for the Future, June 2017

2. Overview of the National Electricity Market

2.1. The National Electricity Market

The National Electricity Market (NEM) is the wholesale electricity market that operates across Queensland, New South Wales, the Australian Capital Territory, South Australia, Victoria and Tasmania. These States and Territory make up five regions in the NEM with the Australian Capital Territory being included in the New South Wales region. This market delivers electricity to about 23 million people or 88 per cent of the Australian population.

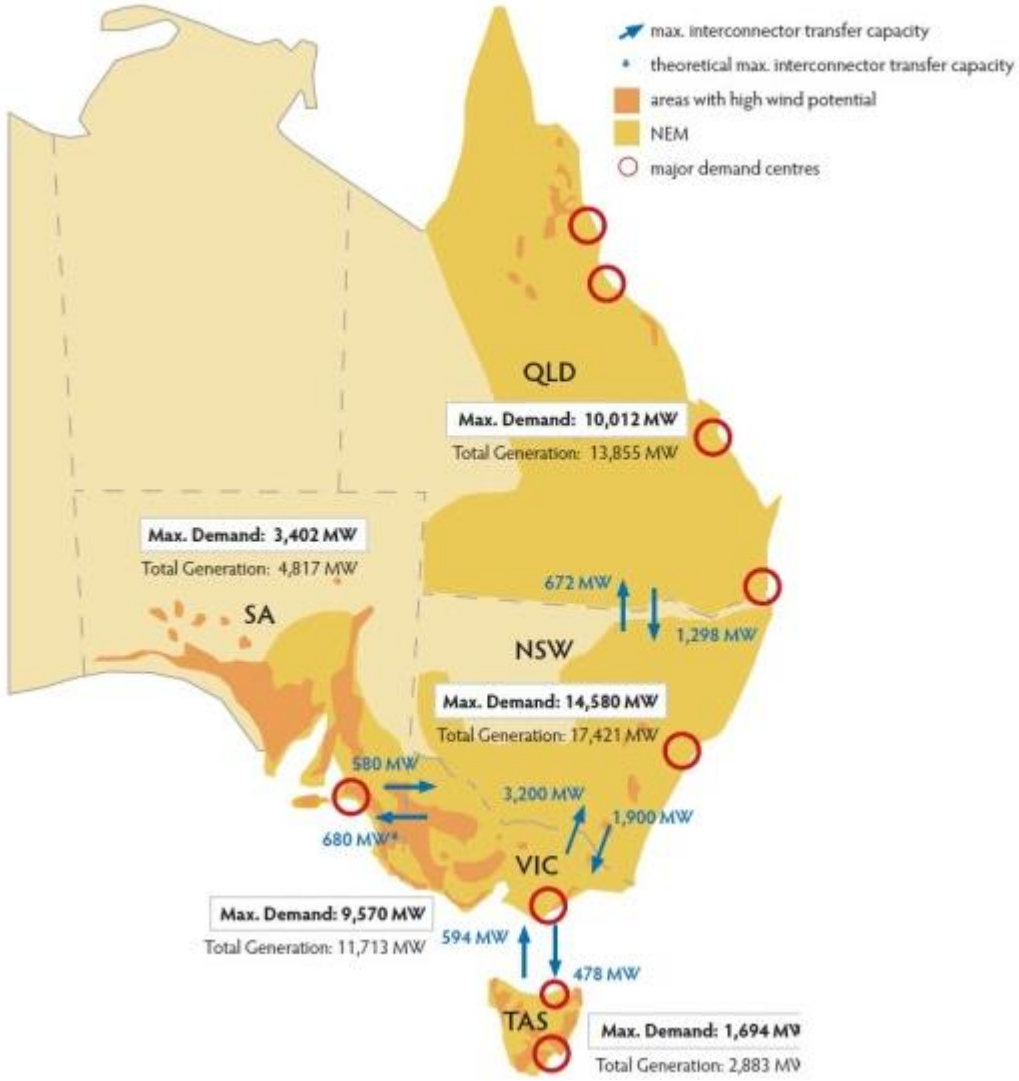
The NEM's transmission grid, with 40 000 kilometres of transmission lines and cables, carries the power from electricity generators to large industrial energy users and local electricity distribution networks. Energy retailers act as market intermediaries by buying electricity from the NEM and paying for its transport through transmission and distribution networks to almost 10 million residential, commercial and industrial energy users.

Figure 2.1 Geography of the NEM

Source: AER

In geographic span, the NEM is one of the world's longest interconnected power systems, stretching from Port Douglas in Queensland to Port Lincoln in South Australia, and across the Bass Strait to Tasmania. It is notable that the interconnections between the five state based regions is limited and there is low population density along most parts of the grid. The approximate capacity of the interconnects is shown below along with the indicative demand for electricity in each region and the generating capacity.

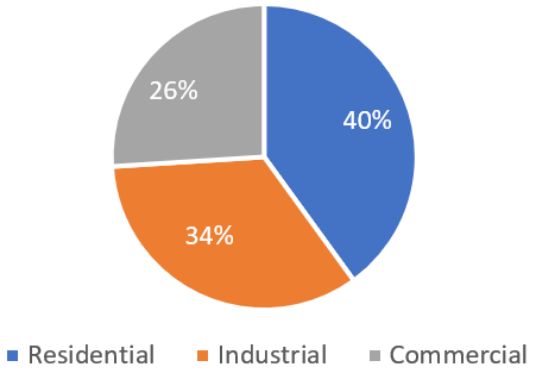
Figure 2.2 Interconnect capacity between regions



2.2. Customers and prices

Small residential and business customers make up 98 per cent of electricity connections. In 2016-17 residential customers accounted for around 40 per cent of energy sales by volume. Commercial and industrial customers are the largest consumer group in the NEM. Industrial customers account for 34 per cent of the total consumption, with large users, including aluminium smelters, making up half of this consumption. The commercial sector accounts for 26 per cent of the total electricity consumption.

Figure 2.3 Customers in the NEM, volume



Source: ACCC, Retail Electricity Pricing Enquiry: Preliminary Report, 22 September 2017, page 17

The ACCC has recently noted that an average annual residential bill in the NEM in 2015-16 was $1524 made up of:

- Network costs 48%
- Wholesale costs 22%
- Environmental costs 7%
- Retail and other costs 16%
- Retail margins 8%

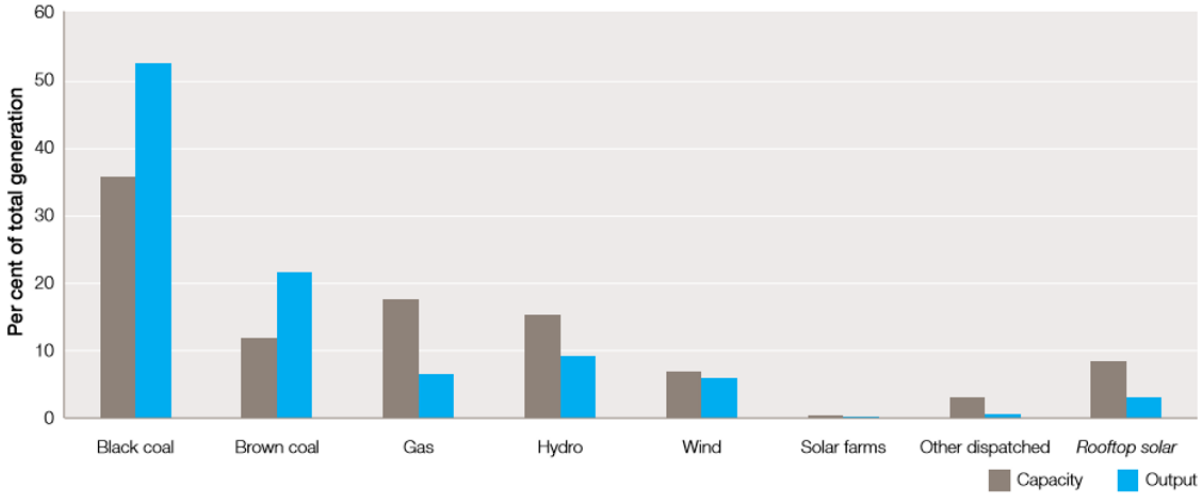
The proportion of these contributions to costs do change over time. For example, the wholesale cost component is estimated by the ACCC in 2016-17, one year later, is 31 per cent of the bill. The network costs contribution has decreased.

2.3. Generators, retailers and market pricing

The NEM includes a wholesale spot market into which generators sell electricity. The Australian Energy Market Operator (AEMO) schedules the lowest cost generation to meet demand every five minutes. The supply of electricity must be matched with demand in real time to meet both system security and reliability requirements.

Over 300 registered generators participate in the NEM, by making bids to supply quantities of electricity at different prices for periods of time. They use a mix of technologies, including coal fired plant, gas powered generators, wind turbines, hydroelectric plant and solar PV panels. Electricity generated by small rooftop solar systems is not directly traded through the NEM and is installed behind the customer meter. The type of generation by fuel source in the NEM is shown in figure 2.4, with black coal having the largest market share with over 50 per cent of output in 2015-16.

Figure 2.4 Generation in the NEM, by fuel source, 2015-16

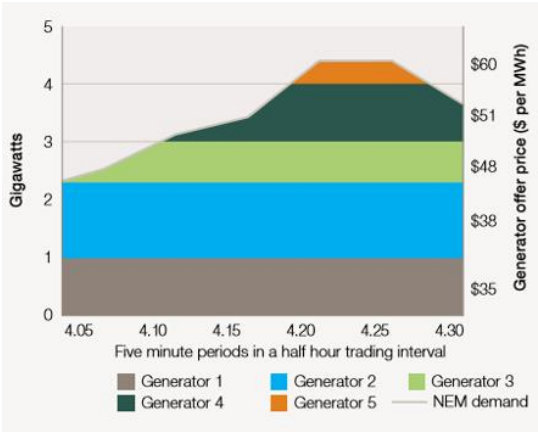


Source: AER, State of the Energy Market, May 2017

From all the bids offered, AEMO uses sophisticated operating systems and algorithms to determine which generators will be deployed in each region to produce electricity. The cheapest bids are selected first, then progressively more expensive bids until enough supply can be dispatched to meet demand every five minutes. The highest priced offer needed to meet demand sets the dispatch price.

This process is explained in figure 2.5.

Figure 2.5 Generator bid stack



Source: AER, State of the Energy Market, May 2017

At peak demand all five generators in the stack are dispatched. Generator 5 in this example sets the highest price offered in that period. At low demand only generators 1 and 2 are required. The price is then set by generator 2's bid.

The settlement price paid to generators is the average dispatch price over 30 minutes. All successful bidders are paid at this price, regardless of how they bid. A separate spot price is determined for each of the five NEM regions every 30 minutes. Prices are capped at a maximum of $14,200 per megawatt hour (MWh) for 2017-18. A price floor of -$1,000 per MWh also applies. As the example in Figure 2.5 shows, some generators (like generator 5) only run a few times each time period. They need to recover their entire costs during those few periods of operation.

It is important to note that when generators bid into the wholesale market they take account of any hedging contracts they have with retailers. Contracting a generator's capacity influences its spot market behaviour. A contracted generator will usually bid its marginal cost to ensure their generation is dispatched when spot prices are above marginal costs. This allows them to earn the spot market revenues needed to meet contract payments to retailers.

Energy retailers typically buy electricity in the wholesale markets and package it with network (transportation) services for sale to customers. Charges may be flat or vary according to the time of day or season, but they usually insulate the customer from movements in wholesale spot prices. Retailers use hedge arrangements to manage their own risk of price volatility in the wholesale market, which then allows them to offer contracts to their customers.

The range of offers to consumers is now expanding. Time of use tariffs have always been a feature of the market with peak/off peak tariffs, especially for larger customers. Where these tariffs are simple, these have been attractive and delivered value. Their greater use is now made possible by increased uptake of interval (smart) meters that measure a customer's energy use in real time. Other options range from spot price pass through arrangements (where the customer takes on the risk of wholesale market volatility) to fixed price contracts (where the customer pays a fixed amount regardless of how much energy they use). And some retail offers are tailored to customers with specific requirements (such as households with swimming pools).

Volatility in the spot market, and the need to finance their businesses, has led to the development of a financial contracts market between generators, retailers and other financial intermediaries in the NEM. Financial derivatives are used in a number of ways. First, these instruments allow the market participants to hedge the financial risk in a volatile spot electricity market and thus enable better operational decisions. Second, a liquid financial market can be used to provide longer-term investment signals by providing investors more certainty of future revenues. By removing their exposure to spot price volatility, contracts also lower the risks and costs of generation investment.

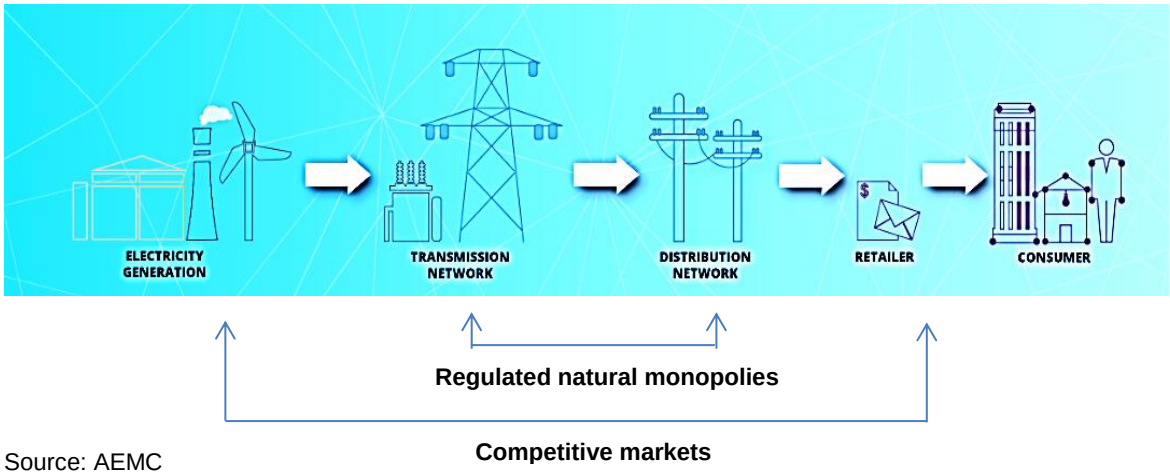
Volatility in the spot market can also be managed through vertical integration. Vertical integration allows generators and retailers to insure internally against risk in the wholesale market, which can reduce the need to participate in these contract markets potentially reducing liquidity in these markets.

The financial derivatives available to market participants can either be contracted through over-the-counter (OTC) contracts (for example, swaps and caps) or through exchanges, for example the Australian Securities Exchange. These derivatives are typically forward contracts.

2.4. Networks

The generators and retailers in the NEM rely on regulated transmission and distribution networks to transport this power. A diagram of the electricity supply chain is set out below.

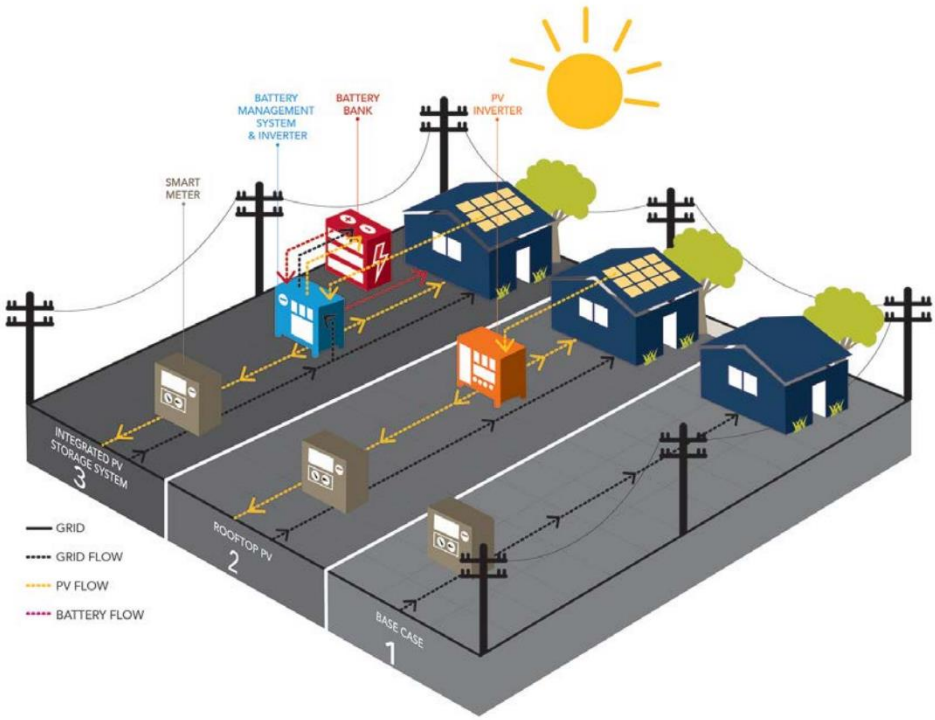
Figure 2.6 The supply chain



Source: AEMC

The flow of power in this diagram is traditional and does not give a sense of the changing flows being experienced. There is now generation at a household level and customers are no longer simple passive receivers of energy. This is better depicted in Figure 2.7.

Figure 2.7: The new supply chain



Source: AEMO

In this figure, household 1 is a traditional receiver of power from the grid. Household 2 has solar PV generation, a battery storage unit, a smart meter and grid power. Household 3 has solar PV, a battery bank, an energy management system, an inverter, a smart meter and grid power. There is an increasing number of households and businesses in the household 2 and 3 categories. These households are both exporting and importing power with two-way power flows in the grid at different times. This trend is expected to continue.

The transmission and distribution networks in the NEM consist primarily of high voltage and low voltage lines respectively. There are five transmission companies (one in each state) and 14 distribution companies.

Electricity networks are capital intensive and it is typically more cost effective to have just one network, rather than multiple networks, in the same geographic area. The result is a monopoly industry structure and electricity networks are regulated.

The key principle of network regulation in the NEM is to give incentives to networks to be as efficient as possible. The AER does so by locking in revenue allowances. With set revenues, the networks increase their earnings by providing services at the lowest possible cost. Their returns are determined by their actual costs of providing services. If networks reduce their costs below the estimate of efficient costs, they make higher than expected profits. But this only continues for the regulated period. In the next period revenues are reset and the added efficiency is shared with consumers in future regulatory periods.

The AER uses a building block approach to calculate a total revenue allowance for a network. This includes estimates of capital expenditure, operating expenditure, a rate of return and an allowance for tax.

2.5. Basic physical requirements

There are fundamental physical requirements that must be met in any electricity system. In order to allow a reliable supply of electricity to be provided to customers, the power system must have sufficient capacity to meet consumers' electricity needs, including a buffer for reserves. The system must also be operated in a secure manner. The system is secure when technical parameters such as power flows, voltage, and frequency are maintained within defined limits. The system is reliable when the potential supply of electricity is sufficient to meet demand, even as both supply and demand fluctuate over time.

In meeting demand, the volume of electricity generated (supply), must be balanced with the volume of electricity consumed (demand) on a second-by-second basis at all and every location on the system. From an operational perspective, it is not sufficient to just have supply meet demand, there also needs to be an adequate level of reserves over demand levels at a particular point in time. This is so that in the event of an unexpected event such as the loss of major source of supply or high demand the system can remain in balance while continuing to remain in a secure operating state.

A mismatch in electricity supply and demand changes the frequency of the power system. If supply exceeds demand at a single point in time, system frequency will increase. Likewise, if demand exceeds supply at a single point in time, system frequency will decrease.

Large deviations from the normal frequency level (50 hertz in Australia) or rapid changes in frequency can lead to instability in the system and cause the disconnection of generation or customers. Uncontrolled disconnections can lead to cascading failures and, ultimately, a "black system" where part or all of the electricity network is de-energised. Consequently, it is important that the power system is able to resist changes in frequency arising from unexpected losses of generation, load or transmission lines until such time as the supply-demand balance can be restored.

The ability of the system to cope with sudden imbalances in supply and demand is determined by the inertia of the power system. Inertia is naturally provided by spinning generators, motors and other devices that are synchronised to the frequency of the system. Historically, in the NEM, plentiful inertia has been provided by coal and gas-fired

synchronous generators and hydro plant. However, many new generation technologies, such as wind turbines and photo-voltaic panels, are non-synchronous and have low or no physical inertia. These renewable generators are currently limited in their ability to dampen rapid changes in frequency. The shift in the generation mix towards more non-synchronous generation gives rise to increasing challenges for the operator in maintaining the system in a secure operating state.

Non-synchronous generators do not contribute to system strength as much as synchronous generating units. One measure of system strength relates to the size of the change in voltage for a change to the load or generation at a connection point. When the system strength is high at a connection point, the voltage changes very little with a change in the load. When the system strength is lower, the voltage changes more with the same change in load. Reduced system strength in certain areas of the network may mean that generators are no longer able to meet technical standards and may be unable to remain connected to the power system at certain times.

2.6. Role of the three market bodies

The operations, regulation and development of the NEM is the responsibility of the three market bodies.

The Australian Energy Regulator (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.

The Australian Energy Market Commission (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 design and provides advice to the COAG Energy Council.

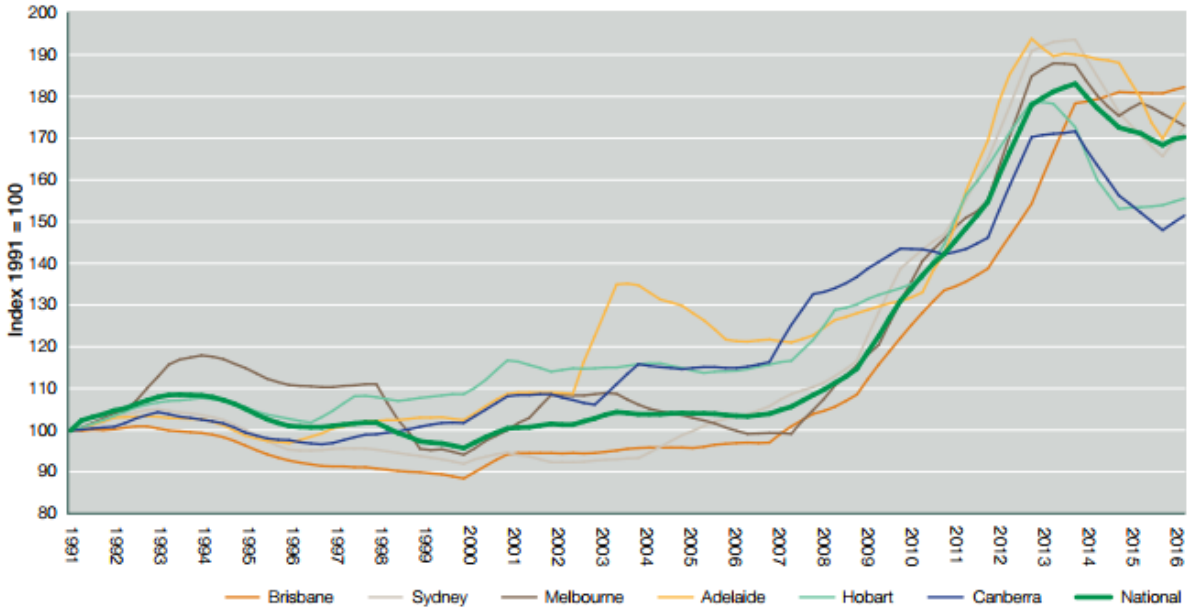
The Australian Energy Market Operator (AEMO) operates the power system and gas and electricity spot markets. AEMO is the body that keeps the electricity system operating. Like all market participants and the AER, AEMO is responsible for implementing changes to the rules that impact on its operations and importantly is also responsible for the provision of information to market participants, for long term planning of the interconnected power system, including forecasting demand and supply and network development.

3. The Present Health of the National Electricity Market

3.1. Efficient prices and affordability

Increases in residential bills have been very high in recent years. In real terms, based on CPI, retail electricity prices have increased by 80-90 per cent between 2007-08 and 2015-16.[2] Most of these increases occurred between 2008 and 2013 and were caused by higher network costs. Other causes were higher retail operating costs and environmental scheme costs. Electricity prices were relatively stable during 2013-16 but since then rose further due to increases in wholesale costs. The relatively high level of wholesale costs is expected to continue in 2017-18.[3]

Figure 3.1 Retail electricity bills, by capital city



Source: AER, State of the Energy Market, May 2017

The large rise in network costs between 2008 and 2013 was due to a number of factors. First some States (NSW and Queensland) raised the reliability standard for networks. The benefits of doing so may not have exceeded the costs. Second the forecast demand that networks were required to serve was above what turned out to be actual. Third, finance costs were unusually high due to the financial crisis at the time.

The increase in wholesale prices in 2016-17 was in part caused by the exit of Hazelwood and Northern coal fired plants, and a tighter supply. A continuing trend of generator consolidation and increased vertical integration in some regions may also have been a factor. Finally gas powered generation has become the marginal source of generation in some regions (Victoria and South Australia) just as gas fuel prices have increased substantially.

[2] ACCC Retail Electricity Pricing Inquiry, Preliminary Report, September 2017, page 7.

[3] AEMC, 2017 Residential Electricity Price Trends, 12 December 2017, Sydney.

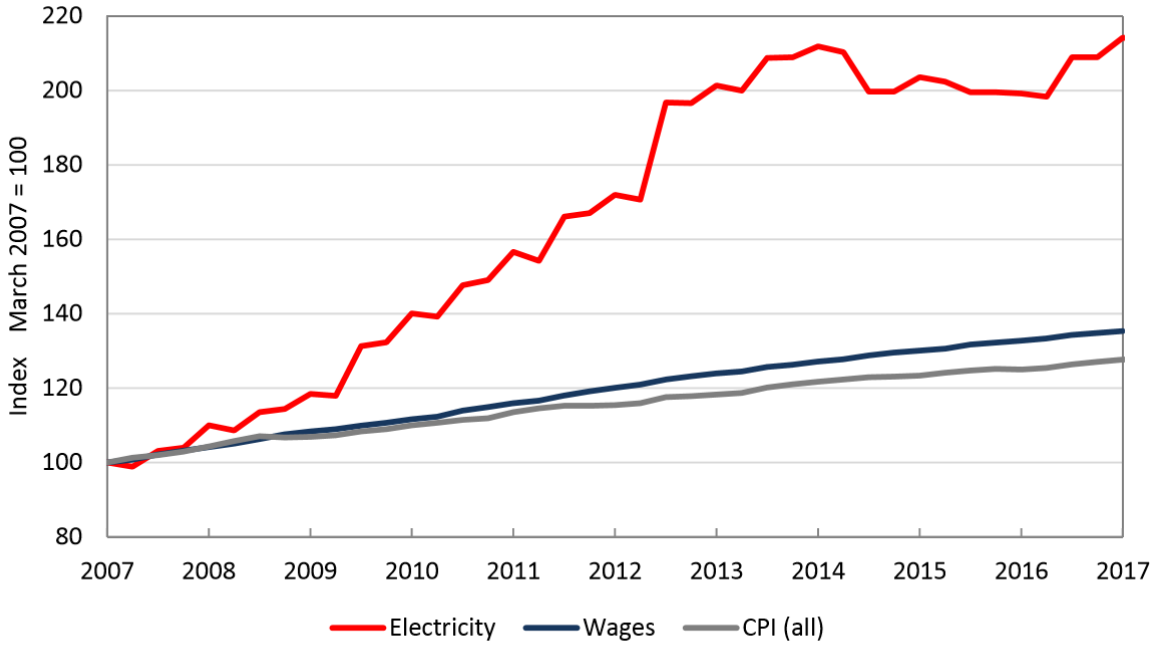
Gas generating plant is now setting the wholesale price more frequently than it has historically.

The increases in residential bills have been offset for some consumers by:

- those consumers meeting some of their own electricity demand through rooftop solar PV; and
- some retailers offering lower charges to those customers who have "shopped" around.

The large increases in electricity prices since 2007 have not been matched by price increases in other areas of the economy, nor in wage growth (see figure 3.2).

Figure 3.2 CPI for electricity compared with other sectors and wage growth



Source: ABS, Consumer Price Index 6401.0 and ABS, Wages Price index 6345.0, Australia.

Business has also experienced large increases in price over the past 12 months, following renegotiation of expiring contracts, with some choosing to enter the spot market for their purchasing needs and being inadequately hedged against the risks of rising prices.

Many businesses cannot pass on the increased costs and are considering reducing staff, and relocating overseas. Some businesses have been forced to close.[4] In the last 12-24 months the electricity costs for business have doubled or tripled in some cases. The experience is shared by small, medium and large customers. Submissions to the ACCC from both individual businesses and industry groups provide evidence and case studies.

[4] ACCC Retail Electricity Pricing Inquiry, Preliminary Report, September 2017, page 6.

Australian electricity prices now rank less favourably internationally. In 2004 Australia was the fourth least costly country in the OECD. By 2016 Australia was more expensive than eight countries—Norway, Canada, United States, Mexico, Israel, Switzerland, Korea and Finland.[5]

Affordability relates to consumers' capacity to pay their electricity bills. It depends on the amount of electricity used, the prices paid, disposable income and other living costs. An increasing number of customers are reporting difficulties in meeting their electricity cost, with some minimising their spending on other essential services to pay electricity bills.[6] Consumer research found around 37 per cent of customers experienced "bill shock" in 2016[7] and electricity prices continue to be the number one household cost concern for Australians.[8] Price rises that took effect in July 2017, and those expected in 2018, will continue to reduce affordability.

Increases in residential bills have been particularly difficult for low income households. The lower income quartile spends around five times more of their disposable income on electricity than the highest disposable income quartile.[9] Efficient prices occur when there is a competitive industry structure, and when regulation is efficient and effective.

Given that recent retail price increases have largely been driven by wholesale costs, the AEMC was asked to estimate the potential contribution to affordability of achieving an economically efficient level of wholesale prices. This preliminary analysis gives an indication that the potential gains available from having an efficient emissions reduction policy mechanism and a workably competitive industry structure in place could be substantial.

It is clear that continuing to manage the rapid and large price rises experienced over the past decade is unsustainable for both residential and business customers. The requirement for efficient prices and affordability is essential for a "healthy NEM". Its "health" is CRITICAL.

[5] ACCC Retail Electricity Pricing Inquiry, Preliminary Report, September 2017, page 25.

[6] ACCC Retail Electricity Pricing Inquiry, Preliminary Report, September 2017, page 6.

[7] AEMC, 2017 AEMC Retail Energy Competition Review, FINAL, 25 July 2017, page 92.

[8] Choice's Pulse Surveys found that electricity prices are the number one household concern for Australians for nine straight quarters. ACCC Retail Electricity Pricing Inquiry, Preliminary Report, September 2017, page 14.

[9] AER/ACCC analysis, AER, Annual report on compliance and performance of the retail energy market, November 2017.

3.2. Consumer confidence

Consumer confidence can be assessed through both market engagement and surveys. Preferences and expectations are changing as new technology is adopted. More consumers are seeking flexibility and variety in service offerings and new product offerings are emerging. Consumers can choose “greener” generation for example and to more easily manage their electricity consumption.

- About 20 per cent of consumers have solar panels and about 18 per cent say they are definitely or likely to take up solar in the next two years.
- About 21 per cent of consumers say they are definitely or likely to adopt battery storage in the next two years, and 18 per cent expect to adopt a smart home management system. [10]

Australians are typically good adopters of new technology and there are certainly signs this is occurring.

On the other hand a major problem in the market is that understanding retail offers, and different retail tariff structures is difficult for anyone. This matter was recognised in the Finkel Review and the Australian Government recently requested action from the larger retailers to address the matter. Transparency is simply not present.

- About 30 per cent of respondents are not able to identify the type of offer they are on.
- Consumers are often unaware of when benefits (such as discounts) will lapse
- Around 50 per cent of consumers have not switched in five years and awareness of independent government comparator sites is low.[11]

Comparing energy offers is more difficult than comparisons in other sectors like banking, insurance, and telecommunications. Awareness of the ability to change retailer or plan is high but, as noted awareness of independent government comparator sites is low. Consumer awareness of the AER’s EnergyMadeEasy comparator site remains low at nine per cent. [12]

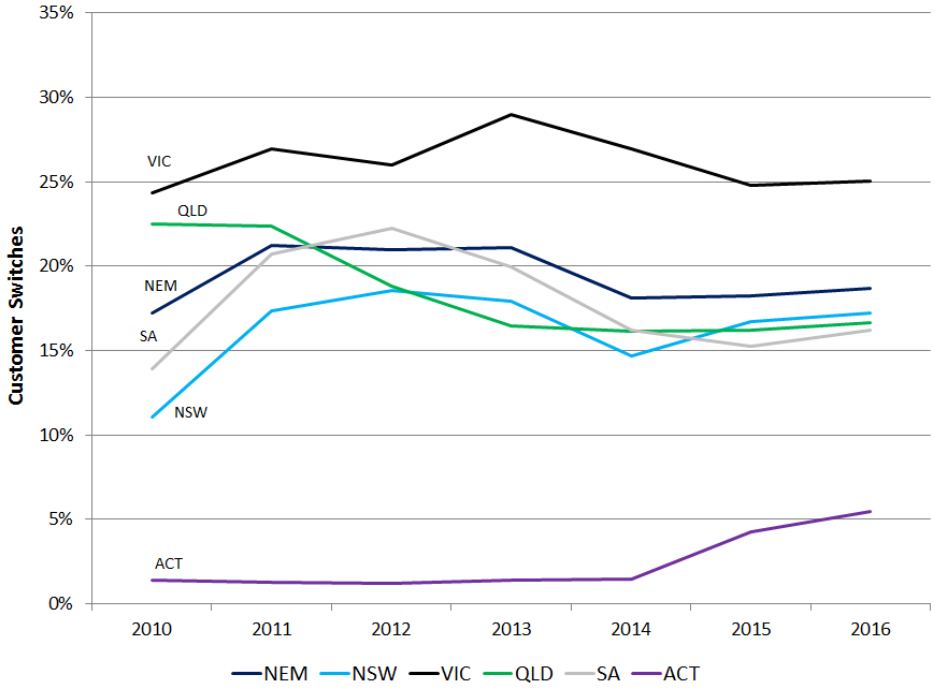
Switching rates are between 15-25 per cent for most jurisdictions as shown in Figure 3.3. Switching is largely price driven. NEM-wide residential consumers and small business consumers required an average quarterly bill saving of 23 per cent on electricity to seriously consider switching.

[10] AEMC, 2017 AEMC Retail Energy Competition Review, 25 July 2017, Section 6.6, pages 97-98

[11] AEMC, 2017 AEMC Retail Energy Competition Review, 25 July 2017, Chapter 6

[12] AEMC, 2017 AEMC Retail Energy Competition Review, 25 July 2017, p. ii.

Figure 3.3 Annual electricity switching rates (by jurisdiction)



Source: AER and AEMO data

The AEMC and Energy Consumers Australia (ECA) both conducted consumer surveys early in 2017 (the AEMC in January/February, the ECA in March). In the AEMC survey, satisfaction of residential electricity consumers with their current retailer for customer service and value for money remained stable.

On the other hand consumer satisfaction for small business electricity consumers decreased. Those small business customers across the NEM, who considered they were getting value for money decreased by 11 per cent to 48 per cent. Victoria experienced the largest decrease of 18 per cent. The ECA survey results were similar to the AEMC but showed some improvement in confidence since 2016.

The survey results reflect consumer sentiment before the major price rises in July 2017 in South Australia and NSW, and the announced increases in Victoria for 1 January 2018. Given those price increases and recent media interest in the sector, the survey results should be treated with caution. The ECA survey (in December 2017) should capture the impact that these price increases have had on consumer sentiment.

On the positive side there are growing signs of customers seeking flexibility and variety in their service offerings. There are also signs of customers seeking to manage their consumption and demand. The uptake of rooftop solar PV is extensive and growing, and battery take-up is following,

Customer satisfaction surveys suggest stability for residential customers though this information pre-dates recent price rises. Small business satisfaction has declined markedly.

Switching retailers is driven by a search for better pricing. Comparison between offers is difficult for anyone and switching rates are generally between 15-25 per cent.

A rating for the “health” of consumer confidence is “BEING MONITORED”.

3.3. Decreasing carbon emissions

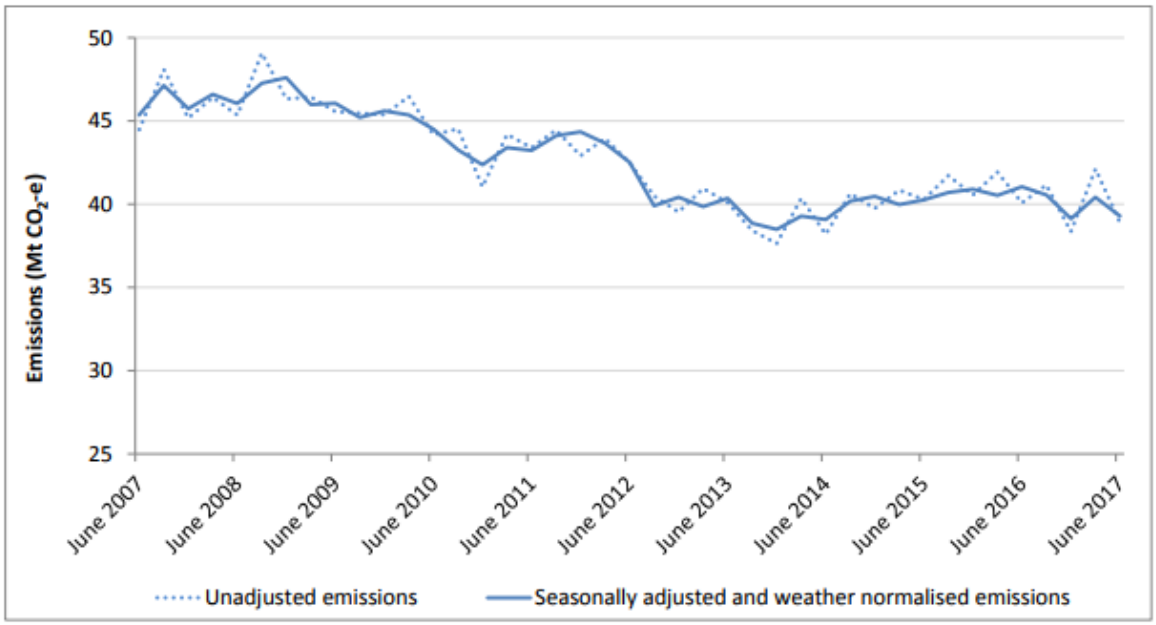
The past decade has been characterised by changes in emissions reduction policies. At the federal level of government, despite international commitments to emission reductions, no settled policy has been possible. The absence of a clear long-term policy has seen a range of different instruments, subsidies and renewable energy targets employed at both state and federal levels of government to attempt to deliver carbon emission reductions.

The problem with this muddled approach is its cost and the policy uncertainty that has inhibited investment in dispatchable power and storage. The various mechanisms have increased renewable generation, but they have added to direct costs that have been passed through to customers in higher prices.

On the investment side, the electricity industry is capital intensive. The ability to attract capital is related to perceptions of market risk and with policy uncertainty these risks increase. In the current environment of changing and uncertain emissions policies the costs of financing investments have increased. This increase is considered by the industry to add about three per cent to the financial cost of new investment. Higher returns are needed to balance the greater risk.

As highlighted in Figure 3.4, carbon dioxide emissions in the NEM have fallen by 12.5 per cent (or 5Mt) over the past decade, but have remained stable in the past five years. Note that the full effect of Hazelwood’s closure, which occurred in March 2017, is not yet apparent in this figure.

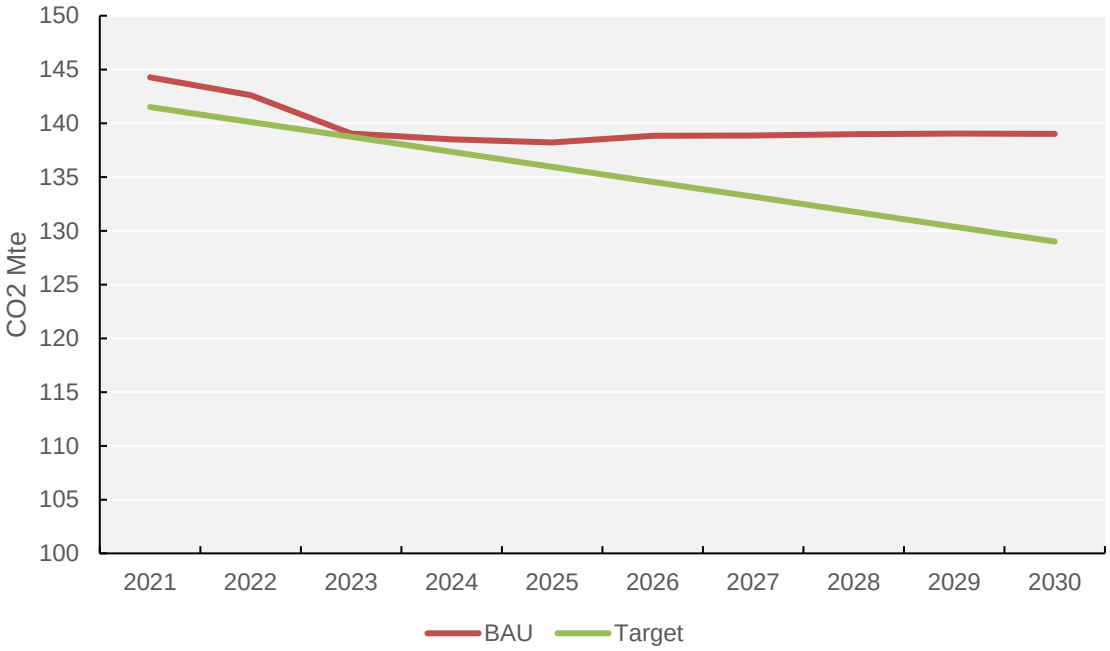
Figure 3.4 Quarterly NEM electricity emissions, June quarter 2007 to 2017



Source: Department of the Environment and Energy

Without a specific policy commitment to achieve emissions reductions in the NEM, emissions will exceed the 2030 emissions reduction target for the electricity sector implied by the international obligation made in the Paris Agreement. This is shown in Figure 3.5.

Figure 3.5 Annual emissions under business as usual compared to assumed target[13]

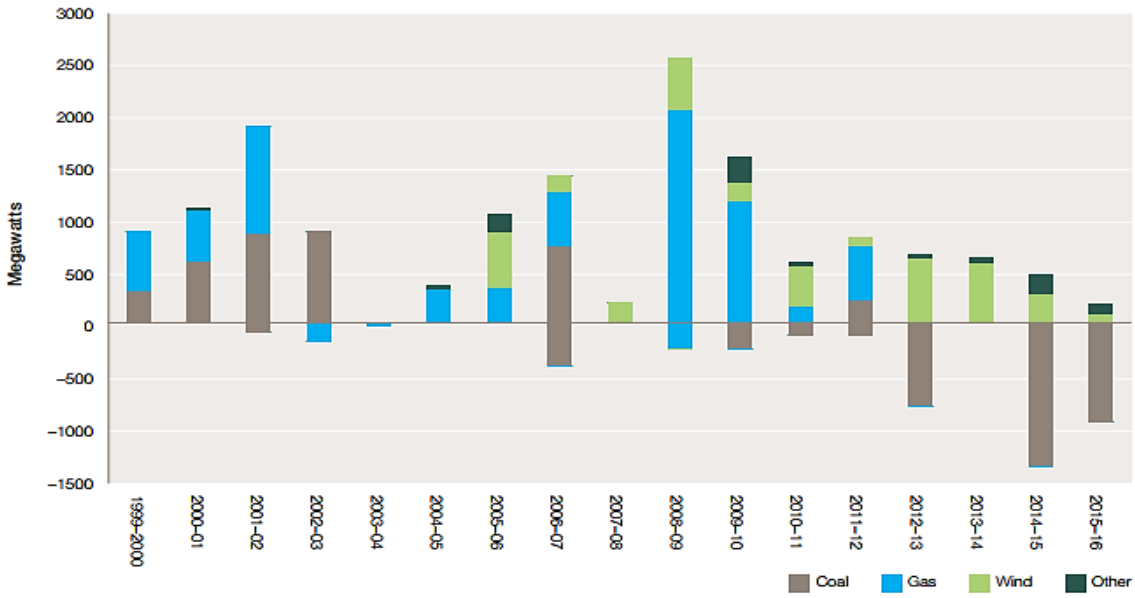


Source: AEMC

The Renewable Energy Target and other environmental schemes have contributed markedly to emissions reduction. As Figure 3.6 below shows, since 2007-08 the new entrants in the generation sector of the NEM have been renewables. This is in stark contrast to the period from 1999-2000 to 2006-07.

[13] The estimated business as usual emissions in Figure 3.5 includes generation investment incentivised under the Victorian and Queensland Renewable Energy Targets.

Figure 3.6 Investment in New Generation and Plant Retirement

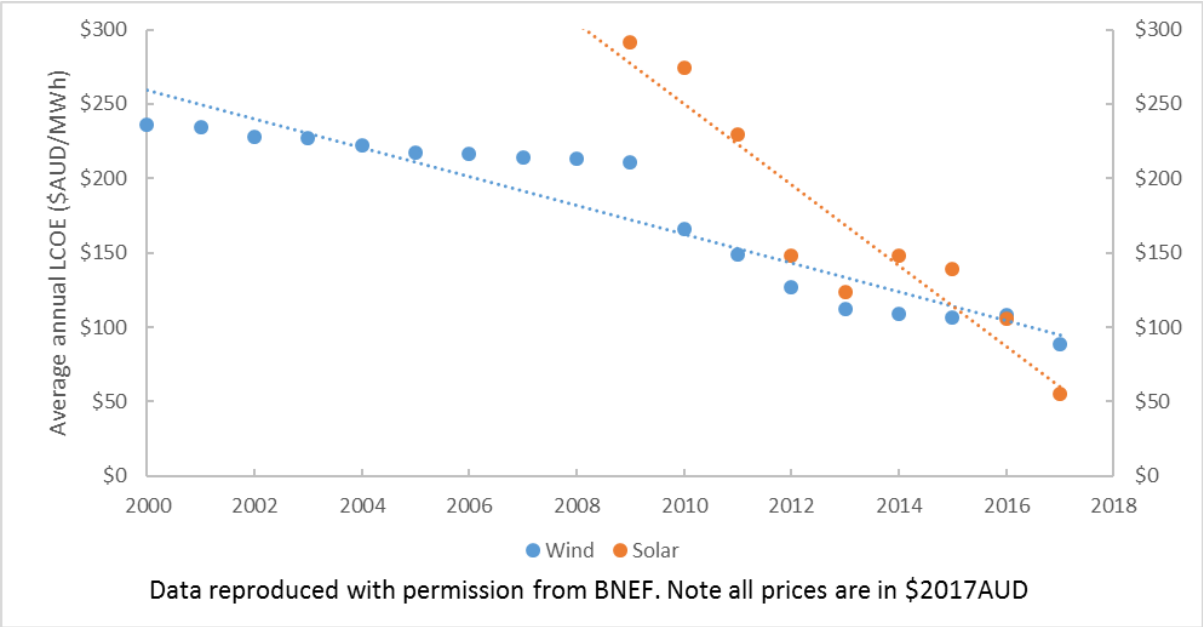


Note: Retirements exclude mothballed plant.
Source: AEMO; AER.

Almost 5,200 MW of coal fired generation has withdrawn from the NEM in the last decade. Of the 2,000 MW added to generation capacity over the five years to March 2017, 80 per cent has been wind generation and 12 per cent solar under the federal government's Renewable Energy Target.

It is also notable that the cost of wind and solar generation is falling rapidly. There is debate about the size of the cost decline, but it is quite clearly occurring and it is substantial. Along with the Renewable Energy Target, these lower costs will deliver 5,318MW in committed renewables before 2020.

Figure 3.7 The cost of wind and solar



Data reproduced with permission from BNEF. Note all prices are in $2017AUD

While progress on emissions reductions in the electricity sector is apparent - through the closure of older, more emissions intensive plant and the built and committed construction of wind and solar renewables - more is needed to meet international commitments or higher emissions reductions targets. The policy uncertainty of the last decade has not only delivered insufficient electricity sector emissions reductions, but it has also increased costs in the industry. This has led to less than optimal outcomes. A workable policy mechanism is an urgent matter for both delivering on emissions reductions targets and for wider industry concerns relating to affordability and reliability. The health of emissions reduction policy mechanisms in the NEM must at present be rated as “CRITICAL”.

3.4. Reliability of supply

Reliability is the ability of generation and network capacity to meet consumer demand. Adequate supply must match demand at all times and in all places.

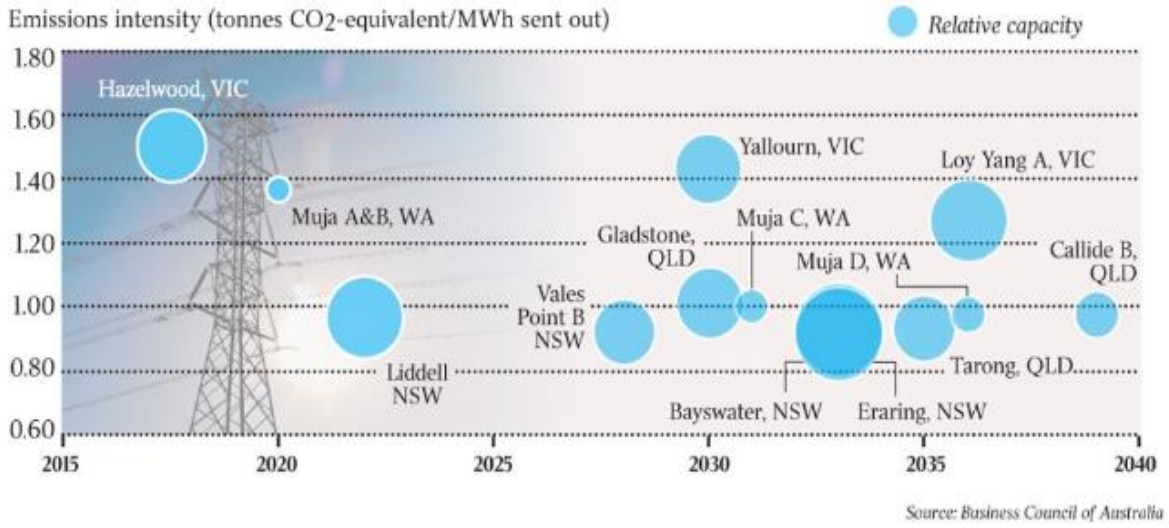
Reliability of supply has become more challenging for the operator in some parts of the NEM and at certain times. This is consistent with the growing experience of other operators around the world as the penetration of variable generation increases. The International Energy Agency has recently pointed out that in systems where 30-50 per cent of the generation mix is from variable renewables there are significant integration challenges. The ability of the system to respond to uncertainty and variability in the supply demand balance is critical and challenging. AEMO is now often needing to intervene in the market for system security reasons and direct resources on or off often in South Australia. The interventions are necessary but far from optimal.

While AEMO anticipates sufficient capacity to meet customer demand during most hours of the year, the overall resilience of the system is at risk. The key challenges are:

- The changing resource mix on the grid which is making the near time supply-demand balance in parts of the NEM very tight. Put simply demand response schemes are only in their infancy and not fully integrated into the NEM; and when intermittent renewables (wind and solar) are not available there must still be sufficient dispatchable power and/or less demand. Without balanced supply and demand the system is not reliable.
- An increased vulnerability to climatic events, such as extended periods of high temperatures, and/or the loss of major generation units, and/or disruption to interconnector capacity. The Bureau of Meteorology’s (BoM) severe weather outlook for this summer is a higher likelihood of heatwaves than in most years and a higher chance of extreme heat in south-eastern Australia. The BoM also notes that the trend is to see more extreme weather and more frequent and longer heatwaves.
- An anticipated retirement of older synchronous units at the end of their economic life. The recent Hazelwood coal station closure and the limited notice of that closure increased reliability risk in the system. It is essential that the transition from our aging fleet of generators is managed in more orderly way.

The technical lives of generator plant is suggestive of when they may retire. Of course more upgrades would extend life, and reduced maintenance or fuel supply problems could lessen life. A possible retirement pattern for the fleet is in figure 3.8.

Figure 3.8 Possible Generator retirements

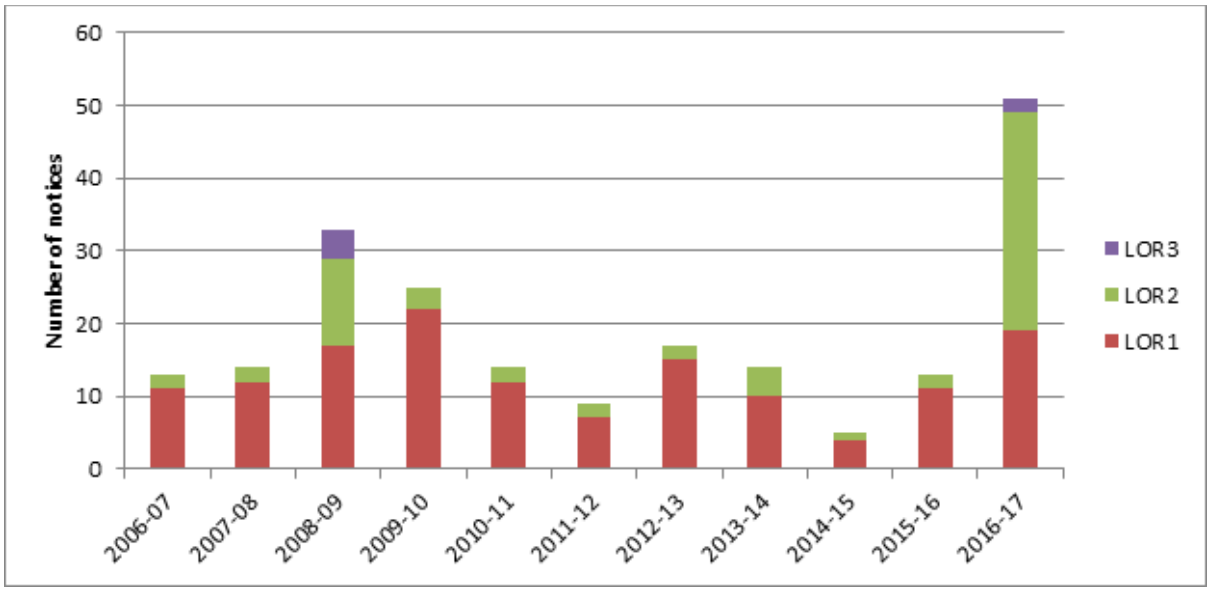


As the fleet of generators in Figure 3.8 retire over time their capacity must be replaced. AEMO now collects and publishes information about the withdrawal of generation capacity from the NEM. As Figure 3.6 showed, new generation capacity has largely been in the form of renewables.

The reason why investment in new dispatchable power has not occurred is now being addressed by the ESB. It can be argued that sufficient signals have not been evident in the market to value flexibility and reliability. In addition, the increasing variability of supply and demand may not be giving sufficient certainty about the forward price for investors. Investors must know where services are valued by the market, and that perceived value must of course be sufficient to cover investment costs, operating costs and an adequate return.

There is now a higher proportion of variable renewable energy in the supply mix. This means reserve requirements must be precisely calibrated to address likely but unpredictable changes in supply output related to weather and plant failure. One of the tools that AEMO uses to ensure supply is “Lack of Reserve” (LOR) notices. This alerts market participants to a loss in reserve in certain regions that may need to be replenished. The LOR notices are graded 1-3 in order of the seriousness of the reserve depletion in the system. Figure 3.9 shows the LOR notices issued by AEMO since 2006-07.

Figure 3.9 Lack of Reserve Notices



Source: AEMO and AEMC

It is noticeable that in 2016-17 there was an unprecedented increase in the number of notices reflecting the tight supply-demand balance, primarily in South Australia. The only other year where there were a higher number of notices was 2008-09, a year of severe drought.

Events such as coincidental high demand, dispatchable plant failures and higher levels of variable renewable energy pose challenges for reliability. The AEMC is currently considering how the NEM's reliability frameworks may need to change in light of these issues in its *Reliability Frameworks Review.* From an operational point of view, AEMO has assembled a strategic reserve for this summer in anticipation of high temperatures and high demand. An additional 2,000 MW of supply, that is not otherwise traded in the NEM, has been sought and put on standby in preparation for this summer. Demand response, additional generation and shorter-term response reserves comprise the extra supply that may be needed.

As the Finkel Review noted the frameworks under which reliability of supply in the NEM is delivered have been compromised. The requirement for dispatchable power has not been linked with emissions reduction objectives. The lack of a settled policy for carbon emissions has meant that as the proportion of variable renewables increases and the aging dispatchable plant retires without sufficient replacement, issues of reliability must be addressed.

The "health" of the current reliability of supply in the NEM is CRITICAL, especially in some regions.

3.5. Security in system operations

Is the NEM able to keep operating in the event of a disturbance? This could be the unexpected failure of a generator or an interconnector, or a sudden unexpected loss of demand as a large customer falls out for some reason.

Key challenges for security at present include:

- *Frequency Control*: to keep system frequency at or close to the design point of 50Hz. Frequency control performance in the NEM has been declining over recent years.
- *Inertia*: Inertia has to date been provided by the rotating mass inherent in synchronous generation. 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.
- *Ramping*: Variation in demand or supply over timeframes longer than those covered by existing frequency control services leads to a need for ramping. Historically, the daily load profile could be predicted with satisfactory accuracy. With the increase in rooftop PV in recent years the daily load profile is changing. Similarly, the anticipated increase in utility-scale solar PV will add to the operational challenges from other intermittent generation such as wind. In the interim, managing frequency control with current mechanisms is adding costs, particularly when a region is at risk of islanding.
- *System Strength*: System strength reflects the sensitivity of the power system to disturbances. It provides an indication of inherent local system robustness, for properties other than inertia. Reduced levels of synchronous machines being dispatched in the NEM are resulting in areas with below acceptable system strength, requiring AEMO to either constrain or dispatch generation out of merit order.
- *Distributed Energy Resource Penetration*: High levels of Distributed Energy Resource penetration can cause local power quality issues. Moreover, PV penetration will reach the point in the foreseeable future[14] where local Distributed Energy Resource generation exceeds the local demand. This will require export of excess generation via interconnectors. Alternative measures such as load shifting or control of the Distributed Energy Resource will be required if the interconnector is not in service. Improved data on the location and size of the Distributed Energy Resource will improve predictability, but better real-time information will also be needed as penetration increases.

The challenges arise because of the different technical characteristics of the changing generation mix referred to above and particularly given the retirement of conventional synchronous generators.

In September of this year the AEMC published rules to oblige transmission network service providers to procure minimum required levels of inertia and system strength. This will

[14] This is forecast to occur in 2024 in South Australia, including an allowance for dispatch of local synchronous machines for system security purposes.

improve confidence that system security can be maintained in all regions of the NEM while minimizing the cost to consumers. Further work on the above issues is being progressed by the AEMC, the Reliability Panel and AEMO.

The issues need to be examined holistically to determine the best collective approach. Some of the challenges can be resolved by similar mechanisms (for example synchronous generators and synchronous condensers can address both inertia and system strength issues). The services required for system security are dynamic and can only be forecast accurately close to real time. Some of these resources will need to be, and currently are, confirmed as available well in advance of real time to provide sufficient coverage for the variability in demand and supply. New market mechanisms including a day ahead market and new reserves mechanisms in real time were raised in the Finkel Review. These matters are on the Energy Security Board's "to be considered" list and will be addressed soon.

The situation at present is that dispatch in the NEM is no longer fully optimized. These economic inefficiencies will increase as out-of-market interventions (directions and instructions) become required on a more frequent basis. The number of directions issued by AEMO in recent years is in figure 3.10. Out of market interventions, which were a rarity previously, are increasing, though limited to South Australia at present. AEMO must now order out-of-market unit commitments and re-dispatch as a routine matter in South Australia during certain weather conditions. These interventions lead to pricing inefficiencies, compensation claims, sub-optimal dispatch, and higher costs to customers.

Figure 3.10 Summary of the number and type of directions in recent years

Year	No. of Directions	Common Causes
2012-13	1	N/A
2013-14	1	N/A
2014-15	2	Extreme weather (cyclones) caused the loss of multiple circuits between central and north Queensland to become a credible contingency resulting in directions to generators.
2015-16	1	N/A
2016-17	10	Generators directed to come/stay online to maintain a minimum of three thermal synchronous generating units in South Australia.

Source: AEMC Annual Report

As an example of the issue, constraints needed to be introduced in South Australia recently to ensure sufficient synchronous generation remains on line to provide the necessary system strength previously provided by default through traditional synchronous generators.

The constraints, now required for system security, are estimated to be costing tens of millions of dollars. The reasons for this increasing cost includes sub-optimal dispatch and compensation claims. With time and further evolution of the system in a disorderly way, these inefficiencies will continue to grow. This is especially relevant given the high volume of new generation connections currently in train, all of it renewable.[15]

[15] The NEM has witnessed unprecedented growth of rooftop solar PV units – from 14.064 units in 2008 to 1,691,840 units (estimated output of 4,917 MW) in 2017. As of 1 July 2017, there are 21,721 MW of connection requests in train - all of it renewable. This comprises 10,678 MW for large scale wind and 11,043 MW for large scale solar. (AEMO, "Advice to the Commonwealth relating to Australia's National Electricity Market", 4 September, 2017)

Managing system security is becoming challenging, particularly in some regions. The risk that essential requirements for security are not present is increasing, along with the market interventions then required by AEMO. The NEM is not fully optimized and economic inefficiencies are raising costs. System security "health" is CRITICAL.

3.6. Competitive wholesale and retail markets

Wholesale markets

The effective operation of the wholesale market relies on competition between generators to deliver efficient prices. Wholesale electricity prices have been rising since 2015-16 following a period of stability. The closure or mothballing of significant coal fired plant without replacement investment has coincided with a resurgence in peak demand, particularly in NSW and Queensland. This reduction in supply has resulted in gas fired generation setting the dispatch price more often than in the past – at a time when gas fuel costs are extremely high.[16]

The current wholesale market design is providing effective signals (in the form of higher prices) for generators to bring on plant to generate energy. However, the retirement of synchronous generating units, which have typically delivered support services to the grid in the form of system strength, voltage support and inertia, is not leading to new synchronous generation that supports these services. The wholesale market design needs to provide signals to parties to ensure these services can be valued and delivered by a range of resources.

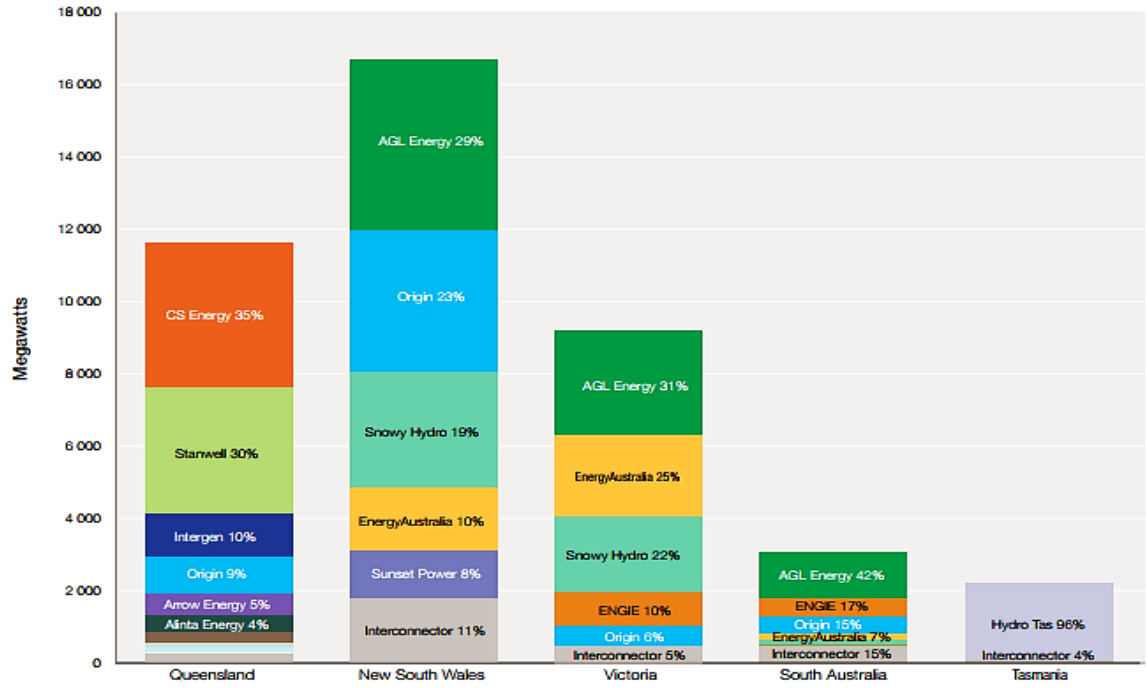
The high levels of market concentration and vertical integration between generators and retailers establish a market structure that can provide opportunities and incentives for the exercise of market power. Whether or not market power exists and is being exercised is being examined by the ACCC and the AER. Vertical integration allows generators and retailers to insure internally against price risk in the wholesale market, potentially reducing their need to participate in hedge (contract) markets. Reduced participation reduces liquidity in the contract markets, posing a potential barrier to entry or increased operational risk for both generators and retailers that are not vertically integrated.

Vertically integrated 'gentailers' in the NEM include AGL Energy, Origin Energy, EnergyAustralia, Snowy Hydro (with retail brands Red Energy and Lumo Energy), Engie (with the retail brand Simply Energy) and Hydro Tasmania (with the retail brand Momentum).

The 'Big 3' retailers – AGL Energy, Origin Energy and EnergyAustralia – supply 70 per cent of retail electricity customers in the NEM. Between 2009 and 2017, these same entities expanded their market share in NEM generation capacity from 15 to 48 per cent. The market share in generation is shown in Figure 3.11.

[16] AER, State of the Energy Market, May 2017, page 51.

Figure 3.11 Market shares in generation capacity, 2017



Increasing market share by generators occurred in Queensland in 2011-12, following a consolidation of state owned generators; in Victoria in 2012-13 following AGL Energy's full acquisition of Loy Yang A, and again in 2017 with the closure of Hazelwood. Similarly, market concentration in South Australia rose following the retirement of Alinta's coal fired plants in 2015-16; and in NSW following the closure of EnergyAustralia's Wallerawang power station in 2014-15.[17]

The largest generator in all NEM regions is usually needed to meet peak demand, and this dependency has recently risen in every NEM region. In every region there is evidence that generators sometimes reduce their output when prices rise above $100 per MWh. This may (or may not) indicate deliberate capacity withholding to tighten supply and influence prices. Investigation of this matter is a matter for the ACCC.

A preliminary report by the ACCC[18] has found that there is insufficient competition in the generation market. They noted rising prices and increasing barriers to entry.

The recent Thwaites review into retail electricity prices in Victoria also commented on market structure, finding that the 'Big 3' have significant market advantages over competitors, including benefits of incumbency, established systems and the ability to obtain lower wholesale energy prices and Renewable Energy Certificates. The report noted three areas of market failure: vertical integration, cost of competition outweighing benefits, and confusing discounts in the retail market.

The wholesale market has had extremely volatile prices since winter 2015, particularly in Queensland, South Australia and Tasmania. The causes of this volatility between regions are complex, but common to all is a tightening in the supply-demand balance.

[17] AER, State of the Energy Market, May 2017, page 48.

[18] ACCC Retail Electricity Pricing Inquiry, Preliminary Report, September 2017, page 8.

Wider commentary in the industry suggests that the contract market has been relatively illiquid. Some market participants claim to have not been able to get contracts on reasonable terms and the AEMC also reports that retailers have identified a lack of liquidity in the contract market. This creates barriers to entry and expansion.[19]

Retailers observe that the cost of hedge contracts has increased, and this is increasing risks and costs to businesses operating in the retail market. Limited access to competitively-priced contracts is seen as a significant barrier to entry, particularly in South Australia.

Retail markets

Retail contestability and deregulation is now present in most jurisdictions; Victoria, New South Wales, South Australia, the Australian Capital Territory, and south east Queensland. Competition among retailers has led to an increased number of competitors, and based on the Herfindahl-Hirschman index (HHI), a decreased level of market concentration in retail. This is in contrast to the increasing concentration among generators already discussed. However, the Big 3 retailers remain the dominant businesses.[20]

The main form of competition is pricing and is typically based on some form of conditional discounts off standing offers. Price dispersion which is sometimes seen as a measure of competitiveness is typically greater in states where deregulation has been in place longer.[21] Consumers in more competitive markets appear to have a greater ability to access market offers with larger discounts on the standing offers. That said, there are real difficulties in comparing market offers from retailers.

Retailers have indicated that vertical integration is not a competitive advantage provided there is a liquid wholesale contract market.[22] A lack of liquidity in the contract market which is currently the situation, does however create a barrier to entry, and increases the benefit of owning generation assets. Limited access to competitively-priced risk management contracts is seen as a significant barrier to entry for new retailers, particularly in South Australia.[23] A competitive, reliable supply of energy depends on both investment in capacity, but also on the need for that capacity to supply hedge contracts and manage risks.

While change is emerging, the market is yet to see retail tariffs that access the full benefits of smart meters. These meters allow tariff offerings that better match consumption profiles. There is an absence of metering capability and a lack of incentive on electricity distribution businesses to set more cost-reflective tariffs. More variety in retail offers is yet to be the norm. While traditional retailers have been providing larger discounts, they have been less successful in other non-price based competition.

Electricity has until recently been seen by consumers as a homogenous product leading to price competition dominance. Value-add product and service markets are only now emerging, stimulated by new energy entrepreneurs partnering with second-tier retailers. This is placing pressure on other retailers to again try to add non-price features to their offers.

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[19] AEMC, 2017 AEMC Retail energy competition review, 25 July 2017, p. iv.

[20] AEMC, 2017 AEMC Retail energy competition review, 25 July 2017, Section 5.1

[21] AEMC, 2017 AEMC Retail energy competition review, 25 July 2017, Chapter 6

[22] AEMC, 2017 AEMC Retail energy competition review, 25 July 2017, p. iv.

[23] AEMC, 2017 AEMC Retail energy competition review, 25 July 2017, page 54 and page 57

There is evidence of increasing market concentration in generation; and decreasing concentration among retailers. The wholesale market has been experiencing difficulties (and high prices) due in part to decreasing liquidity in the contract market. Wholesale price volatility is high. The NEM retail market is basically price competitive and different non-price offers to consumers are only now beginning to emerge and encompass market choice and energy management options. The "health" of competition in the wholesale and retail markets is in a "BEING MONITORED" position.

3.7. Robust and responsive regulation and planning

Network regulation and planning, in a healthy NEM would be characterised by:

- efficient investment and expenditure by networks
- appropriate incentives to become efficient
- support for energy market transformation and rewards for innovation
- well balanced incentives to invest in network and non-network solutions, including distributed energy resources, new information technologies and demand response capabilities
- coordination between transmission and generation, particularly new renewable generation
- network reliability standards and settings that reflect the value that consumers place on these attributes
- the evolution of networks into efficient platforms for two-way energy flows, including the integration of distributed energy resources
- tariffs that reflect the costs of providing existing and new network services, and the value of distributed energy and demand management
- risks being allocated to those most able to manage them

To determine whether or not regulation and planning is currently robust and responsive a review of the recent past is informative. The previous round of regulatory determinations (2009-14) allowed network revenues to increase in order to meet stricter reliability standards, augment assets to respond to forecasts of rising peak demand and provide for higher financing costs during the global financial crisis.

There have been a number of decisions which, with the benefit of hindsight, could have been better:

- The increase in reliability standards by state governments in NSW and Queensland may not have passed a benefit / cost test.
- Some ongoing years of over tight regulatory constraint can lead to a sudden and heavier investment requirement and some argue that this may have added to the price shock in some cases.
- The actual demand was significantly lower than forecast.
- The mandatory rollout of smart meters by distribution network businesses in Victoria.

All of these rising costs drove escalating revenues for the 2009-14 regulatory periods.

These cost pressures have now eased. Lower financing costs have coincided with declining energy demand in recent years, and with government moves to provide electricity networks with greater flexibility to meet reliability requirements.

In combination, these factors have reduced the forecast revenue requirements for most network businesses. Significant reforms were also introduced in the network regulatory framework in 2012 through a rule change about the economic regulation of network services. Key elements of the change included:

- Changes to the rate of return framework giving the regulator more discretion
- Changes to the way operating and capital expenditure allowances are granted giving the regulator more discretion to benchmark network businesses
- Changes to the capital expenditure incentives to give the regulator discretion to introduce new schemes and inventive mechanisms.

In the current round of AER decisions, regulated network revenues are forecast to fall and related distribution charges in residential electricity bills will fall by up to five per cent per year.

Network planning

The change in generation mix has raised an important issue on how, and whether, generation and transmission investment is efficiently co-ordinated. Historically, the consequences of whether or not transmission and generation investment was coordinated were less material, but this is likely to change going forward as the shape of the transmission network may need to change to reliably supply consumers from increasing amounts of renewable generation.

Under the existing NEM frameworks:

- Generation investment is determined by market participants on the basis of market signals. These are expectations about future spot prices along with retailers' willingness to enter into contracts to hedge against future price risk. Investment in generation assets in the NEM is market-driven taking into account - among other things - expectations of future demand, the location of the energy source, access to land and water and proximity to transmission infrastructure.
- Transmission networks are responsible for making investment decisions in accordance with their planning activities. Transmission networks must make investments in order to meet the relevant jurisdictional reliability standard. Any investments made by transmission networks are funded from revenue received from consumers. Transmission networks are also permitted, but not obliged, to undertake capital expenditure to reduce congestion – within their own region or between two regions. Such expenditure must pass the Regulatory Investment Test – Transmission.

The differences in generation and transmission investment decision making processes have the potential to allow investment that does not minimise the total system costs faced by consumers. This results in higher prices in the long run.

In its role as the transmission planner, AEMO provides a strategic view of the NEM transmission grid requirement over a twenty-year planning horizon. Following the Finkel Review AEMO has been tasked with developing an Integrated Grid Plan to determine the

optimal transmission network design to enable the connection of renewable energy resources, including through interconnectors. The first Integrated Grid Plan is due in 2018.

This planning work is critical to the transition underway in the industry. The current transmission grid was planned to transport power from the existing (and retired) coal generation plants to the main load centres in the cities. In the long term this grid needs to change geographically. It will need to connect into strong renewable energy zones and transport their power to the cities. The grid also needs to plan for more distributed power entering the system from behind the meter. These are challenging and exciting problems. They are also long term in nature and the priority order for new investment needs to be worked out.

Network businesses undertake planning reviews to identify network constraints expected to arise over a ten-year planning horizon. In this context the network businesses have several planning challenges. The first is the high population growth in Brisbane, Sydney and Melbourne and the increasing reliance in those cities on electricity to power public transport and communications. The second issue is the growth in behind the meter generation and its use and connection with the network. This is a network management challenge and one that is emerging rapidly with the growth of solar PV, batteries, smart meters and energy management products at the retail level.

These types of changes will be driven by technology and the benefits they offer. Rules will need to change, and possibly quite rapidly, to encourage innovation and adoption. A step was made in July 2017 with a rule change to the application of the Regulatory Investment Test. The Regulatory Investment Test had been only applied to augmentation expenditure but given the trend to more replacement expenditure the new rule will now support more efficient replacement expenditure decisions.

Further regulatory changes of this kind are likely as the industry changes. Changes are evident where non-network solutions are being considered as part of network planning. However, incentives remain asymmetric to encourage investment in network asset options rather than non-network alternatives. This is an example of where further review is necessary. The challenge for the regulators and the planners will be to keep up with developments, ensure they are efficient, and not stifle innovation.

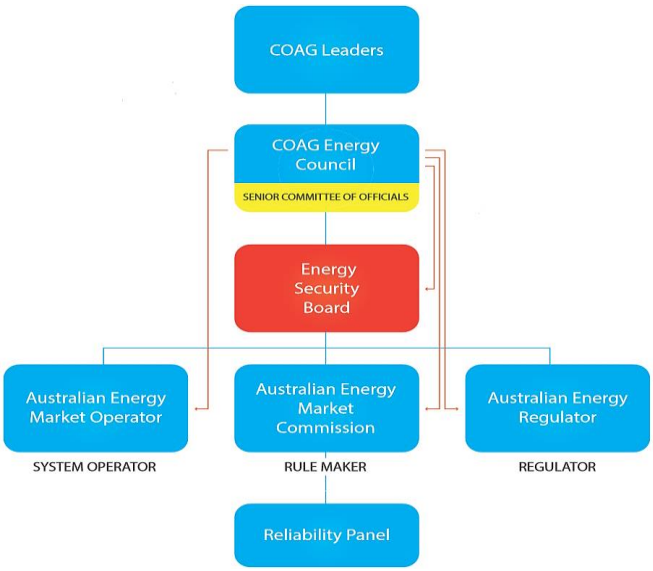
Robust and responsive regulation and planning is a necessity as extensive disruption to network operations occur in response to new technology and developments behind the meter. There is ongoing recognition of the task ahead so its “health” is rated as “BEING MONITORED”.

3.8. Fit for purpose governance

Both the recent Finkel Review and an earlier 2015 Vertigan Review examined the governance arrangements in the NEM. In the case of both reviews recommendations were made about how those arrangements were applied – at the level of the COAG Energy Council that sets the strategic policy agenda, and at the level of the market institutions and their co-ordination with each other.

Given the unprecedented pace of change in the electricity industry it is certainly important to implement the recommendations from these Reviews. The current structure, including the new Energy Security Board is in figure 3.13.

Figure 3.13 Governance framework



Source: The Finkel Review, June 2017

The Finkel Review set out six principles of good governance for the NEM:

- clarity of purpose and functions
- accountability and transparency
- well-designed rules
- maintaining trust and independence
- appropriately skilled board and staff
- effective information management.

On the basis of those principles the Finkel Review noted that special attention be given to three matters. First the coordination between the market bodies, and between them and the COAG Energy Council. Given that strategic policy is to be developed in this fast transforming industry, this requirement for coordination between the market bodies, ESB and the COAG Energy Council is essential, with a view to:

- the market bodies discharging their roles effectively,
- providing timely advice to inform the strategic policy agenda to be set by the COAG Energy Council

Clarity about accountability for outcomes is the second matter that needs special attention. Vertigan noted that there was not sufficient clarity and focus in roles, and that there was a

diminished sense of common purpose. A clarity of roles is essential. Vertigan argued the rule maker (AEMC) and the regulator (AER) must be clearly separate from the operator (AEMO) and the operator should focus on operations. This is not controversial.

The operator, the Australian Energy Market Operator (AEMO), has the responsibility for keeping the power system reliable and secure. As the penetration of variable renewable generators increases, both in large scale and behind the meter, and as demand response measures become more managed and sophisticated, the operator is at the forefront on a day-to-day basis. Their challenge is immediate and is not going to settle for some years.

The regulator, the rule maker and the operator must work closely together as the system transforms. Changes to market rules to address operational concerns are likely to be needed. The AER and the AEMC are required to consider and consult widely with stakeholders and market participants on any changes to the market. There must be in the long-term interests of consumers, and appropriately balance price, reliability and security.

Continued consultation is important but change is upon us and governance must keep in front of it to make sure we keep the system reliable and secure, affordable, and meeting emissions reduction targets. Balancing the different senses of urgency, as well as the different views about the strategy, becomes part of the role of the ESB as a whole. Through its Strategic Energy Plan the COAG Energy Council also has an important role to provide direction.

Finally, Finkel noted attention be given to the timing of the rule change process that is run by the AEMC. This was a matter that Vertigan also discussed and is a matter that many market participants have raised. Some issues, following thorough reviews, have taken around two years to result in rule changes. Even if the rule change is not controversial, by the time all stakeholders have (slowly) considered them, the rule change is very late coming. This matter is being addressed but there is a balance between addressing issues quickly enough and adequate consultation and analysis on significant reform.

At this stage the ESB's preliminary observations on governance are that:

- the ESB is not likely to be needed beyond its initial three year term, though this might need revisiting if cooperation across the market bodies is not satisfactory.
- The three market bodies are experiencing unprecedented change as the NEM transitions. This affects how each discharges its responsibilities and functions.
- Each market body is experiencing increased pressure to perform more effectively and respond to change more rapidly.
- The AER needs to continue to evolve to manage its expanding role in a rapidly changing industry.
- AEMO has a very challenging operation role in front of it as the NEM transitions.
- AEMC as the strategic advisor, must be mindful of the industry transformation and the challenges AEMO is facing. Accountability and timeliness of the rule making process will assist and must continue to improve alongside a continued focus on the long term interests of consumers and the balance required between reliability, security and price.
- The three market bodies need to evolve and transform the way that they carry out their roles together. They must co-operate and support each other so that energy consumers receive a secure, reliable and affordable supply of energy into the future.

- Through the ESB the market bodies have begun the process of co-ordinating their work programmes. Over time, and with clarity and direction from the COAG Energy Council, the market bodies will be better placed to meet expectations and prioritise their work programmes.

Given the difficulties facing the NEM there is a clear need to improve governance.

Between the COAG Energy Council, the market bodies, and now the ESB, the current governance arrangements are in catch-up mode. In terms of “health” of the NEM the fit for purpose nature of governance is “BEING MONITORED”

4. Work in progress: Improving the National Electricity Market

4.1. Efficient prices and affordability

It is obvious that the pace of recent high price rises are not sustainable. They are signs of inefficiency and prices are not affordable. (See section 3.1). The situation does however seem to be improving. The forward curve indicates a decline in prices, at least until Liddell closes in 2022.

There are a number of measures being taken to improve the efficiency of pricing and affordability in the NEM. These measures are concentrated in three areas: strengthened regulation and steps to improve market competition, better information for consumers, and improvements to concession schemes and assistance for hardship.

In terms of better regulation and steps to improve competition in markets:

- Network costs, the largest component in price, are being addressed through strengthened regulation; an increased budget for the AER; improved consumer and business engagement in regulatory processes; and the removal of the Limited Merits Review from AER decisions. As a result of these actions it is expected that this regulated component of price will not increase in the near future.
- High gas fuel prices have been contributing to high electricity prices. Progress on gas market reforms will assist with gas availability and steady the very large electricity cost increases caused by this fuel. Gas is increasingly important in the NEM as coal generation retires and continuing attention will need to be given to the cost of gas. The risk of even higher gas prices is significant.
- The AER has a new role to monitor and report on the competitiveness of the NEM, including deterrents to wholesale competition. This will identify whether wholesale electricity markets are competitive and delivering efficient electricity prices.
- The appearance of high retail margins has prompted a range of inquiries and reviews. Notably, the ACCC's inquiry into retail electricity pricing as well as the Victorian Government's review of electricity and gas retail markets (the Thwaites review). These are examining among other things whether retailers' margins and profitability are in line with their costs and risks.

More accessible information for customers is being addressed in a number of ways:

- Under a new rule retailers are now required to inform customers at the end of the benefit period in their market offers.
- The Commonwealth is leading a project to improve consumer access to their metering data. This will help consumers understand the best deal for the circumstances.
- Retailers have agreed to – but are yet to complete – a transition of vulnerable customers from standing offers to more suitable market offers. They have also agreed to report on their actions to get families on a better deal and provide the number of customers on expired discounts.
- Improvements to the AER's comparison site EnergyMadeEasy are underway, as is a review of retailers' compliance with the pricing information guidelines for clear and accurate data.

As noted earlier the recent high price rises have been difficult for some customers and increased numbers of consumers are falling behind on their bills, being disconnected, and struggling to complete hardship assistance programs.[24] This raises serious questions about the effectiveness of consumer protection programs and the adequacy of the consumer protection safety net.

- In this context the AER and Essential Services Commission of Victoria are:
  - reviewing retailer hardship and payment plan policies and practices so vulnerable customers are assisted, including audits and enforcement action where required.
  - reviewing disconnection practices given the serious customer consequences that can follow.
- Some states (for example, NSW) have recently reviewed the effectiveness of their concession schemes. A NEM-wide review of concession schemes was recommended in the Finkel Review and has been identified in the AEMC's Strategic Priorities Review.
- The Victorian government is negotiating with the Big 3 retailers to provide rebates to a range of vulnerable customers ahead of the price rises expected in Victoria from January 2018.
- A further rule change to strengthen protections for customers on life-support devices is underway.
- The AEMC has recommended that, States harmonise their energy customer protection arrangements where possible so that barriers and costs for traditional and new retailers who operate across the NEM are minimised.

Taken together these measures should help.

The Finkel review recommendations that are particularly relevant to efficient prices and affordability are recommendations 6.1 and 6.6. The status of progress on these recommendations is summarised at Section 5. Both require more attention in 2018.

Given all the actions underway there is some confidence that the position of electricity prices and affordability will not deteriorate further. The outlook is IMPROVING.

4.2. Consumer confidence

The immediate action required to improve consumer confidence in the retail market is more transparency in retail offers to customers to empower the search for a lower cost outcome. This is in progress. The AER has taken a number of actions:

- They have issued guidelines to retailers about what they must present in offer information to customers. A comparison rate or reference price as a single dollar figure is proposed to represent the offer, making comparisons easier.
- Requirements for energy price fact sheets to give simple and clear information about key aspects of offers has also been put into effect.

[24] AER Annual Report on Compliance and Performance of the Retail Energy Market 2016-17, November 2017.

- The EnergyMadeEasy price comparator website has been improved to make it easier for customers to search and compare offers, as noted above.

The second action is to improve information about energy saving possibilities and their costs. This includes solar PV, batteries, demand management and use of smart meters. This action has commenced but requires more attention in 2018 and beyond.

The AEMC has made recommendations to improve consumer confidence in the sector, and contribute to better customer outcomes. These include:

- The development of a broad information program by the Energy Consumers Australia in partnership with the states and territories to support consumer awareness and confidence in the options that are available to manage their energy bills.[25]
- That the COAG Energy Council should continue to consider how the National Energy Customer Framework can be reformed, given the diversity of new retailers, service providers and product and service offering available in the competitive retail energy market.[26]

A number of other measures are ongoing to improve consumer confidence. In particular the Finkel Recommendations pertinent to consumer confidence are recommendations 6.3 and 6.5. Their progress status is summarised in Section 5.

Steps to improve customer confidence have begun though the full effect of recent price rises has not yet been reflected in retail surveys. Continuing customer assistance and easy-to-access information will help. The outlook is UNCHANGED.

4.3. Decreasing carbon emissions

Emissions reduction in the electricity sector is not expected to meet the sector share of the Paris Agreement commitment without further policy measures after 2020 when the targeted amount of eligible generation under the Renewables Energy Target scheme plateaus.

Tentative steps towards an agreed approach to both reduce emissions and maintain a reliable system have been made. The Commonwealth Government sought advice from the ESB on how to reduce electricity sector emissions in line with their international commitments, while at the same time, maintaining a reliable system and consumer affordability.

In response the ESB provided advice to the Commonwealth Government recommending the development of a National Energy Guarantee (Guarantee). The Guarantee would impose two complementary requirements on retailers and other market customers. First, they would have to meet a percentage of their load requirements with contracts that provide dispatchable and/or flexible capacity. Second, retailers would be required to meet their load requirements at a certain average emissions level. Both these requirements would be met through market contract positions.

At the COAG Energy Council meeting in November 2017 the majority of the Council agreed to the ESB pursuing further work on this approach. Such work is to be approved by Council and to be done in close consultation with the Senior Committee of Officials.

[25] AEMC, 2017 AEMC Retail Energy Competition Review, 25 July 2017, p.1.

[26] AEMC, 2017 AEMC Retail Energy Competition Review, 25 July 2017, p.20.

Initial ESB work suggests that the Guarantee can decrease emissions while maintaining reliability and affordability. Details around the design of the Guarantee are currently being considered, including whether other changes to market design may be required to ensure the operator has the tools it needs to operate the system reliably and securely. A report is due to the COAG Energy Council in April 2018. The National Energy Guarantee may provide the flexibility to meet the different concerns and undertakings of all jurisdictions while operating within the existing NEM arrangements.

There are two Finkel Review recommendations directly relevant to emissions reduction. These are 3.1 and 3.2. The progress status of each of these is in Section 5. The Guarantee mechanism, if it were agreed by Council in April 2018, would be a substitute for the Clean Energy Target of recommendation 3.2.

Work on the National Energy Guarantee does provide grounds for optimism that carbon emissions can be reduced within a mechanism that fits within existing market arrangements, and is flexible enough to encourage its adoption by all jurisdictions. On this basis we judge this health characteristic as IMPROVING.

4.4. Reliability of supply

A lot of activity is underway and some completed to address the reliability issues noted in Section 3.4. The work on the National Energy Guarantee discussed above is one important part of this effort. Recognising the link between reliability requirements and the increasing penetration of intermittent renewables in the NEM is an important forward step. Should this policy be accepted by the COAG Energy Council it will not be implemented until 2019-20. In the meantime there are shorter term problems that need attention.

First, AEMO has just published a report on industry preparedness for the coming summer where coincidental days of high temperatures and unforeseen events, like plant failures, are likely. To ensure the adequacy of dispatchable generation AEMO delivered advice on dispatchable generation requirements in September 2017. Following this, a design for an alternative Strategic Reserve mechanism is being developed. This complements the AEMC investigation about whether change is needed to the current strategic reserve mechanism - the reliability and emergency reserve trader frameworks (RERT).

More generally a range of initiatives are underway to address reliability:

- Consideration by the AEMC of a mechanism to facilitate demand response in the wholesale energy market. A draft rule change is to be proposed by mid-2018.
- The AEMC's Reliability Frameworks Review is considering what mechanisms and changes are necessary to provide an adequate amount of dispatchable capacity in the NEM to meet the reliability standard. This involves longer-term considerations like the level of investment, as well as short-term operational matters to make sure that adequate supply is available at a particular point in time. Consultation has started. An interim report incorporating this feedback will be published on 19 December 2017.
- This Reliability Frameworks Review is also considering changes to existing market intervention mechanisms, such as the lack of reserve, plant retirement obligations and the reliability and emergency reserve trader frameworks (RERT). New mechanisms that may be needed are also being examined. This includes considering the need for a day-ahead market, a strategic reserve, as well as the retailer reliability obligation to assist in maintaining system reliability. This review is being progressed with a view to completion by mid-2018.

- AEMO has proposed a rule change to how Lack of Reserve conditions are triggered. This rule change seeks to replace the contingency-based definitions of lack of reserve conditions with a system triggered by a wider range of risks.
    - The AEMC is currently consulting on its draft determination with a new framework to become operational by 9 January.[27]
- The Reliability Panel, in collaboration with AEMO, is currently reviewing the Reliability Standard and the market price settings that underpin that Standard. This review is considering whether existing standards and settings remain suitable to guide efficient investment in the power system. A draft report has been published for consultation and a final is expected to be published by 30 April 2018, with any changes to standards due to commence in 2020.
- The Reliability Panel has recently begun reporting on both unserved energy and Lack of Reserve notices. This recognises the present importance of adequate reserves.
- AEMO has commenced a three-year demand side response trial in partnership with ARENA. The project is in place for this coming summer and will help decide what forward looking tools should be developed.

Progress on Finkel Recommendations 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 4.4 and 6.7 are set out in Section 5.

While there is action proceeding to address reliability concerns the problem will not be solved quickly. Should the National Energy Guarantee proceed to policy acceptance, there will be a mechanism in place that will address part of the longer-term concerns. There are also short term issues that remain to be addressed. The critical rating on the health of reliability remains UNCHANGED.

4.5. Security in system operations

In common with reliability requirements many of the security issues will need changes and modifications to market designs that currently exist. Work on these market design issues is underway.

- A clear understanding of the specific issues to be addressed must be set out.
- Any existing mechanism (in this market or elsewhere) that deals with it, and its inadequacies, must be specified.
- The various alternative ways to fix the problem will be debated and stakeholders consulted carefully; and
- A solution will emerge.

Meanwhile, a range of initiatives are underway that focus on what can be learned from experiences last summer.

[27] http://www.aemc.gov.au/Rule-Changes/Declaration-of-lack-of-reserve-conditions#

- AEMO has acted, with industry and government, to implement the recommendations it made after investigating the South Australia black system that occurred in September 2016.[28] These actions aim to address risk in five key areas:
    - Reduce the risk of the South Australia region islanding (separating from the NEM).
    - Improve forecasting of events that could cause islanding.
    - Increase the likelihood, in the event of islanding, that a stable electrical island in South Australia can be sustained.
    - Improve performance of the system restart process, so supply to customers can resume as quickly and as safely possible.
    - Improve the market and system operations processes required during periods of market suspension.
- To reduce the risk to supply to South Australian consumers, black system recommendations are being progressed:
    - All measures from these recommendations that are needed to identify, prevent and manage risks of the islanding of South Australia have either been completed or are scheduled for completion for this summer.
    - All critical improvements to operational tools and processes have been implemented.
    - AEMO is also working with ElectraNet to complete a range of actions to expand available capacity (including necessary upgrades to hardware and secondary systems). These actions are on track and will be in place over the course of the summer months.
- The AER is currently investigating the compliance of market participants in relation to three significant events that occurred in the wholesale energy market last summer, including the black system event in South Australia. This work will inform future requirements.
- Following the AEMC's determination in March 2017, AEMO is working with ElectraNet to improve the emergency frequency control schemes that apply in South Australia and also undertaking a power system frequency risk review, to be completed by 6 April 2018. This work establishes 'last line of defence' mechanisms such as controlled load shedding to protect against a major blackout if a sudden and unexpected loss of generation or load causes rapid changes in system frequency.
- AEMO has undertaken work in to maximise resources in the system, including reserves for emergencies to prepare for the 2017-18 summer period. A summer operations program report was published in late November 2017.[29]

[28] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Market_Notices_and_Events/Power_System_Incident_Reports/2017/Integrated-Final-Report-SA-Black-System-28-September-2016.pdf

[29] AEMO Summer Operations document https://www.aemo.com.au/-/media/Files/Media_Centre/2017/AEMO_Summer-operations-2017-18-report_FINAL.pdf

As well as the lessons from last summer additional information is being sought from a number of participants. The aim of getting this information is to allow better management of the power system by both AEMO and the networks.

- A new rule has been made by the AEMC requiring more information from generators. The final rule clarifies the range of parties who are required to provide model data to AEMO and networks, and when this model data must be provided.[30]
- COAG submitted a rule change proposal to establish a register of distributed energy resources in October 2017. The purpose is to ensure that AEMO and network businesses have sufficient visibility of distributed energy resources to be able to securely operate. This rule change is currently pending commencement by the AEMC.[31]
- AEMO is also undertaking work to improve accuracy of its supply and demand forecasting activities.

Specific work is underway to improve frequency control, inertia, and the technical performance standards of generators.

- AEMO has entered into a MOU with ARENA to collaborate on various proof of concept trials. Trials such as the Hornsdale Windfarm 2 Frequency Control Ancillary Services trial are underway and are demonstrating that resources coming on to the system and new technologies are continuing to evolve and may provide potential solutions to current security challenges. Further related work will be carried out by AEMO in collaboration with AEMC and AER.
- AEMC have established a Frequency Control Frameworks Review to explore, and provide advice to the COAG Energy Council on any changes required to the regulatory and market frameworks to meet the challenges in maintaining effective frequency control arising from, and harness the opportunities presented by, the changing generation mix in the NEM.
- AEMC has introduced a range of new regulatory arrangements to ensure system strength and minimum levels of inertia are maintained.
    - AEMO has recently published interim system strength assessment guidelines[32] pending the publication of final guidelines by 1 July 2018.
    - A method for assessing minimum inertia requirements by 1 July 2018 is also being prepared by AEMO.[33]
    - AEMC is considering market based mechanisms for the provision of future inertia services.
- AEMC is engaging with AEMO and stakeholders on changes to generator technical performance standards, frequency operating standards and frequency control

[30] http://www.aemc.gov.au/Rule-Changes/Generating-System-Model-Guidelines#

[31] http://www.aemc.gov.au/Rule-Changes/Register-of-distributed-energy-resources#

[32] http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Interim-System-Strength-Impact-Assessment-Guidelines-PUBLISHED.pdf

[33] http://www.aemc.gov.au/Rule-Changes/Managing-the-rate-of-change-of-power-system-freque

frameworks. The latter provides opportunities to better use distributed energy resources for more effective control of the power system.

- AEMO submitted the rule change to the AEMC in early August 2017. The AEMC is currently considering submissions on its consultation paper.[34]

Finally, the Finkel review also made a range of recommendations which aim to improve the resilience of the NEM and manage the risk of threats, whether these are human (for example cyber security attacks) or environmental (for example natural disasters and the increasing severity of extreme weather). These are a critical part for the safe and stable operation of the power system.

The challenge of cyber security is of growing concern across the global energy sector. There have been cyber-attacks on utilities in other electricity systems internationally, notably in Estonia and the Ukraine in recent years. This is an area of considerable focus for AEMO, as the NEM operator, and was identified as a key risk for the energy sector in the Finkel Review.

The Finkel Review made a number of recommendations concerning system security. These were 2.1, 2.2, 2.3, 2.5, 3.3 and 3.4 and there are a number of overlaps with other recommendations. The majority of these recommendations were to be completed by mid-2018.

Addressing security concerns is both an immediate and longer-term issue. In the short term there is considerable work underway but the longer-term matter will take time to consider as they may include new market mechanisms and market design changes. For the moment the ongoing health of the security of the system remains UNCHANGED.

4.6. Competitive wholesale and retail markets

From Section 3.6 it is clear that the competitive nature of both the wholesale and retail markets has shortcomings. The Finkel Review recommendation 6.1 was aimed at improvements in the retail markets around transparency in the offers made. Better information concerning the contract market was addressed in recommendation 6.2.

It is notable that last year the COAG Energy Council required the AER to report every two years on the competitiveness of the NEM, including deterrents to wholesale market competition. The AER is currently developing and consulting on frameworks to implement this requirement. In addition, the AER was asked to provide advice on the NSW electricity market and the impacts of the closure of Victoria's Hazelwood power station.

The ACCC's retail pricing inquiry, which is looking at all aspects of the supply chain including the wholesale market is due in 2018. The AER's report into the wholesale electricity market, and the factors that are detrimental to its competitiveness and efficiency is also due in 2018. These reports will be critical to understanding any market failures or issues of market power, and what further actions are required.

The recently proposed National Energy Guarantee, if agreed and implemented, is expected to have implications for the wholesale market. The Guarantee may reduce wholesale costs by improving the contract market and reduce barriers to entry through greater investment certainty. Concerns have been raised about whether the Guarantee will exacerbate market

[34] http://www.aemc.gov.au/Rule-Changes/Generator-technical-performance-standards#

concentration issues, particularly in South Australia. Measures will need to be considered as part of the development of the Guarantee to avoid worsening any market power issues.

In most international wholesale electricity markets the regulators have authority to investigate and penalise market manipulation. Given the push for more liquidity in contract markets, the inability of the AER to examine whether the wholesale electricity market is being manipulated is a shortcoming in the current arrangements. The AER has market manipulation oversight for new gas supply hubs. Similar provisions for the wholesale electricity market will be considered.

In terms of actions underway and recommendations:

- The AEMC has made a rule to align the market settlement time with the dispatch period of five minutes. This should improve market efficiency.
- Metering competition commenced in all jurisdictions other than Victoria on 1 December 2017.
- After a period where the visibility of hedge contracts was limited, AFMA is now re-commencing its surveys of market liquidity.
- Markets for the provision of fast frequency response and inertia are under development

There is obviously work underway to understand the competitive shortcomings in both the retail and wholesale market. These studies take some time and conclusions have yet to be made. At this stage the health of the competitive wholesale and retail markets is UNCHANGED.

4.7. Robust and responsive regulation

Network regulation

AEMO and the AER are currently implementing a series of rule changes made by the AEMC following an earlier Power of Choice review in 2012 These rule changes are:

- A cost-reflective network pricing rule change. This reform provides an incentive to retailers if they respond to price signals at times of congestion on the distribution network. Building the network to meet peak demand is a major driver of network costs. Around 25 per cent of the network is required to meet only 40 hours of peak demand each year. Most network tariffs are not cost reflective because they are based on total consumption and not when that consumption occurs. Energy Networks Australia estimate that cost reflective network tariffs could lead to savings of $18 billion in present value terms over a 20 year period. The rule is in operation and is being implemented by distribution network businesses with oversight from the AER. Whether substantial savings suggested are achieved or not will be monitored.
- Expanding competition in metering rule change. The final rule will facilitate a market-led approach to the deployment of advanced meters where consumers drive the uptake of technology through their choice of products and services. This competitive framework for metering services is designed to promote innovation and investment in advanced meters that deliver services valued by consumers. AEMO has undertaken a significant implementation schedule to allow the rule to take effect on 4 December 2017.
- Demand management incentive scheme rule change. The final rule provides for the AER to create a scheme to incentivise distributors to use non-network options for

demand management, by providing funding for research and development in demand management proposals that may reduce long term network cost. The AER is due to publish a final incentive scheme in December 2017.

It is clear that constructive engagement between the Regulator, the businesses, customers and stakeholders is essential to ensure network regulation responds to emerging issues. A range of reforms are already underway that are intended to drive improvements to the regulatory framework and facilitate more responsive network regulation, including:

- The AER has been working closely with Energy Networks Australia and Energy Consumers Australia to explore ways to improve sector engagement, and identify opportunities for regulatory innovation. This work explores opportunities to better incorporate consumer views in revenue determination processes, and to improve consumer trust and confidence in network regulation. Ultimately, this may lead to developing an alternative path for network businesses to take in forming their regulatory proposals, and for the AER in approving those proposals.
- A Review of the Rate of Return Guideline is currently underway. The rate of return has a significant impact on consumers' bills, so it is important that the rate of return is informed by the latest developments. Stakeholders have raised a range of priority topics for review but there are key themes emerging, including return on debt, the value of imputation credits, and the return on equity.

A number of other actions are underway that are specific to distributed energy resources. These actions include:

- The Contestability of energy services final rule. This rule promotes competition in the provision of behind the meter distributed energy resources - completed on 12 December 2017.[35]
- The AEMC will review the financial incentives that network businesses face in delivering economically regulated services under the existing regulatory framework. This analysis will be particularly focussed on the financial incentives network businesses face to deliver their regulated services using distributed energy resource based solutions relative to traditional network solutions.[36]
- Off-grid power supply – in the Alternatives to grid-supplied network services rule change (published on 19 December 2017), the AEMC set out a range of changes to laws, rules and State and Territory instruments needed to enable off-grid systems to be used where they are cost effective, while protecting customers. The AEMC set out recommendations regarding these changes in its final determination.[37]

[35] AEMC, Rule Determination: Contestability of energy services, 12 December 2017.

[36] AEMC, 2017 Report: Electricity network economic regulatory framework review, 18 July 2017, p. viii.

[37] AEMC, Rule Determination, Alternatives to grid-supplied network services, 12 December 2017.

Network planning and coordination of transmission and generation investment

To address the core issue of the coordination of transmission and generation investment the market bodies and the COAG Energy Council are undertaking a number of actions:

- The AEMC is currently undertaking a review into the coordination of generation and transmission investment. A range of solutions, including renewable energy zones are being considered. Stage one of the review was published on 18 July 2017.
- AEMO is developing an integrated grid plan to facilitate the efficient development and connection of renewable energy zones
- AEMO is expected to develop a list of potential priority projects in each region that governments could support
- AEMO in collaboration with the AEMC, should develop a rigorous framework to evaluate the priority projects, including whether governments should intervene to facilitate.
- The COAG Energy Council and Energy Security Board are reviewing ways for AEMO's role in national transmission planning to be enhanced.

The ESB is monitoring these actions and providing coordination between the market bodies and their processes.

In the Finkel Review recommendations to improve network regulation and planning were made. (Recommendations 5.1 to 5.5). Progress against these is reported in Section 5.

There are certainly actions underway to make regulation and planning more responsive and robust. These actions include changes to processes and possibly responsibilities, as well as ensuring that innovation is not hampered by out of date structures and regulation. The rating of robust and responsive regulation is IMPROVING.

4.8. Fit for purpose governance

The Finkel Review made a large number of recommendations about governance and built on the earlier Vertigan review. These included the establishment of the ESB and its role in monitoring the implementation of the recommendations themselves.

Better governance usually takes a long time, but matters are urgent. What is most positive is the will and determination of all the market bodies and the ESB to get this sorted out. To date it is remarkable that in a short period of time:

- The ESB has been established
- The first Health of the NEM report has been done
- AEMO has addressed its internal governance issues
- Other matters, including the preparation of Statements of Expectation, are well underway.

The market bodies are developing new processes and procedures in response to the need for rapid change within the industry.

- The AEMC has taken a new approach to the implementation of its system security work programme. A review and five rule changes were dealt with concurrently so that the entire suite of projects was completed within 16 months. Compared with previous practice this reduced the time taken to deliver by around 50 per cent.

- The AER has strengthened its regulatory functions and started work on how best to ensure that innovation is not impeded on the networks through outdated structures or regulation. They have maintained a solid focus on customers.
- AEMO has led the way in drawing attention to the major reliability and security issues, and is involving itself in the solution to these matters. Its planning work, notably on the integrated grid, is underway.

The ESB needs to balance the need for prompt and urgent action against the capacity of industry, consumers and other stakeholders to keep up. While the vast majority of stakeholders have called for more timely delivery of projects, those same stakeholders also stress the importance of open and consultative processes in which views and perspectives are heard and factored into decision making.

Progress is well underway as reported in Section 5. The relevant recommendations are 7.2 to 7.9, 6.1 and 6.2, 2.1, 2.5 to 2.9, 2.11 and 2.12.

Fit for purpose governance is both a necessity and a target. It will not happen quickly and while there is a positive charge there is also more to be done – clear and full identification of problems, coordinated solutions, good communication, and measured policy development with the COAG Energy Council and Senior Officials. Nevertheless, in the light of actions to date the health of fit for purpose governance is IMPROVING.

5. Summary of Finkel Recommendations: Progress status at December 2017

	FINKEL RECOMMENDATIONS	Who	Year	Time	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	End	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	End	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	End	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	Mid	Underway	New rules to maintain system strength and inertia in the power system were made by the AEMC in September 2017. The AEMC intends to continue its assessment of the appropriate design of an inertia market mechanism through the recently initiated Frequency control frameworks review. Current set of decisions leave a gap in the regulatory frameworks relating to acquiring system strength & inertia for market benefits.
2.1	AEMC should require full disclosure (for new generators) of any software or physical parameters that could affect security or reliability.	AEMC	2018	Mid	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	Mid	On track	Work is underway through the Generator technical performance standards rule change.

2.1	AEMC should require new generators to have fast frequency response capability.	AEMC	2018	Mid	On track	Work is underway through the Generator technical performance standards rule change process which proposes that new generators should have frequency response capability. In the case of non-synchronous generators, this entails FFR.
2.1	A comprehensive review of the connection standards should be undertaken every three years.	AEMC	2018	Mid	Under considera tion	Connection standards, over and above those in Generator technical performance standards rule change, will be considered through any rule change requests lodged. A process for further comprehensive review on an ongoing basis is under consideration.
2.2	Move towards a market-based mechanism for FFR if there is a demonstrated benefit.	ESB / AEMC / AEMO	2020	Within three years	On track	Work is underway through the AEMC's frequency control frameworks review. AEMO published a working paper on FFR in the NEM in August 2017. The market bodies will liaise with the ESB to coordinate this and other market design issues.
2.3	AEMO and AEMC should: Investigate governor and deadband settings.	ESB / AEMC / AEMO	2018	Mid	On track	AEMO investigation has established that deteriorating frequency performance is in part driven by changes to governor and dead-band settings. Work to address this is underway through the AEMC's frequency control frameworks review. The market bodies will liaise with the ESB to coordinate this and other market design issues.
2.3	AEMO and AEMC should: Consider tightening the frequency operating standard.	AEMC / AEMO	2018	Mid	On track	Work is underway through the AEMC Reliability Panel's review of frequency operating standards (FOS). FOS Stage 1 commenced on 14 November 2017 to reflect new emergency frequency control scheme arrangements and provide further guidance on managing different kinds of contingency events. FOS stage 2 will commence following the

						Frequency control frameworks review.
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	Mid	On track	Plans to be updated once the SRAS guideline is issued and procurement of new SRAS services is 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	Mid	On track	Work is underway through the AEMC's frequency control frameworks review. AEMO is also working with DNSPs to explore operational frameworks for managing system security and reliability in the presence of high levels of DER. The market bodies will liaise with the ESB to coordinate this and other market design issues.
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	Mid	On track	Register of distributed energy rule change was submitted on 5 October 2017 and will be progressed in coming months. AEMO is also working with DNSPs to establish data collection framework.
2.7	The Australian Government should regularly assess the NEM's resilience to human and environmental threats.	Australian Government	2019	Mid	Under consideration	The Department of Environment and Energy will develop the approach to quantitatively measure and assess energy security performance. The ESB notes the importance of this workstream including the role for state governments in assessing and implementing any recommendations. Where the ESB can assist in this process it will do so.
2.8	AEMC should review and update the regulatory framework to facilitate proof-of-concept testing of innovative approaches and technologies.	AEMC	2018	End	Complete	AER considers each proposal on a case by case basis and can issue a letter of no action to allow proof of concept testing.
2.9	A long-term funding source for trials by the AEMO and ARENA should be assured	COAG Energy Council	2018	Early	Under consideration	Funding was provided in October 2017 to facilitate trials between AEMO and ARENA to source demand response from the market. This provision was made on a one-off basis and

						consideration needs to be made for a long-term funding source.
2.10	An annual report into the cyber security preparedness of the NEM should be developed by the Energy Security Board	ESB / AEMO	2018	End	Under consideration	Initial discussions held with government and industry stakeholders. Formal discussions with TNSPs, AEMO and Australian Cyber Security Centre underway.
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	End	On track	AEMO has been working closely with the bureau of meteorology to improve forecasting, has implemented enhancements to forecasting models and had a detailed independent audit of short term forecasting processes undertaken.
2.12	COAG Energy Council should do a national assessment of the future workforce requirements for the electricity sector	COAG Energy Council	2019	Mid	Under consideration	The Chair of the COAG Energy Council will write to the Chair of the COAG Industry and Skills Council to seek agreement for the Councils to work collaboratively to develop the national assessment being prepared. The ESB notes the importance of this workstream. Where the ESB can assist in this process it will cooperate with the COAG Energy Council to do so.
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	End	On track	The Australian Government is currently reviewing its climate change policies, including a potential long-term emissions reduction goal post-2030. The review is due to conclude this year.
3.2	AEMO should publish a register of long-term expected closure dates for large generators.	AEMO	2017	End	On track	AEMO publishes a 10-year outlook of generation availability on its Generation Information page. The next update to this will be published before end 2017. AEMO will also set out information including announced closures in the Integrated Grid Plan and seek feedback from stakeholders (Dec 2017). Recommendation 3.2 will support the delivery of this recommendation.

3.2	The Australian State and Territory governments agree to an emissions reduction trajectory for the NEM.	COAG Energy Council	2018	Mid	Under consideration	The emissions reduction trajectory for the NEM is partly an element of the NEG and will be consulted on as the detailed design of the NEG is developed in the lead up to the consideration of the NEG by COAG Energy Council in April 2018.
3.2	Clean Energy Target should be adopted.	COAG Energy Council	2018	Mid	Under consideration	The Federal Government has proposed a National Energy Guarantee as an alternative to a Clean Energy Target in order to achieve both emissions reduction and reliability outcomes. Detail of this proposal is being developed and will be considered by Energy Ministers at their April 2018 meeting.
3.2	New requirement for all large generators to provide at least three years' notice prior to closure.	ESB / AEMC / AEMO	2017	End	On track	Drafting of the rule change request is underway and consultation to begin shortly. The AEMC will incorporate this in its reliability frameworks review.
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	Mid	Under consideration	A reliability requirement proposed by the Australian Government as part of the National Energy Guarantee may replace the need for a generator reliability obligation. Detail of this proposal is being developed and will be considered by Ministers at their April 2018 meeting.
3.4	AEMC and AEMO should assess: The suitability of a 'day-ahead' market.	AEMO / AEMC	2018	Mid	Under consideration	Consideration of day-ahead markets and their suitability is underway through the AEMC's reliability frameworks review. ESB will commence consideration within weeks.
3.4	AEMC and AEMO should assess whether SA licencing arrangements should be applied elsewhere.	AEMO / AEMC	2018	Mid	On track	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. Work

						underway through the Generator technical performance standards rule change to consider whether these or other new arrangements are needed for generators connecting to the NEM.
3.4	AEMC and AEMO should assess: The need for a Strategic Reserve as an enhancement or replacement to RERT.	ESB / AEMO / AEMC	2018	Mid	Under consideration	Consideration of the need for a strategic reserve mechanism is underway through: - the AEMC's reliability frameworks review. - AEMO's advice to government regarding dispatchable generation -The ARENA-AEMO demand response trial AEMO has developed a high level design for a possible mechanism. The market bodies will liaise with the ESB to coordinate this and other market design issues.
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	End	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	Mid	Under consideration	AEMO provided advice to the Commonwealth Minister in September 2017 on the need for additional dispatchable generation in 2018 and 2019. Proposals are currently being developed regarding strategic reserve in consultation with industry stakeholders. This work will be presented to the ESB in December 2017 and then to the COAG EC with the intention for a new mechanism to be in place for next summer.
4.3	Governments should adopt evidence based regulatory regimes to manage the risk of individual gas projects on a case-by-case basis.	COAG Energy Council	2020	Within three years	On track	COAG Energy Council continues efforts to bring on new supply through its Gas Supply Strategy

	(including landholders receiving fair compensation).					
4.4	COAG Energy Council should bring together relevant data on gas in an accessible format.	COAG Energy Council	2019	Mid	On track	COAG Energy Council continues efforts to communicate information about the onshore gas industry for landholders and communities through its Gas Supply Strategy
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	Mid	On track	AEMO has commenced work on an integrated grid plan, the first version to be released in late June 2018. AEMO intends to integrate its national transmission network development plan (NTNDP) with this integrated grid plan. The AEMC is currently undertaking a review into the coordination of generation and transmission investment in which renewable energy zones are being consider. The market bodies will liaise with the ESB to coordinate this and other network planning issues.
5.2	AEMO should develop a list of potential priority projects in each region that governments could support	AEMO	2019	Mid	Under consideration	Initial consideration of renewable energy zones is underway as part of the AEMC review into the coordination of generation and transmission investment and associated priority projects is underway as part of the development of an integrated grid plan. AEMO will develop a list of transmission developments including priority projects as part of the 2019 integrated grid plan and NTNDP. The market bodies will liaise with the ESB to coordinate on this and other network planning issues and transmission and generation investment coordination issues.

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	Mid	Under consideration	Initial consideration of the framework and process to evaluate priority projects is underway as part of the AEMC review into the coordination of generation and transmission investment and associated priority projects is underway as part of the development of an integrated grid plan. AEMO will develop the criteria for this through consultation in the second half of 2018 to align with scenario modelling and the process for identification of renewable zones and priority projects. The market bodies will liaise with the ESB to coordinate on this and other network planning issues.
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	Within three years	Under consideration	AEMO's role in national transmission planning will be considered by ESB in due course and in light of other relevant work.
5.4	COAG Energy Council should finalise and implement reforms to LMR.	COAG Energy Council	2017	End	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	Within three years	Under consideration	ESB will consider the RIT-T and RIT-D in due course and in light of other relevant work.
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	End	On track	The ACCC will consider the need for additional AER powers as part of its inquiry into retail electricity supply that is due to report in July 2018. 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.

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	Mid	On track	Occurred in the ACCC draft report inquiring into electricity retail supply. Recommendations will be made in the ACCC's final report due in July 2018. The AER is taking action in a number of areas: - monitoring customers on offers with expired benefits - working with BETA to develop a 'comparator rate' and to improve how offers are presented by retailers - continuing to promote and raise awareness of Energy Made Easy.
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	End	On track	Health of the NEM report published [December 2017]. It will include high level information on contracts taken from the ACCC interim report on retail electricity prices. Further information will be included on this topic in subsequent reports.
6.3	COAG Energy Council should improve consumers' access to, and rights to share, their energy data.	COAG Energy Council	2017	End	Underway	Work is underway but behind schedule. A consultant has been engaged and is expected to provide a report to officials and AEMO for consideration in early 2018. The AER is looking to upgrade Energy Made Easy and is exploring technological tools so customers can use their data more easily when comparing offers. The Australian Government has recently announced it will legislate a national Consumer Data Right, allowing customers more access to their own banking, energy, phone and internet data.
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	End	Complete	Health of the NEM report published [December 2017] covering this topic in part.

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	Mid	On track	Energy Consumers Australia is working with industry to progress a voluntary code to consumer protections for behind the meter electricity supply. The AER is progressing its work to enable customers of exempt sellers to access energy ombudsman schemes. It is also reviewing retailers' hardship policies and practices.
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	End	Under consideration	Work has not yet commenced to identify and consider options to support low income households investing in energy efficiency and demand management. The ESB will work with SCO to progress this.
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	Mid	Under consideration	Consideration of demand response and a demand response mechanism is underway through the AEMC's reliability frameworks review. ARENA-AEMO demand response trial is underway to inform work on facilitating demand response and will also inform work on considering strategic reserves and RERT replacement. The market bodies will liaise with the ESB to coordinate this and other market design issues.
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	Mid	On track	Capital and operating incentives, including financial modelling and a potential move to a total expenditure framework (removing the split between capital and operating expenditure) will be a core focus of the AEMC's 2017-18 Economic network regulatory framework review.

6.9	AEMC should review the regulation of individual power systems and microgrids including draft a proposed rule change.	AEMC	2018	Mid	On track	The AEMC is due to publish the Alternatives to grid supply rule change request in December 2017. The COAG Energy Council is investigating the use of stand-alone power systems through its energy market transformation program. Further changes will be investigated through a review commencing mid-2018 should they be necessary.
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	End	On track	COAG Energy Council endorsed and released the 2017 annual report on the National Energy Productivity Plan (NEPP). This plan highlighted the 2017 achievements. Opportunities to accelerate actions in the NEPP will be considered as part of implementation plans by June 2018.
7	**Stronger governance**					
7.1	COAG Energy Council should develop and maintain a strategic energy plan.	COAG Energy Council	2018	Mid	Under consideration	The ESB will be providing advice to the COAG Energy Council to assist in developing a strategic energy plan based partly on the AEMC's strategic priorities advice provided to the COAG Energy Council in October 2017.
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	any	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	any	Complete	Appointed in August 2017
7.2	Energy Security Board administrative support should be provided by AEMO.	COAG Energy Council	2017	any	On track	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	any	On track	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	Mid	Under consideration	Drafting of the new AEMA will commence in 2018 with COAG Energy Council consideration expected to be sought in July 2018.
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	Mid	On track	First report to COAG First Ministers was provided by Energy Ministers in August 2017. 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	Mid	Under consideration	The market bodies and the ESB have commenced a process to develop new Statement of Expectations and a Statements of Role for consideration by officials and COAG Energy Council in 2018.
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	End	Complete	Health of the NEM report published [December 2017].

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	End	Complete	Health of the NEM report published [December 2017]. Further information will be included in subsequent reports to reflect performance against the COAG Energy Council's Strategic Energy Plan.
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	End	Complete	Health of the NEM report published [December 2017].
7.6	The Energy Security Board's annual Health of the NEM Report should include: Progress against a Statement of Expectations.	ESB	2017	End	Under consideration	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 in 2018.
7.7	AEMC, Energy Security Board or other suitable body, to complete a comprehensive review of the National Electricity Rules with a view to streamlining them in light of changing technologies and conditions.	ESB / AEMC	2020	End	Not yet started	Initial discussions to commence in 2018.
7.8	Recommendations of the Vertigan Review to expedite the rule-making process should be implemented by COAG Energy Council.	COAG Energy Council	2017	End	Ready	The legislation has been drafted and is awaiting introduction to the SA Parliament. This is now likely to occur following the South Australian state election in March 2018.
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	Mid	Under consideration	The ESB will be considering this matter in due course. Recommendation 7.8 will be an important step in addressing this issue.
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	End	Under consideration	The AEMC has released a guideline on applying the national energy (electricity, gas and energy retail) objectives. COAG Energy Council to engage with the AEMC regarding these principles.

7.11	COAG Energy Council should ensure that the AER and the Energy Security Board are adequately funded	COAG Energy Council	2018	Mid	On track	The ESB's initial budget has been approved. AER ongoing funding was significantly increased from 1 July 2017.
7.12	AEMO should update its Constitution: new skills matrix to ensure power systems engineering or equivalent.	AEMO	2017	End	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	End	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	End	On track	The AER has commenced and is on track to provide stage 1 of the data strategy and is coordinating with the ESB to do so.
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	End	On track	Stage 2 will commence upon completion of stage 1.