Australian Government
Department of the Environment and Energy

COVER SHEET FOR SUBMISSIONS

Independent Review into the Future Security of the National Electricity Market

Overview

Please include this cover sheet with your submission on the Preliminary Report of the Independent Review into the Future Security of the National Electricity Market.

Background

The Preliminary Report outlines the Panel's observations about the current state of the NEM and offers questions on the major issues the Panel has identified. The questions are designed to elicit suggestions or answers that may help form the Panel's final recommendations.

The Preliminary Report serves as an issues paper for broad public consultation. As such, the questions and views will be subject to further consideration and discussion, in anticipation of the final blueprint being produced in 2017.

Stakeholders are encouraged to keep their submissions as succinct as possible, and include a one-page executive summary.

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Submission Instructions

The submission period will be open until close of business on Tuesday **21 February 2017**.

All submissions should be emailed to the NEM Security Review at the mailbox: NEMSecurityReview@environment.gov.au

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3 March 2017

Independent review into the future security of the National Electricity Market

The Australian Energy Council (the Energy Council) welcomes the opportunity to make a submission to the Preliminary report of the independent review into the future security of the National Electricity Market (NEM).

The Energy Council is the industry body representing 21 electricity and downstream natural gas businesses operating in the competitive wholesale and retail energy markets. These businesses collectively generate the overwhelming majority of electricity in Australia and sell gas and electricity to over 10 million homes and businesses.

We set out below a high level overview of the issues canvassed in the preliminary report. Further detail is provided in our attached submission.

Policy is the problem, not markets

The NEM wholesale market has delivered on its price and reliability objectives for almost 20 years. Recent price and reliability events are not the result of the electricity market failing, but the result of sustained policy interference. The market has been signaling new generation to enter the market, but this investment remains impaired by sustained national policy uncertainty and arbitrary constraints on gas supplies. This is driving up electricity prices to unsustainable levels. The impact on the industry, its customers, and the economy is now critical. The cost of sustained policy inaction is now higher than the cost of efficient and durable policy action.

Changing generation will require an upgrade of the way we operate the market

As the generation mix changes to incorporate a growing amount of intermittent generation, demand for energy services such as Frequency Control Ancillary Services (FCAS), reactive power, and inertia will increase. The operation of the market also needs to change to reflect these changed conditions. Wind and large scale solar generation cannot typically be used for Automatic Generation Control (AGC). Ensuring system security will require additional, complementary measures that support a NEM in transition. To date, revenue adequacy has been compromised by the weight of off-market subsidy for new renewables as a proxy for emissions reduction policy.

Transparent markets are efficient markets

A key element of successful market design is that incentives are aligned with the goals of the system. Cost-reflective pricing and user/causer-pays allocation of grid costs provide important signals for behaviour that contributes towards an efficient electricity system.

It is vital that risks are allocated to those best able to manage them. Renewables support schemes, in particular, should not seek to remove all risk from project proponents. Where the decision-making powers of energy market bodies are enhanced, strong and clear accountability must be maintained.

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Energy is evolving into a consumer good, and needs competitive, innovative retail markets

Competitive retail electricity markets have been the delivery mechanism for new distributed energy technologies by both incumbents and new entrants. Similarly, markets will most efficiently deliver other customer choices, such as storage and electric vehicles. It follows that competition for grid supply should be maintained and strengthened. Traditional retailers and new service providers will compete to find the best way to meet customers' needs through a combination of grid supply and behind the meter services.

With these points in mind, we summarise below the most important actions governments can take to ensure Australia's energy markets are fit for purpose to deliver reliable supply at an efficient cost while progressively decarbonising.

Immediate/short term reform priorities

- Development of new ancillary services markets that value inertia and system strength and reward market participants who can contribute to these objectives.
- Empowerment of the market operator to manage system security and protect against contingencies efficiently and flexibly. This should be backed up by governance arrangements to ensure accountability of the Australian Energy Market Operator's decision making.
- Development of a national climate change policy that is capable of durability and scalability to meet not just the 2030 target but deeper targets in the future. In turn, jurisdictions should wind back existing support schemes such as renewable targets.
- Removal of barriers to networks (and in turn retailers) offering more cost-reflective pricing, including any barriers to the market led rollout of smart meters.
- Initiation of a process to resolve legitimate landowner concerns that can allow the removal of moratoria on onshore gas exploration and production.
- Careful implementation of gas market reforms as set out by Australian Energy Market Commission and the Australian Competition and Consumer Commission.

Medium term

- Continuation of research and development support via the Australian Renewable Energy Agency, with the remit broadened to address system security in the context of a decarbonising electricity system.
- Development of a process to bring on more widespread cost-reflective network pricing.
- Redevelopment of regulatory investment tests so that they reflect the risks inherent in building such long-term assets in conditions of uncertainty.

Any questions about our submission should be addressed to, Kieran Donoghue General Manager Policy by email kierandonoghue@energycouncil.com.au or by telephone on (03) 9205 3116.

Yours sincerely,

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AUSTRALIAN ENERGY COUNCIL

INDEPENDENT REVIEW INTO THE FUTURE SECURITY OF THE NATIONAL ELECTRICITY MARKET

AUSTRALIAN ENERGY COUNCIL SUBMISSION
MARCH 2017

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Chapter 1: Technology is transforming the electricity sector

a. New technologies in the NEM

The transformation of Australia's electricity sector is under way, characterised by the increased use of intermittent renewables, distributed energy resources and greater consumer involvement and choice.

Australia is expected to see a three-fold increase in residential storage this year on the 2016 sales (off a low base) and four-fold increase in non-utility storage[1]. Growth in solar PV installed capacity has slowed since 2014, but is still expected to increase by 1.3 per cent in 2016[2].

These technologies deliver the greatest benefits when they are optimally deployed in the electricity system. The most responsive framework to ensure this efficient deployment is competitive markets. Competition in retail and energy services markets, as in other sectors of the Australian economy, incentivises business to optimise efficiency, improve service, develop products that meet consumer needs and find ways to lower their costs so they remain competitive. Like other consumer markets, competitive markets are best placed to facilitate the development of new technologies as they incentive business to deliver services to best suit consumers.

The AEMC recently highlighted that "*without consumer choice, there is no way for these preferences to be revealed and no way for the market to act on this knowledge. A market with consumer choice therefore promotes innovation and efficiency"*[3]*.* Competitive neutrality is essential to achieve this. Ring-fencing and other regulatory tools should be designed to ensure no regulatory advantage (economic or legislative) is bestowed on any market participant. This point is explored further in chapter 2.

Competitive markets flourish when framed by supporting general legislation and regulation that facilitate contracting between parties. This enables trust between market participants and protects property rights. Market failures can be addressed by appropriate regulation, however care must be taken to only intervene when it is clear that such intervention will efficiently address an identified market failure, resulting in delivered benefits for the market and consumers.

There should be an emphasis on policy outcomes rather than technology outcomes, supporting the government's technology neutral principle. This will enable all available technologies to be used in the most efficient way. Retailers have a key role to play within this transition.

Retail competition has not been able to deliver the same benefits to network costs as these are regulated monopolies. Their revenue is determined by the Australian Energy Regulator (AER) and tariffs must be offered on an equal access basis. The advent of competitive metering and the availability of digital meters allow for

[1] Sunwiz Solar industry intelligence, 2017. Battery Market Report, p. 62. Accessed online <http://www.sunwiz.com.au/index.php/battery-market-report-2017.html>
[2] Clean Energy Regulator, 2017. Postcode data for small-scale installations 21 January 2017. Accessed online <http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations>
[3] AEMC, 2016. Distribution Market Model, Approach paper, 1 December 2016, Sydney. Accessed online < http://www.aemc.gov.au/Markets-Reviews-Advice/Distribution-Market-Model>

more cost reflective network tariffs to be offered by the networks with retail competition an important driver in uncovering those which are best for consumers' needs.

Risks with predicting the technology of the future

Technology risk is a feature of all rapidly transforming markets. Existing assets are always at risk of being stranded or made obsolete by new technologies. This is a normal commercial risk borne by all asset owners across all parts of the economy. What is essential is that this normal risk is not exacerbated by poor policy. Picking winners, or assuming technologies will become available (when they don't) are the most common ways policy makers can exacerbate technology risk.

There is a role for government in addressing market failures that can sometimes exist when nascent technologies are starved of the capital needed to develop. This is often the case where venture capital is scarce (like Australia). Government resources are also scarce. Technology developers should still have to compete for funding, whatever the resource, and any funding source should have clear and strict boundaries about entry and exit of their funding.

While it is beneficial to monitor emerging technologies it is important not to pick a winner, which could inadvertently reduce innovation and competition of other technologies. Policy makers should not try to predict future technology development. A market-led system will discover the most efficient technology mix through appropriate price signals. This still entails a certain amount of regulation, but the difference is that the regulations are to support the market, rather than vice versa.

Benefits of innovation technology in electricity generation, distribution and consumption

Innovative technology improves services, reduces the costs of providing reliable and secure energy supply and can contribute to reducing emissions.

The innovative services which provide network benefits by reducing congestion are in an early stage of development. Competitive pressures to bring these services to market, combined with recent reforms to network regulation, have created new opportunities for product development.

Retailers and other energy service providers are using innovative technology as part of trial projects that include large scale storage and integrated housing design. Businesses such as Reposit Power are engaged in this process of experimentation and market development by partnering with networks and retailers to sell grid services from distributed generators[4]. ERM Power is trialing demand management, energy efficiency measures and information to help schools change their energy use behaviour[5]. AGL has established its New Energy division to provide distributed energy services which includes digital metering, solar PV, battery storage and electric vehicles[6]. In 2016, AGL also conducted trials of innovative offerings, including virtual net metering

[4] Reposit Power, 2016. Key Features. Accessed online <http://www.repositpower.com/features/>
[5] ERM Power, 2016. Lessons in energy efficiency bring immediate savings. Accessed online <http://www.ermpower.com.au/post_powering_on/lessons-energy-efficiency-bring-immediate-savings/>
[6] AGL, 2016. Sustainability report 2016. Accessed online <http://agl2016.sustainability-report.com.au/system/files_force/downloads/agl_csr_2016.pdf>

and demand response[7], to investigate how emerging technologies can be used to balance spikes in electricity demand, reduce network costs and ultimately reduce energy costs.

EnergyAustralia has responded to electricity customers preferences by providing a carbon neutral product option at no cost to the customer. Launched in November 2016, the product carries the Australian Government's official carbon neutral trademark, which means it has been certified under the National Carbon Offset Standard[8]. EnergyAustralia, partnered with the Melbourne Energy Institute and Arup Group, is undertaking a pumped hydro project in South Australia using seawater. It would have the capacity to produce 100 MW of electricity with six-to-eight hours of storage which is the equivalent of installing 60,000 home battery storage systems, but at a third of the cost[9]. These are just a few examples of the many trials and new services being developed in businesses around Australia.

Other electricity innovations that may impact the market in the future

Innovation in the electricity market has tended to focus around new types of generation and opportunities for storage. This has resulted in the exploration of new zero or low emissions technologies including, but not limited to, wind, solar PV, solar thermal, geothermal, wave energy, carbon sequestration, new chemical storage technologies and a range of physical storage technologies including molten salts and pumped hydro. These reflect the growing need to provide reliable and cost-effective electricity at scale with reduced greenhouse emissions.

Innovation in electricity systems is much broader than this. The experience of integrating high levels of intermittent generation in South Australia and the development of more distributed, consumer-led generation suggests innovation in electricity systems will be needed in a much broader scope of activities. These may include:

- Transmission: Reducing loss factors and costs to transport energy longer distances (reducing the cost of supplying solar west of load centres into evening peaks).
- Retail: Innovation in aggregation of services; billing systems; customer information and remote appliance management; metering and load control; management, aggregation and data reporting from behind the meter technologies.
- Market operations: Increased intermittent generation will require innovation in how electricity markets are operated, to ensure reliability under changed operational conditions at the lowest cost.
- Market design: Changing market conditions may create opportunities for innovation in new markets for services like inertia, fast response, frequency and voltage, which in turn may change the value of other technologies.

More broadly, the potential for innovations to impact the electricity market are almost limitless. Anything that materially (in aggregate) changes demand levels or load profile could impact the market, as could different supply side technologies. Innovations may be as much about how products and services are bundled together

[7] AGL, 2016. AGL trials impacts of emerging technologies on the grid and energy bills. *ASX and Media Releases,* 11 March 2016. Accessed online <https://www.agl.com.au/about-agl/media-centre/article-list/2016/march/agl-trials-impacts-of-emerging-technologies-on-the-grid-and-energy-bills>
[8] EnergyAustralia, 2016. EnergyAustralia customers to Go Neutral on carbon emissions, 28 November 2016. Accessed online <https://www.energyaustralia.com.au/about-us/media-centre/current-news/go-neutral>
[9] EnergyAustralia, 2017. Consortium assessing pumped hydro storage plant in South Australia, 21 February 2017. Accessed online < https://www.energyaustralia.com.au/about-us/media-centre/current-news/consortium-assessing-pumped-hydro-storage-plant-sa>

and offered to customers, or it may be about how different parts of the electricity system (including behind the meter) communicate with each other and how control mechanisms are implemented. Irrespective of the type of electricity innovation that may occur in the future, the market mechanism provides an environment for any innovative technology/system to enter the market. This is only if the regulatory frameworks are flexible enough.

Chapter 2: Consumers are driving change

a. Maintaining consumer choice and control

Competition provides important incentives for businesses in retail energy markets, as in other sectors of the Australian economy. Competition incentivises business to improve efficiency and improve the value to customers. This is achieved by developing services and products that improve consumer experiences and or deliver those services at a lower cost. Competition in the delivery of energy services has been enhanced by the emergence of distributed energy technologies that provide new ways of improving consumer satisfaction and value.

As the range of service options grow, we anticipate greater engagement from consumers. Customer empowerment will continue to drive this change to a decentralised customer centric model.

Retailers are designing products and services to cater for the needs of different customers. Electricity offers now make it easier for customers to manage their bills, access more information and control over energy usage, receive real-time price signals and achieve energy self-sufficiency.

Competitive markets are best placed to facilitate this change. Businesses should be encouraged to cater to customer preferences while continuing to develop new products, services and technologies. The wholesale and retail electricity sectors are working on creating opportunities for consumers' needs to be met.

The Independent Pricing and Regulatory Tribunal's (IPART) review of the performance and competitiveness of the retail electricity market in NSW[10] found that the ability of customers to shop around for lower prices is indicative of an effectively working competitive market. Professor Stephen Littlechild[11] found that retail competition had effectively kept prices low as customers took advantage of price offers and attractive deals in the UK and Australia. UK regulatory intervention, intended to simplify choice by constraining the number of tariffs on offer, resulted in the disappearance of bespoke tariffs that suited small groups of customers and a rise in average retail margins.

Meeting the needs of vulnerable and hardship consumers

The AEC recognises that energy affordability and accessibility experienced by vulnerable consumers remains a key issue, particularly with the increasingly interactive role of the consumer with the electricity market. Energy affordability and accessibility is a complex issue that cannot be solved by energy retailers alone. It is therefore in everyone's best interest to work together on consumer engagement in order to keep vulnerable customers supplied with energy and access to new technologies.

There are a number of existing frameworks that address consumers facing payment difficulties. These include payment assistance, flexible billing, bill simplification, concessions reform and early consumer engagement. For example, National Energy Retail Rules prohibit disconnection of small energy customers for non-payment

[10] IPART, 2016. Review of the performance and competitiveness of the retail electricity market in NSW from 1 July 2015 to 30 June 2016. Accessed online <https://www.ipart.nsw.gov.au/Home/Industries/Energy/Reviews/Electricity/Retail-electricity-market-monitoring-2016?qDh=2>
[11] Littlechild, S., 2014. Promoting or restricting competition? Regulation of the UK retail residential energy market since 2008. *EPRG Working Paper,* 15 August 2014, p.49. Accessed online <https://doi.org/10.17863/CAM.5835>

where the amount owing is less than an amount approved by the AER, and the customer has agreed to repay that amount. We support the AER's conclusion that the minimum amount of $300 remains appropriate[12], as it meets a reasonable balance between debt management and customer protection.

Energy policy is not an effective proxy for welfare policy. Genuine remediation of energy affordability issues requires joint action from other stakeholders such as government and consumer support groups, if customers are to avoid disconnection because they simply cannot afford to pay.

Consumer engagement remains a key priority to effectively managing affordability and accessibility challenges. The energy market is constantly developing and evolving, and retailers and other service providers are at the forefront of managing consumer responses to this changing market. Novel service offers such as solar Power Purchase Agreements can address barriers such as access to capital, by offering solar installations with no upfront cost.

b. Equitable price structures

The AEC supports a competitive market for energy services and the opportunity for market-led solutions driven by consumers' needs. Consumer preferences are highly variable and prescribing their interaction with new services is premature. Provided there is a level playing field between competitors, then pricing for new energy technologies is likely to be inherently equitable.

Grid electricity is more complex as it entails deciding how to divide up the shared costs of the network (and of certain ancillary services). The AEC supports the transition to cost-reflective tariffs for network services, noting that such a move need not preclude effective choice of retail tariffs. Cost-reflective network tariffs will encourage more efficient network use, as well as more efficient investment in behind-the-meter technologies. Highly averaged feed-in tariffs are an inappropriate policy tool to reward distributed generators for network benefits.

Distributed generation should not be considered in isolation without understanding the impacts to the distribution system from customers who import and export electricity. It is likely that when both of these factors are determined that the application of any distribution benefit may be customer and locational specific, and care must be taken to ensure that the complexity of allocating any benefit or cost does not exceed its true value.

The innovative services which provide network benefits by reducing congestion are in an early stage of development. Competitive pressures to bring these services to market, combined with recent reforms to network regulation have created new opportunities for product development. The market will require time to learn and adapt to new product offerings.

Intervention could limit the scope for innovation and discovery, which are essential benefits of new technology and software at this point in the energy transition. To the extent that new regulations are required, they should be focused on ensuring equal access.

[12] AER, 2016. Review of the Minimum Disconnection Amount, 23 May 2016. Accessed online <https://www.aer.gov.au/retail-markets/retail-guidelines/review-of-the-minimum-disconnection-amount-2016>

c. Ensuring a level playing field for the competitive supply of new energy services

One potential driver of take-up and efficient use of distributed energy resources is the opportunity to benefit from offering services back to the networks so they can manage demand efficiently. AEC supports a nationally consistent, competitive network services market for distributed generation or any other emerging technology or service. The Australian Energy Market Commission (AEMC) and AER, as national rule maker and regulator, are best placed to assess the impacts of distributed generation and other resources across the interconnected market. The AEMC have just commenced two relevant pieces of work:

- Distribution market model review[13].
- Annual monitoring of electricity network regulation[14].

The competitive delivery of an emerging class of energy services would benefit from clarification in the National Electricity Rules (NER). In October 2016, the AEC lodged a rule change request with the AEMC to propose that networks must procure network support services externally where they are provided by an asset that provides services in addition to the conveyance of energy[15]. Such services may be provided by technologies such as distributed generation, storage and demand management tools. The key challenge that has arisen is how to maximise the use of the competitive market to provide innovative and adaptive solutions that will deliver the most efficient outcomes in both the short and long term.

The balance between the data sharing benefits and privacy concerns

The transformation of the use of data for businesses, government and the general public is important given the increased emergence of new technologies, and their associated information system and regulatory arrangements.

With technology advances there are increased opportunities for data collection to inform consumer decision making about their energy use, investment in technologies like distributed generation and product development by businesses. While the energy market is in a period of structural shift driven by technology innovation and the decarbonisation of energy, it is important to consider energy data in the existing regulatory frameworks. Processes recently completed or currently under way specifically examining or addressing electricity sector data include:

- the COAG Energy Council's Energy Storage Registration, which examines the need for an energy storage register and the respective data and access requirements.

[13] AEMC, 2016. Distribution Market Model, Approach paper, 1 December 2016, Sydney. Accessed online <http://www.aemc.gov.au/Markets-Reviews-Advice/Distribution-Market-Model>

[14] AEMC, 2016. Electricity Network Economic Regulatory Framework Review, Approach Paper, 1 December 2016, Sydney. Accessed online <http://www.aemc.gov.au/News-Center/What-s-New/Announcements/Approach-paper-for-new-annual-monitoring-of-electr>

[15] AEMC, 2016. Contestability of energy services, Consultation paper, 15 December 2016. Accessed online <www.aemc.gov.au/Rule-Changes/Contestability-of-energy-services-demand-response#>

- the COAG Energy Council's Energy Market Transformation program, which analyses the need to develop standards for communication capabilities for new technologies[16].

- the AEMC's new rule for competitive metering[17], to commence from December 2017, sets a framework for the commercial provision of electricity consumption data to those who assist with energy market operation or to provide consumers new services like mobile phone apps that show near real time use and cost information.

- the Australian Energy Market Operator's (AEMO) Demand side participation information Guidelines, which aims to improve visibility of data to better understand the changing demand trends across different customer categories in order to improve AEMO's load forecasts[18].

- the AEMO's Future Power System Security Review that includes a key priority area to analyse the data needs of the future power system while maintaining reliability and security of supply[19].

Any national reform to data availability should consider existing energy market reforms, and the proposed energy data collection processes under way by government agencies prior to imposing an additional regulatory requirement on the energy sector.

The benefits of greater data availability need to be carefully weighed against potential risks associated with data, in particular privacy and security concerns. These are particularly relevant to wider availability of real-time data in the electricity sector such as the use of smart meters to measure electricity consumption. The Productivity Commission's Data Availability and Use draft report[20] acknowledges that real-time data is often not necessary in order to obtain many of the benefits of data use. It remains to be seen whether all consumers will want to engage at a detailed level of data such as half hourly consumption data or whether summary information meets the needs of most people. While regulation can be used to increase data sharing and availability, it may not always be the most effective means to increase the use and value of data. The COAG Energy Council is considering the trade-off between regulated data availability in the electricity sector and allowing market participants to innovate and discover products without intervention[21].

[16] COAG Energy Council, 2016. Energy Market Transformation Project Team – Forward work plan 2016. Accessed online <http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/EMTPT%20-%202016%20Forward%20Work%20Program_2.pdf>
[17] AEMC, 2016. Expanding competition in metering and related services, Rule Determination, 26 November 2015, Sydney. Accessed online <http://www.aemc.gov.au/Rule-Changes/Expanding-competition-in-metering-and-related-serv#>
[18] AEMO, 2016. NEM demand side participation information guidelines. Accessed online <https://www.aemo.com.au/Stakeholder-Consultation/Consultations/NEM-Demand-Side-Participation-Information-Guidelines-Consultation>
[19] AEMO, 2016. Visibility of the Power System, Fact Sheet. Accessed online <https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Reports/AEMO-Fact-Sheet_Visibility-of-the-Power-System---Final.pdf>
[20] Productivity Commission, 2016. Data Availability and Use Draft Report, Canberra.
[21] COAG Energy Council, 2017, Energy Market Transformation Bulletin No 03 – Work Program Update, 1 February 2017. Accessed online <http://www.coagenergycouncil.gov.au/publications/energy-market-transformation-bulletin-no-03-%E2%80%93-work-program-update>

Chapter 3: The transition to a low emissions economy is underway

a. The electricity sector's role in reducing greenhouse emissions

Australia's electricity system is transitioning towards a lower emissions economy. This is encouraged by the Australian Government's ratification of the *Paris Agreement* (Paris, 12 December 2015), which aims to keep global warming below two degrees Celsius, and, ideally, below 1.5 degrees Celsius. Given these factors, Australia should manage the transition in a manner that supports investment decision making and Australia's international climate commitments.

By international standards, Australia has had a relatively high emissions intensity electricity supply[22] as the system was built around utilising abundant coal reserves proximate to major load centres. The electricity market will continue to transition to a lower emissions intensity due to technological developments, increased use of renewables, and energy user choices. The further deployment of low and zero emissions generation, as well as a reduction in emissions across the sector will be necessary if the sector is to contribute to the national emissions reduction task.

A lack of national leadership to reduce emissions will increase the difficulty in delivering Australia's 2030 emissions reduction target. Emissions reduction is most effectively achieved nationally, with a durable and consistent strategy to decarbonise Australia's economy while also providing power system security.

The role of natural gas in reducing greenhouse gas emissions in the electricity sector

In the short-term at least, wind and solar remain the cheapest widely applicable zero emissions technologies. Gas-fired generation remains the lowest cost flexible resource to balance out the intermittency of wind and solar, and provides the energy security services inherent in synchronous generation (noting the unlikelihood of further development of hydropower at scale). Ongoing and flexible gas supply will be required to manage the transformation of the electricity sector at lowest possible cost while maintaining system reliability. Highly efficient, combined-cycle gas turbines produce one-third of the emissions of brown coal-fired electricity generators and half the emissions of black coal-fired generators[23].

Developing access to new gas reserves will be critical to meet Australia's energy demand as we continue the transformation to lower emissions. The continued safe, environmentally responsible and timely development of gas resources requires a stable and efficient regulatory regime. Gas access and market issues are further discussed in chapter six.

[22] EnerData, Global Energy Statistical Yearbook 2016. <https://yearbook.enerdata.net/CO2-intensity-data.html#CO2-emissions-data-from-fuel-combustion.html>

[23] Talberg, A. & Nielson, L. 2011. *Performance standards to reduce energy emissions*, Department of Parliamentary Services. Accessed online <http://parlinfo.aph.gov.au/parlInfo/download/library/prspub/485509/upload_binary/485509.pdf;fileType=application/pdf#search=%222010s%22>

Gas-fired generation plants, along with hydro, provide more than just energy to the market, they also provide stability and security of the grid. As part of that stability, firm generation also allows the system to address rapid changes in frequency due to significant changes in either supply or demand. At present the installed solar and wind capacity does not offer these other ancillary services to the grid. In the future solar and wind, with additional technology, could potentially provide partial ancillary services.

Access to a stable supply of competitively priced gas is critical to support the transformation. Without increases in gas supply it is feasible that gas generation will decline, as it is squeezed by renewable generation and coal-fired generation both with lower marginal costs. This would be an inefficient outcome, increasing pricing volatility and reducing power quality.

Given prevailing gas prices, gas generators cannot economically provide base load power at current wholesale electricity prices. Alternatively, plants could run less often and seek to capture periodic price spikes. Operated as a peaking station, these generators need substantially higher prices to run in order to recover their fixed costs over a lower utilisation rate.

The result may be that the gas generator shuts down rather than competes. Across the NEM it is quite feasible that a number of gas generators are uneconomic when their gas supply or electricity off-take contracts end. This could result in a reduction in gas-fired generation despite the inherent value and importance of gas in a generation market dominated by renewables. Currently, Australia's electricity market only utilises 9.14 per cent of the total installed gas generation capacity of 11,795.9 MW[24].

This dilemma for gas generators has been recently illustrated by the mothballing of the second unit at Pelican Point in South Australia. This meant that the plant was unable to commit to return to service at short notice when a capacity shortfall presented, resulting in forced load shedding for a short period. Even if the plant could physically have been restarted in the time frame, the market rules would not allow it to make itself available without a confirmed fuel supply, which it did not have due to its mothballed status.

To resolve this issue, not only does gas policy need to address the lack of supply, the NEM needs to recognise the value gas generators provide, such as inertia and frequency control, and needs to consider valuing these services rather than just the energy the generator produces.

The role for low emissions coal technologies

Whilst effective research in all new lower emissions technologies will broaden the type of technologies available to use, the industry has no plans to start building new coal-fired power stations. Over the past decade, major generators have shelved plans to develop new coal-fired generation. These assets are effectively un-investable, as they have a 50-year operating life and a high emissions profile. While lower emissions coal-fired power stations are being built in other countries, there is no current investment appetite to develop new coal-fired power in Australia. Coal with carbon capture and storage (CCS) could in theory address the emissions constraint, but is still largely developmental technology, requires appropriate geology proximate to the proposed power station site, adding a significant layer of cost and complexity.

The industry's investment focus has shifted to a combination of firm lower emissions gas generation, renewables and enabling technologies like storage. More than 2,000 megawatts of firm generation exited the

[24] Electricity Supply Association of Australia. 2016. 'Electricity Gas Australia'. Melbourne: ESAA.

market in Australia last year, with no plan to replace it. The investment in generation urgently required by the industry cannot occur without credible and enduring national energy and climate policy.

Policy design should be technology neutral. Then, if technologies such as CCS do make rapid progress in the future, we will not need to redesign policy in order to allow it to play its role in the energy transformation. The same principle applies to nuclear technologies (noting that legislative change would be required to enable its development in Australia).

The role for existing coal-fired power stations

During this transition it is important to consider the role and services that the current coal-fired power stations provide to the electricity system. Existing coal-fired power stations, which have relatively low fuel costs, provide low cost electricity. This is partly due to the externality of their emissions being unpriced, nevertheless this is the basis on which Australia's energy-intensive industry was established.

Coal-fired power stations are dispatchable, meaning they can supply highly controlled electricity output on demand. Although coal-fired power stations may be less flexible than gas or hydro plants, they can increase or decrease output as required. As a result, their supply is very reliable, with only occasional unplanned outages.

Coal-fired plants as well as other plants based on rotating turbines such as gas, hydro, nuclear or geothermal are described as synchronous, which allows the electricity system to address rapid changes in frequency due to significant changes in either supply or demand. In regards to inertia, the speed rate of rotation of generators on the network determines the frequency of the system. As such, the greater the inertia in the system the less the network is susceptible to frequency variations outside the normal operating parameters due to sudden disturbances. Coal-fired power generation ('synchronous' generation) provides large levels of inertia.

Over recent years several coal-fired power stations have closed, noting that some of these were commissioned in the 1960s. With the recent exit of Northern and Playford, and the planned closure of Hazelwood[25] the system will require sufficient dispatchable generation, inertia and Frequency Control Ancillary Services (FCAS) services to maintain a secure and reliable operation. If there is sufficient financial incentive to maintain or procure plant that can supply these services, then the market can manage this transition in a manner that maintains Australia's energy security, without the intervention of regulated closure.

b. Barriers to investment in the electricity sector

Australia has undergone a number of policy changes over the past 15 years. This has resulted in a mismatch of Commonwealth and state policies, and a lack of integration of climate change policies with energy policies. This in turn has led to distortions to investment signals distortions in the market, which has resulted in the energy industry not being able to anticipate the necessary changes and make appropriate investment decisions to achieve a secure, reliable energy market. The numerous carbon and energy policies initiated by individual jurisdictions are resulting in increased cost and higher risk for energy users and, are challenging the integrity of the NEM.

[25] Electricity Supply Association of Australia. 2015. 'Electricity Gas Australia'. Melbourne: ESAA.

To assist and manage the transition towards a net zero emissions economy, a national, stable emissions reduction policy is required to provide certainty for investment decision making. Major investment is required for future energy generation, as coal-fired power stations are decommissioned. Such investment will not take place unless there is policy that investors expect to last through multiple election cycles.

Market-led investment will also be inhibited by the growing inclination of governments to underwrite investments that presumably are otherwise not economic.

In regards to the financial market, the lack of climate policy in Australia has implications for the financial market. Climate risk is now becoming a financial problem, and regulators are putting greater emphasis on stress testing for organisational and systemic resilience in the face of adverse shocks. Financial regulators are expecting to see more sophisticated scenario-based analysis of climate risks at the firm level[26].

c. Key elements of an emissions reduction policy to support investor confidence and a transition to a low emissions system

Australia should not rely on a particular predicted future as it moves away from emissions intensive electricity generation. Should the cost of solar PV and/or batteries not reduce as expected, or if gas is less available or more expensive than forecast, Australia may have insufficient electricity supply options in the face of binding emissions constraints.

Therefore, energy and climate change policies should be national, integrated and durable. These policies should be capable of achieving our committed emission reduction targets at the lowest possible cost while ensuring the security and reliability of the energy system.

A range of electricity generation technologies may be required to meet the government's current emissions reduction targets and international obligations. It may be wise to ensure that all generation options are available to use during this transition. A lower emission energy system will mean a greater penetration of different types of generation and Australia's electricity markets must be fit for purpose.

A national emissions reduction policy should allow Australia to meet its short and long term emissions reduction goals at least cost. The following principles should be considered in the development of a national policy:

- energy security – the policy should ensure security of supply of electricity.
- technology-neutral national energy policy, which allows for innovation. Achieving energy security is likely to require new approaches to support the integration of more diverse generation technologies. New entrant technologies can and will need to play a role in ensuring a secure energy system and these should be assessed alongside existing technology options, not in isolation.
- resilience - Australia's electricity system must be resilient to extreme weather events which may increase as a result of a changing climate.
- trade competitiveness - policy should prevent the unnecessary loss of competitiveness by Australia's trade exposed industries and net increases in global emissions that might otherwise occur due to the uneven international application of climate policies.

[26] Summerhayes, G. 2017. '*Australia's new horizon: Climate change challenges and prudential risk',* Insurance Council of Australia Annual Forum, Sydney. Transcript accessed online, 17 February 2017 <http://www.apra.gov.au/Speeches/Pages/Australias-new-horizon.aspx>

- investable - Australia's electricity markets must be investable across all time horizons and provide confidence that long-term investment decisions can be made and adequate returns earned.
- administration – compliance costs should be kept to a minimum. Any changes to enhance existing regulatory frameworks should ensure clarity in institutional roles and responsibilities and the alignment of risk allocation and incentives.
- review - Australia needs regular independent review of its emissions policies, its targets (including their consistency with agreed overall goal, and international undertakings) and the efforts of other countries. This should involve full public consultation.

Other mechanisms to potentially reduce emissions, including state-based renewable energy targets, are not favoured because it is not a least cost method to achieve emissions reduction. A fragmented jurisdictional approach is counterproductive to the national emissions reduction effort.

Chapter 4: Integration of variable renewable electricity

The Australian electricity system has begun the process of decarbonising supply. The execution of this will reflect the Australian geography and its resource endowments: world class wind resources along the southern coastline, high levels of solar irradiation in central and northern Australia, abundant coal and gas reserves across the continent, some fully exploited hydro-electricity resources in the Snowy Mountains and Tasmania, and abundant uranium reserves.

In the short to medium term, the decarbonisation of the energy system will be led by the closure of high emissions firm generation (coal) and its replacement with a mixture of gas and intermittent renewables. This may be augmented by the use of more distributed energy resources and over time the co-ordinated use of storage and other emerging technologies. It will require more access to gas and more liquid domestic gas markets, as discussed in our responses in chapters 3 and 6.

To date the primary focus of energy policy has been on the design of the policies that frame the constraint on emissions and incentive investment in these new sources of generation. Typically this debate is framed by how (and if) a price on emissions should be set and the use of renewable energy targets.

As a result of a series of recent events, South Australia now finds itself with more than 40 per cent of its generation coming from intermittent generation sources. This has contributed to increased fragility of that grid, with a resultant increase in the number and severity of interruptions to supply.

This has resulted in growing recognition that while policies to reduce emissions and signal appropriate new investment are necessary, they are not sufficient to ensure secure supply. There is a parallel process which needs to consider the technical integration of intermittent renewables, i.e. how these technologies at scale can operate within the constraints of the network. What is required for increasing levels of these technologies to meet operational standards and support rather than degrade the efficient and reliable operation of the grid? These two complementary streams of work to find appropriate climate and energy policy while also finding technical solutions to network operation will ensure that in the short term we can maintain power security and reliability while providing long term certainty for investment and supply at an efficient price.

We need a durable, stable and integrated national climate and energy strategy, whilst also upgrading the operating systems for the grid to handle these new technical challenges. It will require co-operation between state and federal governments, and both major parties. Right now this appears to be the biggest barrier to fixing South Australia's power security challenge which will arise in the NEM as we transition the power system.

a. Energy policy reforms

Gas is an essential part of the energy transition and removing regulatory impediments to the expansion of domestic gas supply from conventional sources may relieve tight east coast gas conditions. Prioritising the recommendations for east coast gas market reform arising from the 2016 Australian Competition and

Consumer Commission (ACCC)[27] and AEMC[28] reviews will also assist in achieving efficient supply of gas in the long run. We support the COAG Energy Council's vision for the gas market and the close collaboration with industry to reform gas markets.

If new support mechanisms for intermittent generation are required, then it is essential that the support mechanism allows the generator to see the wholesale market value of the energy they provide through the wholesale price. In 2016, the average price wind generators received in the South Australian region was 27 per cent lower than the regional average price, $57/MWh for wind compared to $79/MWh for all generation (Table 1). Policy design to increase the deployment of renewable generation needs to incorporate these signals from the wholesale market about where and when generation is most valuable.

Table 1: the volume weighted price wind generators received in South Australia, 2016

VWP ($/MWh) in South Australia			
	Wind generation	**All generation**	**Difference**
Mar-2016	42.6	50.3	-15.4%
Jun-2016	60.2	78.6	-23.4%
Sep-2016	78.6	118.2	-33.5%
Dec-2016	43.7	68.4	-36.2%

Source: NEM Review and AEC calculations.

These are important signals that the market provides to renewable developers which should be preserved to guide developers when designing and locating their potential generation projects. Shielding generators from wholesale price fluctuations makes them insensitive to market signals and results in inefficient outcomes for consumers in the long run. Any policy intervention in a market creates a loss in efficiency through distorting and curtailing resource use. Policy to expand renewables should yield net benefits when this economy-wide cost is considered, and assessing policy for its ability to meet the National Electricity Objective (NEO) is a useful measure of long term efficiency, and overall benefit.

Whichever policy is chosen to lower emissions, it must be credible and durable to provide investment certainty. A developer assessing the value of a project considers the costs and the revenue over the life of the project, with energy assets having long lives of 20 years or more. The revenue available to renewable developers is determined by the wholesale market price and the price of large-scale green certificates (LGCs). The current outlook for wholesale market prices and LGCs is both high and uncertain due to policy risk and changes in electricity demand in most states of Australia.

As intermittent generation makes up a larger share of our generation mix, dispatchable generation that can fill the gaps when the wind or sun varies will become increasingly valuable. Currently, the market price cap was put in place when the majority of generation was baseload, dispatchable generation. Energy-only markets (such as the NEM) should exhibit high price volatility in such conditions because periods of extreme prices encourage rapid generator response to scarcity and are necessary for recovery of generators' fixed costs.

[27] ACCC, 2016. Inquiry into the east coast gas market, April 2016. Accessed online <https://www.accc.gov.au/system/files/1074_Gas%20enquiry%20report_FA_21April.pdf>
[28] AEMC, 2016. East Coast Wholesale Gas Markets and Pipeline Frameworks Review, Stage 2 Final Report, 23 May 2016, Sydney. Accessed online <http://www.aemc.gov.au/getattachment/576299ec-c361-4a2c-a6cd-bb45fb834741/Stage-2-Final-Report.aspx>

Raising the market price cap is one option to ensure that dispatchable generation can recover its costs and fast responding, dispatchable generation is provided adequate value to remain in the market[29]. Volatility is not inherently an issue providing the financial markets continue to work well to provide both buyers and sellers of electricity with tools to hedge against it.

b. Technical Solutions

The AEMO has identified high priority areas for providing system security under the NEM's changing market structure. Four areas are of immediate concern to AEMO:

1. Management of extreme power system conditions.

2. Frequency control.

3. Visibility of the power system (information, data, and models).

4. System strength.

The solutions to these technical challenges are many, and some are at the cutting edge of technology change while others are well established technologies. For example, Hydro Tasmania used synchronous condensers to improve system strength in the network which enabled more productive wind farm generation[30]. These technical remedies all involve some cost. Together the energy industry is closely collaborating with AEMO and the AEMC to respond to the market challenges as technology and energy use transforms the market through the Future Power System Security work program[31] and the System Security Market Frameworks Review[32]. Below we outline some of the options for managing power system security in the near term and into the future.

Creating a value for essential, power security services

As non-synchronous generation becomes a larger share of total generation, we can expect more regions to have low system strength and high rate of change of frequency (RoCoF). If strong systems and a low RoCoF provide positive externalities then the owners of assets that assist in delivering these outcomes should be able to realise the full benefit of their contribution to the market. If strong systems provide positive additional benefits to the whole network beyond their direct benefit to the investor and customer, then there may be a role for the operator to procure services that enhance system strength or reduce RoCoF.

AEMO currently has the ability within the National Electricity Rules (NER) to procure a suite of security enhancing services. In particular, Network Support and Control Ancillary Service (NSCAS) could allow AEMO to create contracts for equipment or generation that provides inertia (such as synchronous condensers or a generation unit). The rules currently require AEMO to identify an NSCAS gap in its annual forecasting report,

[29] J. Reisz., 2016. Energy-only markets with high renewables, *Centre for Energy and Environmental Markets,* presentation, 29 May 2015, Sydney. Accessed online <http://ceem.unsw.edu.au/sites/default/files/event/documents/Riesz-EOM%20with%20high%20renewables-2015-05-29b.pdf>
[30] Hydro Tasmania, 2016. Managing a high penetration of renewables– a Tasmanian case study. Accessed online <https://www.aemo.com.au/Media-Centre/~/-/media/B47810C12E25473CB81968D5D4218F78.ashx>
[31] AEMO, 2017. Future Power System Security Program – Reports and Analysis. Accessed online <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/FPSSP-Reports-and-Analysis>
[32] AEMC, 2016, System Security Market Frameworks Review, Interim Report, 15 December 2016, Sydney. Accessed online <http://www.aemc.gov.au/Markets-Reviews-Advice/System-Security-Market-Frameworks-Review>

then provide a certain amount of time for a transmission business to respond to the identified gap, prior to AEMO directly procuring the service. Given the pace of change in the market and the upcoming planned retirement of generators, NSCAS may need to be more agile and responsive than it currently is in the Rules. This may include ensuring that the full range of potential suppliers of NSCAS can contribute.

Managing extreme conditions with a new protected events category and emergency frequency control scheme

The AEMC has taken up the proposal for a protected events category to better mitigate the risk to the secure operation of the NEM of extreme events (such as weather events)[33]. The current NEM rules allow AEMO significant control and flexibility to classify credible and non-credible events and adjustments between these two categories. In the event of unusual weather, adding a third intermediate category may provide benefits, provided sufficient controls exists within the NER with regard to its use. As more information about extreme events become available, it is possible to better estimate the consequences and likelihood of their occurrence and take mitigating action. The aim of the additional category is to allow AEMO to take pre-emptive mitigation measures that would allow a more secure outcome for the system if the event remained classified as a contingency event, but be less restrictive on market operations than reclassification to a credible contingency. We support this development on the basis that the Reliability Panel is tasked with consulting with the Market with regard to the settings to apply to this new protected events category, this should provide AEMO with greater ability to take action before an emergency occurs. The Reliability Panel is the most appropriate body to set locations where the Protected Events category should be applied and the range of circumstances under which a reclassification to a protected event should occur.

We support the development of an emergency frequency response service, to expand the scope of ancillary services to meet the needs of the changing network. We also support the AEMC's draft rule to allow for the potential use of any technology solutions that can provide emergency frequency control. As the emergency frequency control scheme is developed, a transparent governance framework will assist to create a robust and effective mechanism.

Contingency FCAS acts to arrest steep rates of change of frequency and then stabilises and recovers the system frequency over time to bring it back to within the normal operating frequency bands. It is also worth noting that in South Australia, due to a South Australian Government directive, FCAS contingency raise services are not scheduled by AEMO for some credible contingencies which may significantly impact the South Australian region.

In South Australia, frequency stabilisation following a credible contingency, such as the trip of the Heywood interconnector flow path from Moorabool in Victoria to Tailem Bend in South Australia that leads to a large frequency fall is managed only by customer load shedding. It is also worth noting that while FCAS contingency services commence activating when frequency falls below 49.75 Hz, frequency load shedding does not activate until approximately 48 Hz, by which time the system frequency in South Australia is somewhat in 'freefall' and frequency stabilisation is difficult. It is possible that even with emergency frequency response enabled in South Australia this may be insufficient to prevent ongoing issues in South Australia if other FCAS contingency raise services remain unavailable for dispatch by AEMO. In addition, in order for emergency

[33] AEMC, 2016. Emergency frequency control schemes, Draft Rule Determination, 22 December 2016, Sydney. Accessed online <http://www.aemc.gov.au/Rule-Changes/Emergency-frequency-control-schemes-for-excess-gen>

frequency response to be dispatched in South Australia, AEMO may require approval from the South Australian Government to schedule such a service if it is viewed as an additional FCAS contingency raise service.

It would be best to ensure AEMO has full access to existing tools for maintaining system security in South Australia, while investigating the options for additional services.

Constraining generators should be a last resort

Constraining down generation to prevent the loss of system security should be a last resort, because it decreases the utilization of assets and may be inefficient for consumers in the long term[34]. In the short term constraining generators is a reliable and immediate tool for managing system security (and was used to control RoCoF following the 2016 system black event in South Australia), where other solutions do not currently exist. Over time, other solutions to control RoCoF may be implemented which may be more sustainable and efficient in the long run. The NEM's strong governance framework and market structure should be leveraged to assist us to find innovative and smart solutions to system security under high shares of intermittent, asynchronous generation.

We recognise that the NEM network planning requirements are not set on the basis of a constraint-free network under all credible conditions, and so constraining generation under some system conditions may be the most cost efficient solution. Ensuring that we make the most of our generation resources means that we find the most effective and efficient means of providing a secure system in the long run interest of consumers. This will enable Australia to minimise possible inefficient outcomes seen in countries such as Ireland where constraining intermittent wind resources has become the norm to maintain system security[35] (which in some circumstances may have been poorly located in areas of congestion). Long term, investors should have the choice of providing inertia services or providing energy and not contributing to inertia.

Regulation should be a last resort if a market mechanism or competitive procurement is not well suited to the provision of system security support services. Regulated generator requirements may lead to perverse outcomes or missed opportunity to create a competitive market with efficient pricing. The AEMC's System Security and Market Frameworks Review is closely examining the most efficient and effective model to increase system security through new services that were not previously valued by the market framework[36].

Visibility of the power system

Visibility of the power system is a key element to integrating intermittent and distributed energy resources to the network. Reliable wind power forecasts help Denmark manage wind power production that can at times exceed the total load of the country[37]. Maintaining good visibility of intermittent generators and maintaining robust forecasting models assists in the overall system operation and the integration of renewables.

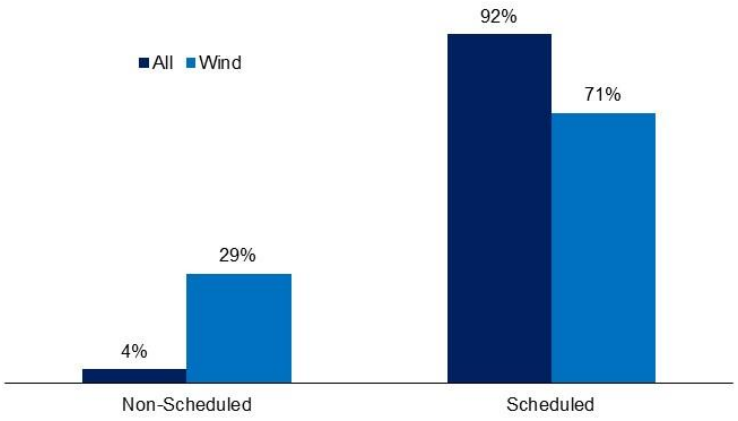
[34] Luo, G.L., Li, Y.L., Tang, W.J. and Wei, X., 2016. Wind curtailment of China' s wind power operation: Evolution, causes and solutions. *Renewable and Sustainable Energy Reviews*, *53*, pp.1190-1201.; Australian Energy Council, 2016, https://www.energycouncil.com.au/analysis/china-s-struggle-to-integrate-renewables/
[35] AEMO, 2016, Update to Renewable Energy Integration in South Australia, p 20. *Joint AEMO and Electranet Report*, February 2016. Accessed online <https://www.aemo.com.au/-/media/Files/PDF/Joint-AEMO-ElectraNet-Report_19-February-2016.pdf>
[36] See Principles presented on page 46 of the System Security Market Frameworks Review Interim Report.
[37] Danish Energy Agency, 2015. Integration of wind power: Energy policy toolkit. Accessed online <https://ens.dk/sites/ens.dk/files/Globalcooperation/system_integration_of_wp.pdf>

Generation which is non-scheduled is not required to participate in AEMO's central dispatch process which diminishes the visibility and accountability of forecast generation.

In our 2016 submission to the Non-Scheduled Generation & Load in Central Dispatch rule changes[38] we outlined benefits from increased information and transparency in generation output. A reduction in the threshold for generator registration from 30MW to 5MW is in the interest of maximising price discovery within the NEM as well as allowing AEMO to better control generation output from a system security perspective.

Non-scheduled generation is not required to conduct its own forecasting that contributes to AEMO's planning and management of system security[39]. In the future, as intermittent generation makes up a larger share of generation it may be necessary for all generators to contribute to the forecasting efforts of the market operator. In 2016, around 30 per cent of wind generators in the NEM were non-scheduled (Figure 1).

Figure 1: Generation capacity by fuel and market status, 2016



Source: Australian Energy Council data, 2017

At the distributed generation level, in the future it may become necessary to improve the visibility of distributed generation to the network or the market operator. AEMO's ability to robustly forecast the impact of solar PV on network performance will inform the tools it uses to control frequency or the mitigating measures taken in anticipation of an extreme weather event. The roll out of smart meters around the NEM is underway, and smart meters have the capability to report customer level data remotely. To take advantage of this capability to increase the visibility of distributed generation, the household system needs to be configured correctly.

If system security enhancing services can be provided by using high speed communications directly with the household (through assets such as solar PV with a smart meter) then these services should be provided through open and competitive markets. Businesses such as Reposit Power already provide a service to

[38] Australian Energy Council, 2016. AEMC Non-Scheduled Generation & Load in Central Dispatch (ERC0203) submission, 20 May 2016. Accessed online <https://www.energycouncil.com.au/submissions/>
[39] AEM, 2016. Non-scheduled generation and load in central dispatch, Consultation paper, 21 April 2016, Sydney. Accessed online <http://www.aemc.gov.au/Rule-Changes/Non-scheduled-generation-in-central-dispatch>

aggregate energy across many distributed generators. If a sufficient price signal is in place to create revenue for additional security services, then these competitive and innovative business models should meet the needs of the market for security services.

Renewable energy already plays an important part in our energy system, and will be an important technology to help meet our greenhouse emissions targets. We will need more renewable energy as we reduce emissions, given that other very low emissions technologies are either currently illegal (nuclear) or have not been proven up at sufficient scale (fossil fuel plant with carbon capture and storage). The challenges in South Australia are not a renewables problem as much as they are a planning and policy problem.

Chapter 5: Market design to support security and reliability

Increased intermittent and distributed generation will pose challenges in balancing system security and affordability as emissions reduce. Efficient deployment of new technologies will need to reflect and respond to efficient investment signals from the wholesale market.

The current reliability settings of the NEM are adequate to achieve reliable and secure supply. Greater reliability would lead to greater cost, which would potentially be borne by consumers and result in increased electricity bills. If this outcome genuinely reflects the value consumers in aggregate place on reliability, then this would be an efficient outcome. Any consideration of increased reliability, however, needs to take account of the increased uptake of distributed energy resources. Long term, a “one size fits all” approach to reliability settings will cease to be the most efficient way to meet consumers’ needs and so the reliability settings may need to evolve over time.

a. Forward contract market for electricity

To help electricity market participants to manage their exposure to jurisdictional spot prices, financial markets offer derivatives (or hedge contracts). Derivatives come in two forms: over-the-counter contracts (OTC) and exchange traded futures. Most OTCs are bilateral agreements between generators and retailers and the information surrounding these agreements is often not publicly available. Exchange traded futures are offered on the Australian Securities Exchange and the information is readily available. These contracts come in multiple forms, including the period covered (calendar year, financial year, quarters, and monthly) and the type of contracts (base, peak, off peak and $300 caps). Over recent years, due to oversupply in the NEM and declining demand, contract prices have been quite stable when compared to previous periods.

Contract prices are a good indication of the expectations of the overall supply/demand balance throughout the year. The increased prices indicate tight supply/demand, which signals to other producers to enter the market and increase supply. Over the medium to long term, new producers enter the market and higher supply moderates prices until a new equilibrium is met.

Price volatility is an important part of the energy-only market design. It signals to generators when to increase or decrease supply. With a high share of intermittent generation, the increased volatility of supply may require changes to price caps to provide a sufficient signal to firm generators to increase supply when needed. The price cap (maximum price) is currently set at $14,000 per MWh. Under a 100 per cent renewable scenario, a maximum price cap of between $60,000 to $80,000 per MWh may be required to bring firm generation into the market when supply is tight. Whether such volatility would impact the contract market is unknown.

Where firm generation is scarce relative to demand, prices for forward contracts rise. This is evidenced by the significant increase in forward contract prices resulting from the recent removal of more than 2000MW of supply (closure of Northern and Hazelwood) without replacement or changes in demand. These higher prices

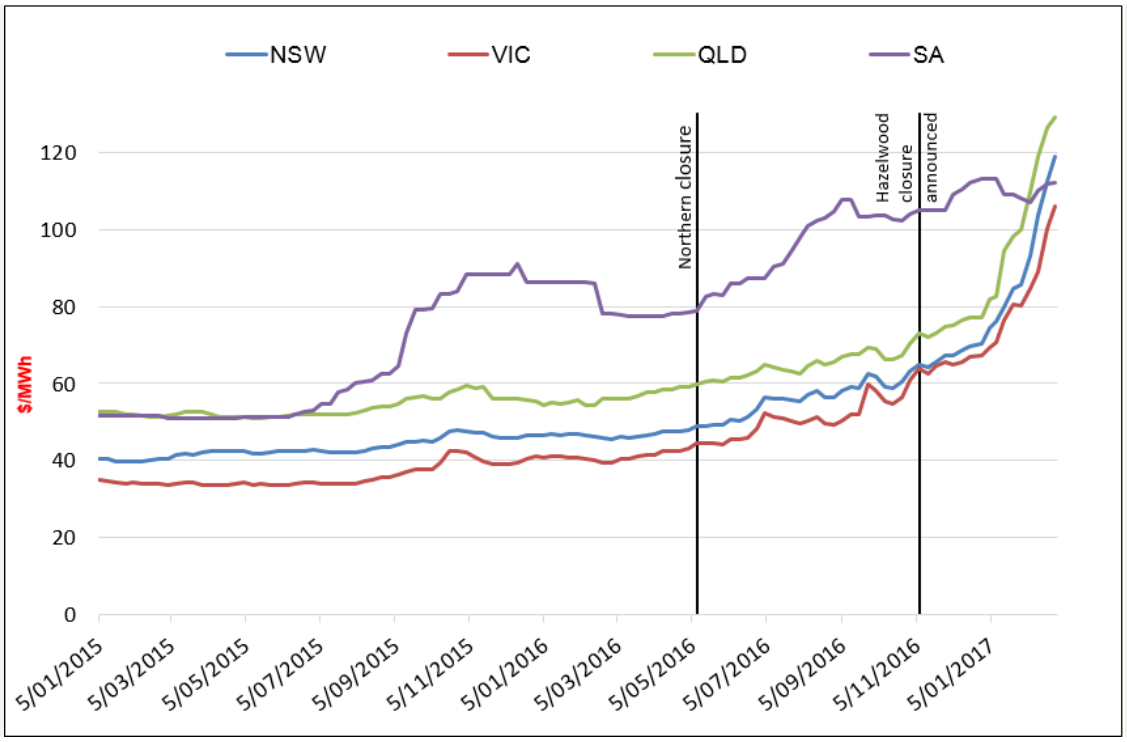
should signal demand for new investment in generation. Lack of policy certainty, or significant policy interventions in the market, including the RET, can weaken long term market signals[40].

The price for cap contracts (which is the revenue model that typically underpins peaking generation) is an indicator of the value of demand response, rather than the spot price.

Impacts from increased renewable generation

In South Australia, the announcement and closure of Northern Power Station led to a large increase in baseload prices and peak future contract prices. Higher contract prices flowed through to higher retail electricity prices.

Figure 2: Future baseload contract prices CY 2017[41]



In its analysis of the July 2016 high price events in South Australia, the Grattan Institute[42] highlighted the need for a credible, predictable climate change policy to achieve effective emissions reduction. The RET was not designed to be the only policy to reduce emissions in the electricity sector. Rising electricity prices in South Australia do not mean the design of the NEM has failed. The market is doing its job, signalling demand for investment in new generation. It is the inability of investors to meet this demand which is the problem. This is

[40] Wood, T., Blowers, D., and Moran, G., 2016. Keeping the lights on: lessons from South Australia's power shock. Grattan Institute. Accessed online <https://grattan.edu.au/report/keeping-the-lights-on-lessons-from-south-australias-power-shock/>
[41] Global Roam, NEM Futures data sets.
[42] Wood, T., Blowers, D., and Moran, G., 2016. Keeping the lights on: lessons from South Australia's power shock. Grattan Institute. Accessed online <https://grattan.edu.au/report/keeping-the-lights-on-lessons-from-south-australias-power-shock/>

the result of more than a decade of policy uncertainty arising from uncoordinated and partial state and Federal Government intervention.

Renewables investment

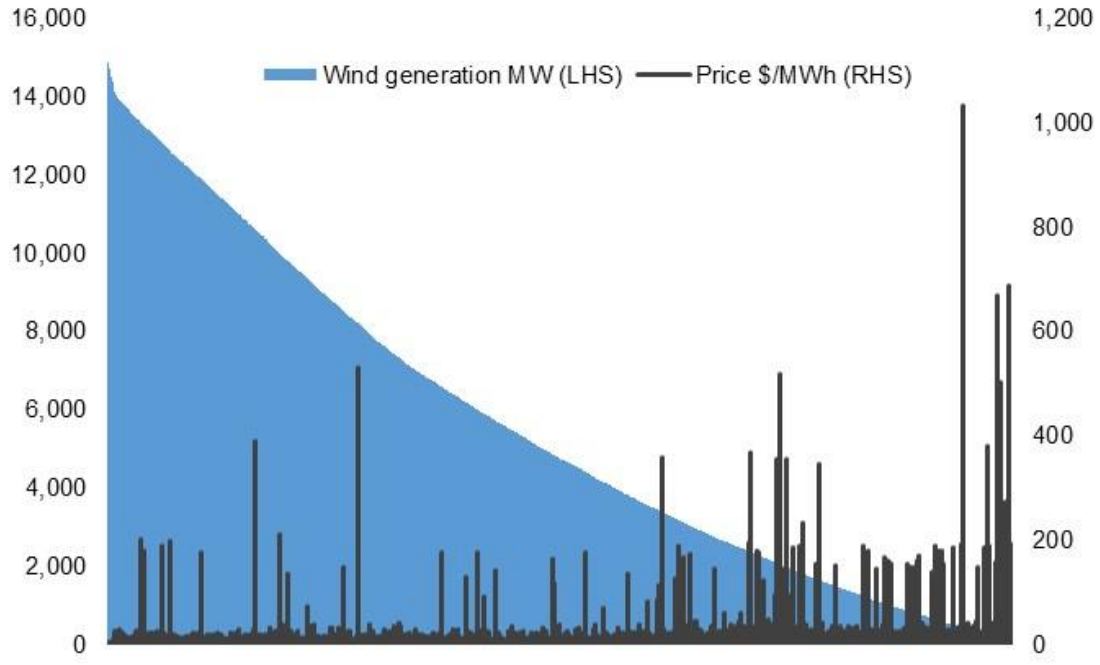
Wholesale electricity prices are a key element in determining whether prospective new generation investments will yield sufficient returns to proceed. Renewable energy projects are currently subsidised through the RET. The RET uses a tradable market for certificates to set the value of the subsidy paid per MWh. This is designed to fund the lowest levelised cost of renewable energy. The RET certificate market is framed with the aim of delivering 33,000 GWh target of renewable energy by 2020, although the scheme continues until 2030.

The decision for renewable energy investors to enter the market will be based on an estimate of returns on investment for each project. For these projects revenue is comprised of the volume weighted price (VWP) from the wholesale market plus the LGC price under the RET scheme. These need to be sufficient for new generators to cover their costs and make a (risk-weighted) return.

Most renewable projects that are currently scheduled are reliant on additional sources of funding to sufficiently de-risk the investment (these include capital grants from the Australian Renewables Energy Agency, debt or equity funding from the Clean Energy Finance Corporation, or government contracts).

The wholesale market provides important information to investors about when and where new generation is most valuable. For example, South Australia is showing signs that the region is saturated with wind generation (Figure 3 below). It is essential to preserve this feedback between demand and supply to ensure efficient investment.

Figure 3: South Australia's wind generation by trading interval and price, 2016[43]



South Australia has high levels of intermittent generation and low levels of interconnection. An efficient market design should discourage over-supply of generators that all supply at the same time, and encourage generation that can supply generation when it is needed, including:

- using hydro or battery storage options, to store surplus energy when renewable resources are strong then discharge energy into the market when demand is high.
- supplying energy from aggregated projects across regions with complementary renewable resources.
- supplying firm generation using a combination of intermittent renewables and firm generation on site.
- designing renewable plant to maximise generation at times of peak demand in a region.

b. Bid and Settlement intervals

The NEM operates as a gross pool market, where all electricity delivered to the market is traded 24-hours a day, seven days a week. The NEM operates as a continuous series of auctions, where the market operator seeks to select the lowest-cost available generation in each 5-minute period. Settlements are conducted on an average price of six of the 5-minute periods over 30 minutes, which determines the spot price at each half-hourly trading interval for each region. This design can result in an inconsistency between the 5 minute prices that market participants base their behaviour on and the settlement price. A proposed change seeks to bring into line settlement and dispatch pricing. At issue is the timing and quality of information provided by market

[43] NEM Review 2017, market data.

participants in advance of each auction, and whether this information can be relied on to provide efficient prices in the long term interest of consumers.

The three rule changes currently being considered by the AEMC will have far reaching consequences with regard to these challenges. These are:

- Demand Side Obligations to Bid into Central Dispatch (ERC 0189) – Initiated 5 November 2015
- Non-Scheduled Generation and Load in Central Dispatch (ERC 0203) – Initiated 24 April 2015
- Five Minute Settlement (ERC 0201) – Initiated 19 May 2016

AEMC undertook an initial analysis of the difference between the total payments by customers that would have occurred, using 5-minute settlement, from 2000 to 2016. They conclude that *"the difference between 5-minute settlement and 30-minute settlement is typically less than 0.1% of total payments through the pool"*[44]. This indicates that on a purely static basis there is no material difference between 5 and 30-minute settlement.

The key question is whether the introduction of 5-minute settlement will change incentives for generators and if this will lead to materially different efficiency outcomes. The AEMC has attempted to quantify the magnitude of efficiency changes that could result from the changed incentives introduced by 5-minute settlement.

The AEMC points out that analysing outcomes under 5-minute settlement should ideally account for changed incentives, i.e. a dynamic assessment[45]. The AEMC's analysis of variations essentially assumes that gross variations in static pricing outcomes imply material changes to dynamic outcomes. We disagree with this position. Without extensive and detailed modelling, it is very difficult to be definitive about the magnitude of the benefits of introducing 5-minute settlement.

Generators respond to price spikes for a range of reasons, and their need to manage the risk of uncertainty appears to dominate a desire to game the basis of settlement. This suggest that there may only be limited changes to dispatch under 5 minute settlement – 5 minute settlement will not improve the market's ability to anticipate price spikes and neither will it materially reduce generators responding to manage the risk of an enduring spike with the result that generators turn on and run into low prices in subsequent dispatch intervals. If dispatch and market prices do not materially change then the impact of moving to 5 minute settlement is not likely to be of material net benefit. This indicates that any benefits in addition to the already implemented rebidding in good faith rule change are uncertain and likely to be very small in magnitude.

In summary:

- there is a lack of evidence that the magnitude of the issue that has led to the consideration of 5-minute settlement is material.
- one of the potential benefits of 5-minute settlement has already been largely realised as a result of the recent "rebidding in good faith" rule change.
- there is no real evidence of material inefficiencies in the operation of the market during times of high prices. The market is working like a market with a complex interaction of many variables resulting in reasonable outcomes.

[44] AEMC, 2016. Five Minute Settlement Working Group: Working Paper No: p.9.
[45] AEMC, 2016. Materiality of the Problem and Responsiveness of Generation and Load. *Five Minute Settlement Working Group: Working Paper No. 1.*

- there is no real basis on which to conclude that the introduction of 5-minute settlement will make any material improvement in the efficiency of the market.
- there is no need to further incentivise fast response generation such as batteries as investment in these is already occurring at an increasing rate and it is possible for battery operators to make profits without the introduction of 5-minute settlement.
- not considering the 5-minute settlement rule change with regard to other related and expected rule changes will create additionality problems where there is a risk of double counting perceived benefits.
- it appears that the prospects of improving dispatch efficiency would be greater if the rule changes to treatment of loads that can be dispatched and currently unscheduled generation were progressed rather than the 5-minute settlement change. They also have the advantage of being lower cost options.
- another material contribution that also could be made to dispatch efficiency would be to have AEMO improve the accuracy of the 5-minute pre-dispatch forecast to the point that it forecasts most price spikes.
- the costs of moving to 5 minute settlement would be high given the broad nature of the rule change and its multiple impacts on the market, its participants and secondary stakeholders.

c. Additional system security services

As non-synchronous generation becomes a larger share of total electricity generation, we can expect more regions to have low system strength. To ensure the system's reliability, AEMC is undertaking a system security market framework review[46]. The measures outlined in the Interim Report provide additional tools for the market operator to manage system security. The AEC supports the continued close collaboration between market participants, AEMO and the AEMC to respond to the market challenges as technology and energy use transforms the market. In particular, we support:

- the development of an emergency fast frequency response service, to expand the scope of ancillary services to meet the needs of the changing network and the proposed governance framework.
- the proposal for a protected events category to better mitigate the risk of extreme events (such as weather events)

Inertia, as defined by the AEMO, is 'produced by synchronous generators' which 'dampens the impact of changes in power system frequency'[47]. Inertia effectively stabilises power systems, allowing the system to cope with rapid changes in frequency due to significant changes in either supply or load. It has historically been provided by synchronous generators and on the demand side by electric motors from large industrial customers.

In regards to increasing inertia, the AEC supports a reward structure that reflects the value inertia provides to the system. The existing causer pays framework may be a useful mechanism to incentivise a demand response for those market participants that add stresses on the level of inertia or rate of change of frequency (RoCoF).

[46] AEMC, 2016. System Security Market Frameworks Review, Interim Report, 15 December 2016, Sydney. Accessed online <http://www.aemc.gov.au/Markets-Reviews-Advice/System-Security-Market-Frameworks-Review>
[47] AEMO, 2016. Update to Renewable Energy Integration in South Australia: Joint AEMO and Electranet Report, February 2016.

AEMO could purchase more system inertia (as proposed in the AGL rule change[48]), and a new fast FCAS service. But if these support services were not developed or were infeasible then a RoCoF limit may be appropriate. At this early stage, it is essential to consider and balance the relative costs and benefits of all options. If it is possible for a competitive process to deliver the necessary services to maintain system security, that competitive process is likely to yield greater efficiency than a regulatory requirement. The existing Network Support and Control Ancillary Service (NSCAS) mechanism provides a framework for these services to be procured by either AEMO or network businesses. The NSCAS quantity procurement methodology is backward looking and does not allow for future impacts or current operations. Prior to establishing new regulatory requirements or a market, an examination should be undertaken of the appropriateness of existing measures to meet security challenges.

As with other ancillary services, it is likely that the revenue streams will be a fraction of that from the energy market. Most assets that are able to provide ancillary services will be dependent on the energy market for the majority of their revenue. A key element of ensuring an adequate supply of ancillary services is to ensure the market design can deliver revenue adequacy and that this is not undermined by poor policy design aimed at incentivizing new generation. This does not preclude some ancillary service provision coming from standalone assets such as synchronous condensers.

How price risk is managed for these new markets will depend on how costs are allocated. If costs are able to be allocated on a causer pays basis, then those that face the costs will be appropriately incentivised to moderate their behavior where it is cost-effective to do so. Where costs are spread across all market participants, then price risk management is not a priority, but is unlikely to be directly manageable.

Constraining generation to prevent the loss of system security should be a last resort, because it decreases the utilization of assets and thus is inefficient for consumers in the long term. Instead, the NEM's strong governance framework and market structure should be leveraged to assist us to find innovative and smart solutions to system security under high shares of intermittent, asynchronous generation. Ensuring that we make the most of our generation resources means that we find the most effective and efficient means of providing a secure system in the long run interest of consumers. This will enable Australia to avoid inefficient outcomes seen in countries such as China where constraining intermittent wind resources has become the norm to maintain system security[49].

d. Visibility of the power system

Visibility of the power system is a key element to integrating intermittent and distributed resources to the network. Maintaining good visibility of intermittent generators and maintaining robust forecasting models assists in the overall system operation and the integration of renewables.

The NEM today does not provide sufficient information at an aggregate level on fuel positions to encourage contracting and investment. This can deter some generators and some large consumers in entering into supply

[48] AGL, 2016. Proposed rule change: NEM Wide Inertia Ancillary Service, *Letter to the AEMC*, Accessed online <http://www.aemc.gov.au/getattachment/bacba344-8989-4107-ae2a-480427c9c9f9/Rule-change-request.aspx>
[49] Australian Energy Council, 2016.The Great Wall ahead of China's integration of renewables Accessed online <https://www.energycouncil.com.au/analysis/china-s-struggle-to-integrate-renewables/>; Luo, G.L., Li, Y.L., Tang, W.J. and Wei, X., 2016. Wind curtailment of China′ s wind power operation: Evolution, causes and solutions. Renewable and Sustainable Energy Reviews, 53, pp.1190-1201

contracts, when in hindsight, both parties could have been better off under a contract. Many of the challenges in South Australia could have been avoided had large users understood the position of the Northern Power Station and the state of the market that would exist without this station.

The lack of sufficient planning information (at an aggregate level to market participants) appears the source of unnecessarily abrupt price changes and a potential impediment to more timely and efficient investment behaviour.

At the generation level increased information and transparency can be beneficial, though the costs to participants of providing information should be weighed against the benefits. Options currently under consideration include a reduction in the threshold for generator registration from 30MW to 5MW, increased requirements on non-scheduled generation, and more transparency on the behaviour of price-responsive load.

In future, at the distributed generation level, it may become necessary to improve the visibility of distributed generation to the network or the market operator. AEMO's ability to robustly forecast the impact of solar PV on network performance will inform the tools it uses to control frequency or the mitigating measures taken in anticipation of an extreme weather event. The roll out of smart meters around the NEM is under way, and smart meters have the capability to report customer level data remotely. The household system needs to be configured correctly to take advantage of this capability

Chapter 6: Prices have risen substantially

a. Drivers of price rises

The unit cost of electricity has been rising for the past decade. This is a function of two key factors: the increasing cost of supplying electricity and the impact of government policy and its objectives. The increasing cost of supply stems from rising prices for key fuels (gas and coal), rising infrastructure costs and the increased cost of meeting peak demand events. The policy costs include the:

- impact of policies to decarbonise electricity supply and the cost of government renewable policy.
- increased reliability standards on network costs.
- cost of other government retail schemes including the use of energy policy to ameliorate hardship and subsidise classes of consumers including pensioners and vulnerable households.
- cost of subsidising the higher cost of providing electricity to regional communities.

To some extent these rising costs can be offset by efficiency improvements, most notably from measures to privatise and deregulate electricity markets and from measures to use electricity more efficiently. To date these gains have been overwhelmed by the rising cost base.

A 2012 Productivity Commission working paper[50] concluded that multifactor productivity in the electricity sector was declining, due to:

- an increase in the ratio of peak to average electricity demand, which lowered average rates of capacity utilisation (this was responsible for half the decline in productivity).
- cyclical investment in lumpy capital assets, which temporarily increased inputs ahead of growth in output.
- a shift to greater undergrounding of electricity cabling, which raised costs and the quality of output, but not the volume of measured output.
- policy induced shifts away from coal-fired power to higher-cost, but less polluting, sources of new supply.[51]

This paper did not fully realise the impact of higher, prescriptive reliability requirements on network costs in NSW or the roll out of mandatory, high-specification smart meters in Victoria.

The current price impact of government policies to decarbonise the electricity system extends well beyond the literal cost of carbon pricing, renewable subsidies and grant funding for related projects. Since 2012, and following the impending closure of Hazelwood power station, more than 5000MW of firm generation will have left the NEM. This has not been replaced. This reduction in the supply-demand balance and a recovery in demand since 2015 has significantly increased the forward contract market for electricity (refer to Figure 2).

Higher wholesale prices are a signal by the NEM for investors to enter the market and increase supply. Investors have been unable to replace retired generation because of sustained policy uncertainty over the past

[50] Topp, V. and Kulys, A., 2012. Productivity in electricity, gas and water: Measurement and interpretation. Accessed online <http://www.pc.gov.au/research/supporting/electricity-gas-water/electricity-gas-water.pdf>
[51] Ibid, pXIV

decade rendering new generation investment currently unbankable. In Australia, the lack of national policy certainty is now the single biggest driver of higher electricity prices. Given the differential between forward wholesale prices ($100-$120 MWh) and what the underlying cost of supply should be ($57MWh based on a 10 year weighted average between 2020-30 from the Climate Change Authority modelling), the electricity cost of sustained national policy inaction is effectively equivalent to a carbon price in excess of $50 a tonne.

This suggests that development of durable and efficient national energy and climate polices, which return investment to the market, are likely to reduce electricity prices.

b. Improving the supply of natural gas for electricity generation

Gas will play a large role in the transition of the electricity sector by reducing emissions, and supplying firm generation, frequency control and inertia, but Eastern Australia's gas market is facing multiple constraints.

Diversifying sources of gas supply

The development of unconventional gas resources has been constrained to date, mainly due to political uncertainty and overly restrictive planning laws and regulatory frameworks, which the relevant regulatory agencies are aware of. Despite several inquiries concluding that the risks imposed by the onshore gas industry can be safely managed, there are several jurisdictions that have moratoriums on gas exploration and fracking.

The Victorian government introduced a bill last year to permanently ban fracking and coal-seam gas exploration, which is currently being debated in parliament[52]. Tasmania introduced a five-year ban in March 2015[53], and the Northern Territory announced a moratorium on fracking in September 2016[54]. This environment has severe implications for the timeliness and diversity of supply. It creates barriers and risks to investment at a time when continued resource development is essential. Moratoriums should be lifted to allow further supply of gas into the market.

Improving the flexibility of gas markets

The ACCC released its report on the East Coast Gas Inquiry[55] in April 2016, which makes a number of recommendations that the COAG Energy Council and state and territory governments can consider to alleviate gas market issues, particularly for industrial users. These include:

- enabling new gas supply to come to market, in particular in south eastern Australia.
- revisiting the regulatory coverage of pipelines, and increasing the ability for pipelines with market power to be regulated.
- the consistency and transparency of the provision of information to the market.[56]

[52] Victorian Legislation and Parliamentary Documents, 2016. Resources Legislation Amendment (Fracking Ban) Bill 2016, Accessed online 17 Feb 2017. <http://www.parliament.vic.gov.au/static/www.legislation.vic.gov.au-bills.html>
[53] Tasmanian Government, 2015. Tasmanian Government Policy Statement on Hydraulic Fracturing (Fracking) 2015. Accessed online <http://dpipwe.tas.gov.au/Documents/Tasmanian%20Fracking%20Policy%20Statement_26-2-15.pdf>
[54] Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, Sited 17 February 2017. <https://frackinginquiry.nt.gov.au/>
[55] ACCC, 2016. Inquiry into the east coast gas market, April 2016, <https://www.accc.gov.au/system/files/1074_Gas%20enquiry%20report_FA_21April.pdf>
[56] Ibid, p20-21.

Similarly, the AEMC released its Stage 2 Final Report for the East Coast Wholesale Gas Market and Pipeline Frameworks Review in July 2016, recommending a package of 15 key reforms to improve the efficiency of gas trading and access to pipeline transportation, forming a roadmap for the future development of the market[57].

In August 2016, the COAG Energy Council released its implementation plan for collaborative action[58] in regards to its Gas Supply Strategy. The plan has numerous actions that are currently being undertaken. The AEMC and its reforms, plays a critical part in the COAG Energy Council's Australian Gas market vision, including the development of a long-term strategy for the design and location of facilitated trading markets. We are supportive of the recommendations made by both the ACCC and the AEMC, which are consistent with the COAG Energy Council's vision.

A long-term strategy should include the whole East Coast gas market framework including the Victorian Declared Wholesale Gas Market (DWGM). The AEMC released their final report on the Review of the Victorian Declared Wholesale Gas Market (DWGM) in October 2016[59]. We support the AEMC's Recommendation 5 whereby COAG Energy Council task the Gas Market Reform Group (GMRG) to consider the AEMC's recommended reforms to the DWGM.

The GMRG's scope of work should not be limited to implementing the AEMC's proposal, but should also assess the merits of the proposal relative to alternative options. Reforms to the DWGM are part of the broader COAG Energy Council agenda to meet the vision for Australia's gas markets, and changes in one part of the market will impact progress toward the vision.

Prior to determining a way forward the review should allow for:

- the consideration of the concerns raised by industry with respect to the AEMC's proposed reforms.
- an analysis of how the current market design could be enhanced to more effectively meet the COAG Energy Council objectives.
- an evaluation of the market design options, taking into account the relative cost and benefits.

An incremental approach to reform that has appropriate regard for existing contracts is warranted. This approach provides a better balance of risks and benefits relative to more heavy-handed reform options and would likely be consistent with supporting industry-led reform.

In developing and mapping out any future market reforms, continued industry engagement is essential with the range of processes currently underway to exam these issues.

[57] AEMC 2016, East Coast Wholesale Gas Markets and Pipeline Frameworks Review, Stage 2 Final Report, 23 May 2016, Sydney. Accessed online <http://www.aemc.gov.au/Markets-Reviews-Advice/East-Coast-Wholesale-Gas-Market-and-Pipeline-Frame>
[58] COAG Energy Council, 2016. COAG Energy Council Gas Supply Strategy Implementation Plan for Collaborative Actions, August 2016. Accessed online <http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/GSS%20Implementation%20Plan%20for%20Collaborative%20Actions%20-%20August%202016.pdf>
[59] AEMC, Review of the Victorian Declared Wholesale Gas Market, Draft Final Report, and 14 October 2016. Accessed online <http://www.aemc.gov.au/getattachment/bc628511-98c9-43fb-8eaa-17f21b44cab4/Draft-Final-Report.aspx>

c. Alternatives to building network infrastructure to service peak demand

Heatwaves earlier this year have been a reminder that pressures on the system due to peak demand have not receded[60]. This pressure affects both the wholesale market and the networks.

With the closure of coal-fired power stations in South Australia and the expected closure in Victoria, the AEMO has assessed the South Australian and Victorian market, and advised there is sufficient generation to meet maximum demand. The increased use of renewable energy will require careful planning to ensure that these risks are managed so the electricity market can continue to decarbonise supply whilst maintaining reliability.

Networks are built to meet local peak capacity requirements. Major upgrades to the network are subject to a regulatory investment test, a component of which is to require the network business to consider non-network alternatives in case they are more cost-effective. It's unlikely that these periodic calls for expressions of interest in providing network support are conducive to procuring the optimal level of network support services. Reforms that could result in a more dynamic market for network support include:

- widening of the scope of regulatory investment tests to include replacement expenditure and to lower the threshold.
- greater use of cost-reflective network tariffs as an on-going signal of the value of peak demand reductions.
- better information on where networks are likely to experience upcoming capacity constraints, via improvements to annual network planning requirements.

The value of these reforms is further explained in our rule change request to the AEMC, *Contestability of energy services - demand response and network support*.[61] As well as the cultivation of active network support markets, passive investments can also make a contribution. Renewable generation such as rooftop solar PV contributes to the supply of electricity in peak demand periods on hot days. The market operator records the solar PV as a reduction in demand. As a result, peak demand is tending to occur later in the day as solar generation drops off. This means that further uptake of rooftop PV is unlikely to impact peak demand much more. Energy efficiency investments, such as housing retrofits, also reduce peak demand.

Critically, the distributed energy resources that will provide network support services will also have a role to play in energy markets (and potentially ancillary services), so it is important that such resources can be co-optimised to provide services to the market in which they can offer most value.

Distributed resources owned by each party should be regarded as theirs to control and the rights and responsibilities associated with the resources should rest with them, though in practice they may find that their utility is maximised by ceding control to another party who can maximise the value of the services on their behalf.

[60] Energy Networks Australia, 2017. How can a heatwave help us to build a smarter energy system? Accessed online <http://www.energynetworks.com.au/news/energy-insider/how-can-heatwave-help-us-build-smarter-energy-system>
[61] Australian Energy Council, 2016. Amendments to Chapters 5, 6, 6A and 7 of the National Electricity Rules, 13 October 2016. Accessed online <http://www.aemc.gov.au/getattachment/505baeff-61b7-4ac9-abb6-d9a389b844d1/Rule-change-request.aspx>

d. Benefits of cost reflective prices

Cost reflective prices provide stronger signals for consumers to minimise peak demand, thereby lowering future network costs, which are passed on to all consumers. The network charges component of a consumer's electricity bill does not, in most cases, reflect the costs of supplying network services to that consumer. In general, distribution network charges currently over-recover for off-peak use of the network and under-recover for peak use, which results in some consumers paying more than the costs caused by their electricity use while others pay less than the costs caused by their electricity use.

The AEMC reported that average network charges for residential consumers under cost reflective prices could be reduced by $28 to $145 per year, and that a small business could save up to 34 per cent of its total annual electricity network charges by using less electricity at peak times for just 20 hours of the year when electricity networks are congested.[62]

The AEMC's rule change on distribution network pricing arrangements will see network prices that better reflect the costs of providing network services to individual consumers and allow consumers to make more informed decisions about how they want to use energy services. The AEMC reported that under the distribution network pricing rule change final determination, it was estimated that 'up to 80 per cent of consumers will face lower network charges over the medium term under cost reflective network prices, with average network charges estimated to fall by up to $57 a year. The full benefits of the new network pricing rules cannot be realised without advanced meters'.[63]

AEMC's rule change on expanding competition in metering and related services, which will commence on 1 December 2017[64], facilitates a market-led approach to the deployment of advanced meters where consumers drive the uptake of technology through their choice of products and services. AEMC note that consumers with advanced metering will have greater ability to manage their electricity use.

Furthermore, advanced meters and cost reflective price structures can also send efficient signals to consumers regarding whether to take up of other technologies, including solar PV and battery storage, which can assist consumers to manage their energy usage and costs. Competition is more likely to drive innovation and facilitate the deployment of energy services to consumers at the lowest possible cost.

A point that is often overlooked is that cost-reflective network tariffs do not have to be passed through in full to be effective. Retail competition will drive retailers to design value propositions for customers that are easy to understand. It is too early to be definitive about the forms these may take, but they could include rebates for load control (to be used in a way that does not affect amenity, such as off peak pool pumps and air conditioner cycling) or fixed price contracts where the retailer manages the underlying risks arising from the customers' load profile.

The drawback of opt-in network tariffs is that they do not require customers who benefit from current tariff design to face the true costs of their load profile. This may be an issue when new technologies like electric

[62] AEMC, 2015. Expanding competition in metering and related services, Rule Determination, 26 November 2015, Sydney, p.38 Accessed online <http://www.aemc.gov.au/getattachment/ed88c96e-da1f-42c7-9f2a-51a411e83574/Final-determination.aspx>
[63] Ibid, p.xiii
[64] Ibid.

vehicles become more popular as uncontrolled vehicle charging could put stress on the network. In the medium term, we encourage governments to revisit constraints on tariff reform.

e. Monitoring competitive retail markets

Australia's electricity sector currently has in place monitoring mechanisms for the retail energy market. This includes annual reviews of competition and performance of the retail energy market by the AEMC and AER as well as jurisdictional regulatory reviews. Compared to most other industries, energy retail is subject to a high level of scrutiny and analysis.

In June 2016, the AEMC released its 2016 Retail Competition Review[65]. It found that in electricity and gas markets across jurisdictions in the NEM, competition continued to be effective in most jurisdictions and is delivering benefits for customers, whereby the key market indicators in those markets improved or remained steady since 2014. The AEMC report also reported on customer satisfaction, and found that the quality of customer service and value for money improved in 2016[66].

According to the AEMC report, customers who shop around in deregulated markets can make substantial savings on their electricity bill. Figure 4 outlines the savings customers made by simply comparing offers and switching to a better offer.

Figure 4: Typical savings customers made switching from an electricity standing or default offer to a competitive market offer annual savings[67]

The AEMC identified four electricity retailers, and three gas retail businesses in the ACT and found that competition was not effective in this market, which still has regulated gas and electricity prices. This contributed

[65] AEMC, 2016. Retail Competition Review, Final Report, 30 June 2016, Sydney. Accessed online <http://www.aemc.gov.au/getattachment/d5a60d5b-d2dc-4219-af60-51c77d8aaa4f/Final-Report.aspx>
[66] Ibid, p.i
[67] Ibid, p. iii

to ACT households being the second least satisfied (at 47 per cent) with the levels of competition in their jurisdiction, only behind Tasmania at 23 per cent. As such, the AEMC recommended jurisdictions to phase out retail price regulation for electricity and natural gas where effective retail competition can be demonstrated, as agreed under the Australian Energy Market Agreement[68].

We support the AEMC's framework for monitoring the market, and agree with their use of indicators to assess the state of competition across the NEM. The AEMC use the following five competitive market indicators:

1. customer activity in the market.
2. customer outcomes in the market.
3. barriers to retailers entering, expanding or exiting the market.
4. the degree of independent rivalry among retailers in the market.
5. whether retail energy prices are consistent with a competitive market.[69]

The AEMC uses these indicators as a framework for evaluating competition in each retail market and then considers the information collectively to inform a judgement on the overall state of competition.

The AER reports annually on the performance of the retail energy market, under the requirement of the National Energy Retail Law, which identifies emerging issues requiring a compliance or enforcement response, and brings transparency and integrity to the market. The AER report includes:

- an overview of the retail market: retailers' shares of small and large customer markets, the number of customers on standard and market retail contracts and switching activity.
- energy retailer performance: customer service and complaints, the assistance given to customers experiencing payment difficulties (including hardship programs) and disconnections.
- an energy affordability analysis: estimates the annual bills of households, including as a proportion of household disposable income.[70]

The AER annual report for 2015-16 notes there were five new retail electricity market entrants in New South Wales, five in Victoria, and two in South Australia and South East Queensland, proving signs of effective competition.

In Australia, each jurisdiction monitors their respective electricity retail markets. For example, in South Australia, the Essential Services Commission of South Australia (ESCOSA) annual report[71] comparing electricity retail prices for residential and small business customers provides consumers with a comparison and assessment of annual bills for each of the retailer's standing offers, lowest-priced market offer and highest

[68] Ibid, p. 29.
[69] Ibid, p. 1
[70] AER, 2016. AER annual report on the performance of the retail energy market 2015-16, 22 November 2016. Accessed online <https://www.aer.gov.au/retail-markets/performance-reporting/aer-annual-report-on-the-performance-of-the-retail-energy-market-2015-16>
[71] ESCOSA, 2016. Annual Report 2015-16, September 2016. Accessed online <http://www.escosa.sa.gov.au/ArticleDocuments/271/20161228-Corporate-ESCOSAAnnualReport_2015-16.pdf.aspx?Embed=Y>

priced market offer. ESCOSA'S report allows consumers to see the difference between available offers, and aids in informing customer choice.

Following the deregulation of the South East Queensland (SEQ) retail electricity market in July 2016, the Queensland Competition Authority (QCA) will now monitor the SEQ retail electricity market. The AEC believes the QCA's market monitoring report will offer the same benefit to consumers in Queensland as that of ESCOSA's annual report.

Additional surveys can also be used to complement annual reviews. The Energy Consumers Australia (ECA) Energy Consumer Sentiment Survey Report[72] found that consumers in deregulated markets were also much more satisfied with the level of competition in the energy market.

[72] Energy Consumers Australia, 2016. *The Energy Consumer Sentiment Survey – July 2016.*

Chapter 7: Energy market governance is critical

a. Australian energy market governance arrangements

In December 2014, the COAG Energy Council agreed to the Terms of Reference for a Review of Governance Arrangements for Australian Energy Markets (the Review). The Review was initiated in response to a COAG commitment to review the governance arrangements in the Australian energy market five years after the establishment of the Australian Energy Market Operator in 2009.

In 2015, the government undertook the Review and produced a Final Report[73] to the COAG Energy Council. The report concluded that the division of functions established by the current governance arrangements for Australian energy markets is fundamentally sound and that Australian energy market governance is amongst best practice internationally[74].

The AEC broadly agrees with the findings of the Review and supports the current structure of split responsibilities between the different energy bodies remains fit for purpose. These are:

- the COAG Energy Council – overarching policy.
- the AEMC - rule changes and reviews, where directed.
- the AEMO – operation of the market and technical advice.
- the AER - implementing the rules and enforcement.

Australia's energy market governance relies on clearly specified and stable policy. In the absence of a stable national policy, in particular carbon policy, Australia's energy market governance arrangements will not perform as effectively as intended.

COAG Energy Council

AEC supports an expanded role for the Standing Committee of Officials (SCO) to avoid the Council becoming a choke point. Increasing the role of the SCO could assist to improve the strategic focus of the Council by allowing it to focus on high level directions rather than implementation details. The AEC considers that the Review's recommendations around an enhanced role for the SCO, supported by a permanent secretariat will improve the operation of the Council. Delegating work to the SCO to manage will better enable the Council to focus on key priorities.

The benefits of the NEM are greatest where all jurisdictions apply the same set of national rules. That said, there will always be pressure from individual jurisdictions to move away from national rules. Short of an

[73] COAG Energy Council, 2015. Review of Governance Arrangements for Australian Energy Markets - Final Report, 23 October 2015. Accessed online <http://www.coagenergycouncil.gov.au/publications/review-governance-arrangements-australian-energy-markets-final-report>
[74] Ibid, p.7.

amendment to the Constitution, jurisdictions will always have the power to enact their own laws. The Review's recommendation to develop clear and rigorous criteria for assessing proposals by jurisdictions who seek derogations[75] is a useful mechanism to ensure the costs and benefits of such choices are transparent.

b. Monitoring the performance of the energy system

The NEM, and the respective bodies that operate with it, should continue to be regularly reviewed to ensure they are achieving the NEM objectives. The NEM is a data-rich system. The wholesale market has a level of transparency unparalleled in Australia's commodity markets and this supports the AER's ongoing monitoring. While price spikes are a natural and essential feature of the energy only market the AER publishes reports every time the spot price exceeds $5,000.

The financial markets are a mix of exchange-trade and over-the-counter contracts. The former generate publicly available trading data that indicate the contract price of energy (and additionally LGCs).

Using its information-gathering powers, the AER requires network businesses to submit an annual statement of operational and financial data. The majority of this information is publicly available. As set out in our response to chapter 6, multiple regulatory bodies carry out reviews of retail competition and publish relevant metrics. Additionally, retailers are obliged to publish their tariff offerings and to provide their full range of tariffs for use in government price-comparison websites (Energy Made Easy, for NEM states other than Victoria, and Victoria Energy Compare).

c. Integration of energy and emissions reduction policy

A national stable emissions reduction policy, whatever the mechanism, will provide the framework for the energy market bodies to reduce emissions. The type of policy chosen will determine what type of additional governance arrangements is needed, if any, to reduce emissions in the energy sector.

Amending the National Electricity Objective (NEO)

While Australia has committed to reducing its emissions, the problem is how this will be achieved. One argument is the value of adding an environmental objective to the NEO, with the assumption that this will assist with the integration of energy and climate change policy.

The current NEO states that:

"the objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:

(a) price, quality, safety, reliability, and security of supply of electricity; and

(b) the reliability, safety and security of the national electricity system."

The aim of the NEO is efficient energy services (taking a long-term perspective) with reference to a range of other characteristics: price, quality, safety, reliability, and security of supply.

[75] Ibid, p.7.

The AEMC recently released its '*Applying the energy objective: A guide for stakeholders*'[76] paper which explains how the NEO is interpreted for the purposes of their decision-making. As the rule maker, the AEMC's understanding of the NEO is particularly pertinent.

The paper states that "the analysis of a particular rule change could therefore be considered as an assessment of a number of possible outcomes and determining which outcome could deliver the greatest efficiency benefit, giving due consideration to each of the relevant variables"[77]. These other characteristics act as side constraints to the pursuit of efficiency, which is still the primary goal of the NEO.

The other characteristics typically manifest as static thresholds at any given point in time, with the thresholds defined by bodies other than the AEMC. For example, reliability is determined for the wholesale market by the Reliability Panel and for networks by jurisdictional governments. Safety is determined by jurisdictions or their regulatory agencies. Service qualities are often derived from technical standards, developed through Standards Australia (though these are only binding to the extent that jurisdictions adopt them). Therefore, the AEMC, (and, as relevant, the AER and AEMO) do not necessarily seek to further the goal of any of the other characteristics in their decision-making; instead they avoid undermining the goal.

There is no clear threshold at the level of the NEM for emissions reduction, other than the economy wide national target for 2030 based on the Paris Agreement[78]. Similarly, several jurisdictions have adopted long term goals for achieving net zero emissions.

The NEO is not the sole key objective that governs energy market body decision making. There is also the national gas objective and the national energy retail objective, which are couched in broadly similar terms and would need to be considered as part of embedding an environmental objective in the NEO.

Changing the NEO by including an environmental objective is not an effective substitute for sound emissions reduction policy settings. If the government sets clear national policies for emissions reduction, then this will inform the work of the energy market bodies, regardless of whether the NEO references them.

Expediting decision-making to keep up with the pace of change

The AEC acknowledges that the electricity sector is transitioning rapidly, and that our current governance and decision making processes need to keep up with the transition. One decision making process that could be examined given the changing environment is the regulatory investment test for transmission (RIT-T) arrangements. Under the present RIT-T arrangements, any investment (paid for by consumers on a regulated basis) must be robust and provide a positive net welfare benefit in the majority of future scenarios considered.

Under the existing technology and policy uncertainty, the challenge is to provide least cost, reliable energy to consumers while lowering emissions. The extent of the take up and type of intermittent generation, distributed generation, demand management and energy productivity add to the risk of long-term investments. As the energy sector transforms structurally, using a risk and time weighted approach to the costs and benefits modelled for the RIT-T may provide greater protection to consumers and mitigate the risk of inefficient outcomes. In the long term, it may be beneficial to reform transmission network payments to allow the investor

[76] AEMC, 2016. Applying the Energy Market Objectives: A guide for stakeholders, 1 December 2016.
[77] Ibid, p.7.
[78] Paris Agreement, 2015. – Articles 2, 4.19

to face some risk to their investment, creating incentives for efficiency and full consideration of all market and non-market options to supply energy.

A RIT-T should be the last step in a broader process aimed at reducing congestion to maximise the efficiency of the supply of electricity to meet demand. The need to respond to changing market conditions should be carefully weighed against the long-term cost consumers may incur for incorrect decisions, and the bar set appropriately high relative to the risk to consumers.