



The Health of the National Electricity Market

2020

Energy Security Board

Volume 1: The ESB Health of the NEM Report

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Abbreviations

AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DER	Distributed Energy Resource
ECA	Energy Consumers Australia
ENA	Energy Networks Australia
ENCRC	Energy National Cabinet Reform Committee
ESB	Energy Security Board
ESOO	Electricity Statement Of Opportunities
FCAS	Frequency Control Ancillary Services
GSOO	Gas Statement of Opportunities
IEA	International Energy Agency's
ISP	Integrated System Plan
LV	low voltage
MWs	megawatt seconds
NEM	National Electricity Market
NER	National Electricity Rules
NSCAS	Network Support and Control Ancillary Services
OTC	over the counter
PASA	Projected Assessment of System Adequacy
QNI	Queensland to New South Wales Interconnector
RIS	Renewable Integration Study
TNSP	Transmission Network Service Provider
USE	unserved energy
VaDER	Value of Distributed Energy Resources

Executive Summary

In 2019 the former COAG Energy Council approved a Strategic Energy Plan for the National Electricity Market (NEM). This Plan built on the recommendations in the 2017 Finkel Review covering the transition in the NEM from large scale thermal generation (mainly coal fired) towards a mix of large and small scale renewable generation, (mainly wind and solar) supported by storage and existing generation. The Strategic Energy Plan has six objectives to be met as the market transforms:

1. Affordable energy and satisfied consumers;
2. a secure electricity and gas system;
3. reliable and low emissions electricity and gas supply;
4. effective development of open and competitive markets;
5. efficient and timely investment in networks; and finally
6. strong but agile governance.

In this Health of the NEM report, the Energy Security Board assesses progress against these objectives and considers the future outlook. Progress is being made and the outlook is improved on previous years.¹

Affordability and satisfied customers

The Covid-19 pandemic increased financial pressure on both residential and business consumers. The proportion of customers in debt increased and steps were taken by the Australian Energy Regulator (AER) to provide support to consumers and electricity businesses as many customer bills could not be paid. As a consequence of the pandemic, affordability remains a critical issue for some customers. While both wholesale and retail prices fell the effect of Covid-19 on both residential and business income was significant. The outlook for affordability improved with retail prices falling and an end to the pandemic in sight. There are, however, risks to this more favourable outlook. The growth in renewable generation has been a primary driver in lower prices, but higher consumer prices could occur if we do not deliver a smooth transition. For example driving out aging thermal generation early and needing additional and earlier investment in transmission and dispatchable generation to maintain security and reliability may impact. Properly considered investments in generation and networks should improve overall affordability but inappropriate investment will not.

Consumer satisfaction has improved from a low level but remains below that in most other essential services industries. Communications to customers must improve as the relationship with retailers and other service providers expands.

¹ A description of the National Electricity Market and its operation was included in the 2019 Health of the NEM Report at Appendix A.

<http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/The%20Health%20of%20the%20National%20Electricity%20Market%20V01.pdf>

The websites of the AER and AEMO also have helpful introductions. For AEMO-

<https://aemo.com.au/learn/energy-markets-and-systems>. And for AER-<https://www.aer.gov.au/industry-information>

During 2020, customers continued to install their own generation, battery storage continued to grow and consumers had more opportunities to manage their demand and improve their energy efficiency. The importance of distributed energy resources to the overall supply mix will continue to grow in the future and the post 2025 Market Design work on distributed energy resources and two-sided markets should offer further opportunities for customers to capture value. It is also important that as the industry moves out of the Covid-19 recession, vulnerable consumers do not miss out on the opportunities afforded to other customers, particularly where these can lower costs.

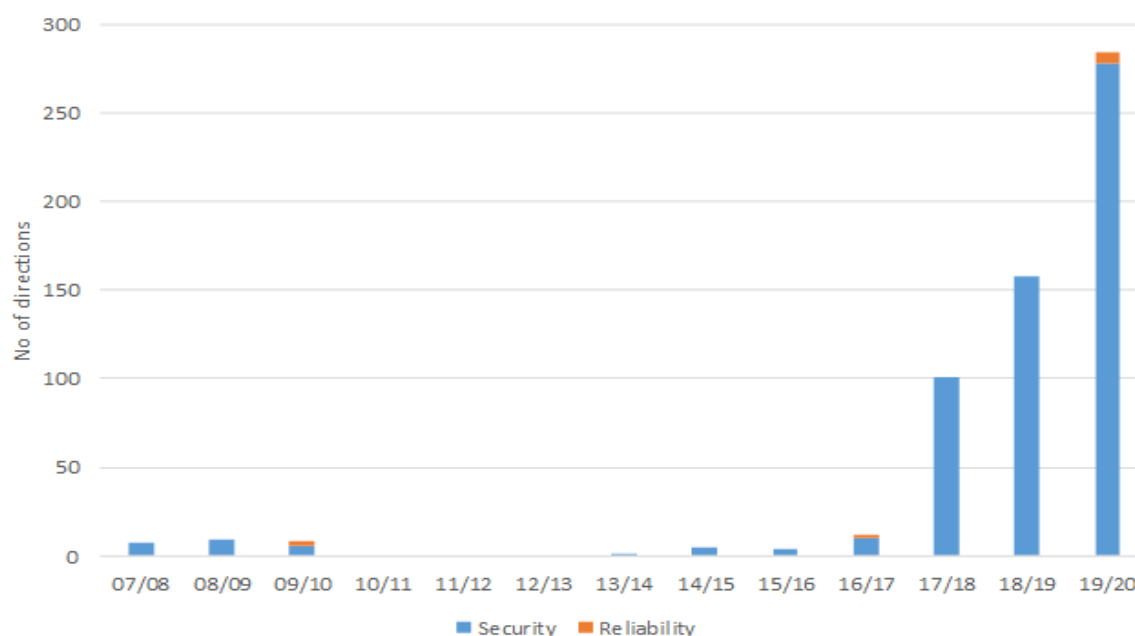
A more detailed discussion of affordability and consumer satisfaction is in section 1.

A secure system

Security remains the most concerning issue in the NEM. Maintaining the electricity system within the required parameters for frequency, voltage, inertia and system strength becomes harder as variable renewable generation increases its presence in the NEM. Wind and solar powered generation resources are non-synchronous and do not have the same technical characteristics as thermal and hydro power generation. In addition, both load and supply variations have increased with the growth in behind the meter and utility scale weather dependent generation along with an aging and less reliable thermal generation fleet.

There are ways to manage these issues but efficient solutions to these problems are complicated by both the significant pace of change and the lack of markets or other means of valuing all the system services essential to system security. To manage security issues, the Australian Energy Market Operator (AEMO) has had to intervene in the market more than in earlier years. The number of directions each year is shown in Figure 1.

FIGURE 1 AEMO DIRECTIONS BY TYPE



SOURCE: AEMO

The outlook for security is rated moderate to critical. The reason for the improvement in outlook is the measures taken by the Australian Energy Market Commission (AEMC) to improve system strength and the interim security measures introduced. The ESB post 2025

Market Design work recognizes the importance of system security and notes several rule changes being considered at present whose implementation during 2021 will assist. In addition, there is widespread agreement in industry to adopt further measures to improve the procurement of essential system services and to do so expeditiously.

This is discussed further in section 2.

System reliability and low emissions

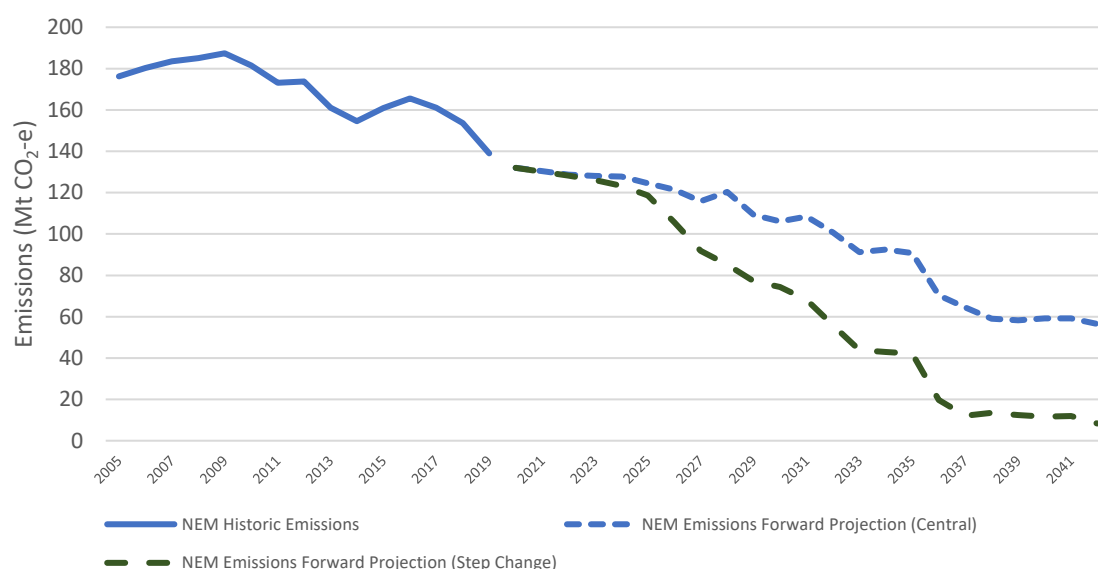
System reliability and low emissions is rated as moderate, an improvement on 2019's rating of critical. There are no immediate reliability concerns and a series of changes to improve reliability were accepted by Energy Ministers in March 2020 and implemented. These changes amend the Retail Reliability Obligation to trigger at a higher reliability standard; establish an out-of-market capacity reserve on a temporary basis; and continue to use the short and medium term notice Reliability and Emergency Reserve Trader to manage unexpected contingencies.

Emissions have reduced substantially in the NEM as Figure 2 shows. By the end of 2020 emissions in the NEM will be 25% below 2005 levels and by 2030 this reduction is expected to be well over 50%. The Integrated System Plan (ISP) examines multiple scenarios and at present the NEM is tracking the faster, or 'Step Change' trajectory shown below. This reflects the rapid investment in renewable generation and the related decline in thermal generation.

The outlook for reliability and low emissions is moderate. The Electricity Statement Of Opportunities (ESOO) forecasts some concerns in NSW around 2023-24 as Liddell closes but the upgrade to the Queensland-NSW transmission interconnector is under and construction and progressing well; and local new renewable generation of around 900MW is underway. The unreliability of older generation plants is already a reliability risk in both Victoria and NSW and the wave of new renewables generation entering the system requires adequate firm and flexible back-up. This situation will require careful management and monitoring, assisted by post 2025 design measures and major policy steps being taken in some state jurisdictions.

Reliability and emissions are discussed in section 3.

FIGURE 2 NEM EMISSIONS - HISTORIC AND FORWARD PROJECTION



SOURCE: DEPARTMENT OF INDUSTRY (HISTORICAL), AEMO 2020 ISP (PROJECTIONS)

Effective development of open and competitive markets

The 2020 rating of this criteria has improved from moderate in 2019 to good. Competition in the wholesale electricity market is evident through spot prices that have dropped to levels not experienced since 2015. The forward markets suggest that this trend will continue over the next three years. Current forward prices are between \$40-60 per MWh depending on region. The development of dispatchable generation (storage or peaking generators) to replace retiring thermal plant, will be important to keep overall wholesale prices at reasonable levels. Retail markets show little change in market share since 2019, possibly due to Covid-19 impacts and the risks faced by retailers in managing customer debts and hardship.

The contract market in the NEM has grown over 2019-20. Exchange traded volumes have grown from around 50TWh per annum to 735TWh in 2019-20, whilst over the counter (OTC) bilateral contracting has remained relatively stable. Transparency in the electricity contract markets would be enhanced by an expansion of the AER's powers to gather information. In the gas markets a range of measures adopted during the year (and still being implemented) should significantly improve transparency through reporting obligations.

Both coal and gas markets are influenced by global dynamics and, as a result, have seen declines since 2018. These markets generally support access to generators in the NEM, though they often lack transparency. Gas prices are expected to slowly rise out to 2022 as economies recover while coal prices are expected to remain flat. The coal price behaviour is uncertain as many global coal companies are not profitable at current prices. Coal quality is an issue for some plants as availability of supply tightens and there could be a risk of rising black coal prices. Spot gas is currently trading at around \$5-6 per GJ and, according to forward market expectations, it will trend to \$6-7 per GJ by 2022. Meeting peak winter demand for gas in the southern states past 2024 may be an issue unless further developments of supply occur.

Innovation is a highlight with capital costs of most technologies expected to fall significantly in coming decades. The Commonwealth Government's Low Emissions Technology Statement released in August outlined target areas – clean hydrogen, energy storage, low emissions steel and aluminium production, carbon, capture and storage and soil carbon. These matters are discussed in section 4.

Efficient and Timely Investment in Networks

The current rating for network investment is good-moderate marking an improvement on 2019. Critical investments from the ISP are on track, actionable ISP rules are in place, interim rules concerning planning for REZ developments are under consideration, and a workplan for DER integration is underway.

The outlook remains at moderate rating as challenges emerge in building the expanded transmission network. The timing of the new investment needed is linked to the location and increase in renewable generation. Significant investment is also needed in the distribution network as DER integrates further into the system. The technical and regulatory challenges posed by DER are not trivial and work is underway as part of the post 2025 Market Design initiatives. Further discussion on network investment is in section 5.

Strong but Agile Governance

The current position and outlook for governance is moderate. There have been major changes to governance at the Ministerial level but their significance is yet to be revealed. The former COAG Energy Council has been replaced by the Energy National Cabinet Reform Committee (ENCRC) and an Energy Ministers Meeting to deal with matters not included in the Cabinet level agenda.

A review of the ESB was conducted in 2019-20 and Ministers decided that work on post 2025 Market Design initiatives should continue into 2021. The future of the ESB will then be decided.

During the year the jurisdictions pursued a number of policy initiatives alongside NEM policy developments and mechanisms. All the states and territories in the NEM set their own emissions target (net zero by 2050), emissions trajectory and enabling policies. The Commonwealth has underwritten several key transmission projects, continues to work with several generation projects on the potential for underwriting and announced a gas led recovery for manufacturing and its Technology Statement. All these initiatives need to be managed within the NEM if it is to remain an integrated national electricity market - which makes for a challenging outlook.

The position on all the six criteria assessed is summarised in Table 1 and further discussion on governance is in section 6.

TABLE 1: CURRENT 2020 STATUS AND FORWARD OUTLOOK FOR THE NEM

	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Affordable energy and satisfied consumers	Moderate-Critical	Moderate	Moderate-Critical	Moderate
Secure electricity and gas system	Critical	Moderate-Critical	Critical	Critical
Reliable and low emissions electricity and gas supply	Moderate	Moderate	Critical	Moderate
Effective development of open and competitive markets	Good	Good-Moderate	Moderate	Good-Moderate
Efficient and timely investment in networks	Good-Moderate	Moderate	Moderate-Critical	Moderate
Strong but agile governance	Moderate	Moderate	Moderate	Moderate

1. Affordability and Satisfied Consumers

Overall Assessment

To assess the health of the NEM in terms of affordability and consumer satisfaction, four criteria are examined. These are whether or not:

1. Energy is increasingly affordable for all consumers, supported by consumer protections and access to dispute resolution.
2. Consumers are empowered to manage their demand and can access distributed energy and energy efficiency solutions.
3. Consumers are able to easily identify and secure the best deal for their circumstances.
4. Vulnerable consumers are on suitable pricing plans, receiving concessions when needed, and can benefit from distributed energy and energy efficiency schemes.

Affordability is improving as retail and wholesale prices continue to fall but affordability will remain a function of the economic circumstances as the COVID-19 recovery continues. The present rating has been kept at Critical largely due to the Covid-19 negative impact on household and business income. The outlook for affordability remains Moderate as the need for investment in dispatchable generation, transmission to integrate renewables, and fuel costs for incumbent generation risks upward pressure on prices.

The June 2020 ECA consumer sentiment survey suggests increasing satisfaction in household and business about the value for money. However, satisfaction with electricity still trails the next lowest rated essential service on this measure by 11%. Gas and insurance are both at 68% levels of satisfaction and electricity is at 57%.

The June 2020 ECA consumer sentiment survey found that the uptake of smart technology and energy management systems is modest but growing. The Post 2025 Market Design work through the Valuing DER and Two sided markets workstreams is working to ensure the market arrangements and regulatory frameworks support the use of these new technologies.

Consumers' confidence in the information and tools available to make decisions about energy is improved from a low base. New questions added into the June 2020 ECA consumer sentiment survey show that a large number of consumers think there is room for improvement in the communications they receive from their energy providers. A data strategy is being put in place to *inter alia* improve access to information to help consumers identify and secure better deals

Finally, COVID 19 impacts have exacerbated customer vulnerability. The electricity system is transforming rapidly and vulnerable customers must be brought along and not get caught by gaps in the consumer protection framework or lack of access to the same resources afforded to others as the energy system transforms.

The overall assessment of affordability and customer satisfaction is shown in Table 2 below.

TABLE 2 AFFORDABILITY AND SATISFIED CONSUMERS

	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Affordable energy and satisfied consumers	Critical	Moderate	Critical	Moderate
Consumers are empowered to manage their demand and can access distributed energy and energy efficiency solutions	Moderate-Critical	Moderate	Moderate-Critical	Moderate
Consumers are able to easily identify and secure the best deal	Good-Moderate	Good-Moderate	Good-Moderate	Good
Consumers with vulnerabilities are protected	Critical	Moderate-Critical	Critical	Moderate-Critical
Overall	Moderate-Critical	Moderate	Moderate-Critical	Moderate

1.1. Affordable energy and satisfied consumers

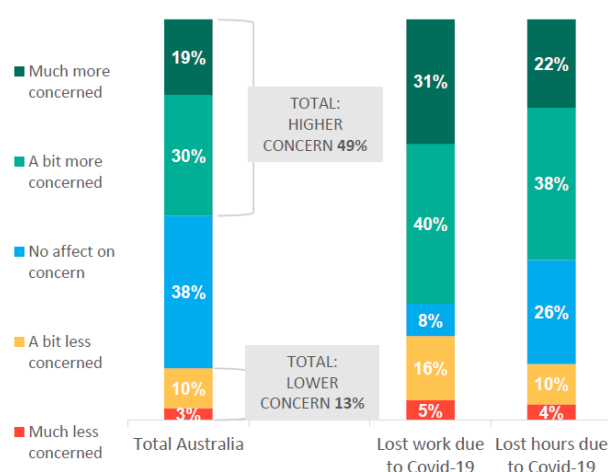
Impact of COVID-19 on Electricity Consumers

The COVID-19 pandemic has had a widespread impact. Both household and business consumers have been under increased financial pressure due to the economic impacts that have ensued. Some residential consumers have faced falling incomes at the same time as their electricity consumption has grown. Businesses have had significant falls in revenue as they hibernated during the pandemic. Whilst support from Governments reduced the severity of the financial impacts, consumers report concerns about their ability to pay bills and the AER has observed the growth in energy debt by both households and businesses.

Figure 3 from research sponsored by Energy Consumers Australia (ECA) in June 2020 highlighted that 49% of those surveyed were more concerned about their ability to pay household bills than before the COVID 19 pandemic began; this increased to 71% for those that had lost work due to COVID-19 or 60% for those who had lost working hours.

FIGURE 3 SHOCK TO THE SYSTEM: ENERGY CONSUMERS' EXPERIENCE OF THE COVID-19 CRISIS - THE NUMBERS

Concern with paying bills (%)



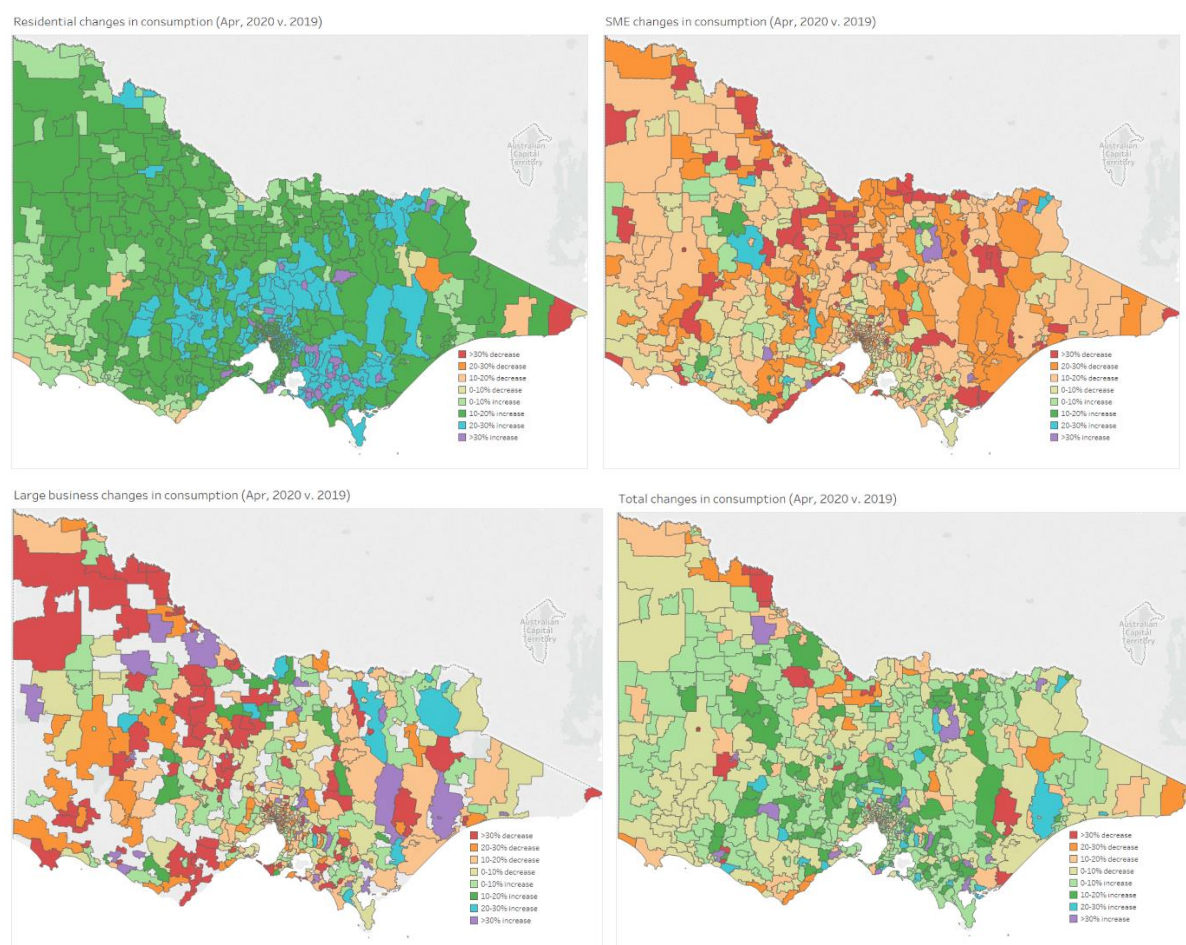
SOURCE: ESSENTIAL RESEARCH FOR ENERGY CONSUMERS AUSTRALIA JUNE 2020

It is interesting to examine Victoria in more detail as the State hit hardest by Covid-19 lockdowns. During Quarter 2 2020 consumption in Victoria fell only two percent on average - but this statistic obscures the differing impacts at a regional and consumer level. In July 2020, Energy Networks Australia (ENA) mapped the impacts of COVID-19 and the restrictions on residential, small to medium enterprise and large business' electricity consumption in April 2020 relative to 2019. They used Victorian Distribution Network data² (the details are shown below in Figure 4). In its associated report ENA highlighted that:

- Total consumption, combining all three consumer types, ranged from reductions of up to 50 per cent to increases just under 50 per cent.
- While Victorian consumption state-wide is down, only one-third of the postcode areas experienced a decline. This effect is driven by six key suburbs, such as the Melbourne CBD, which normally have very high consumption, but are now showing a significant reduction.
- Residential consumption in Q2 2020 is about 20 per cent higher on average than the same period last year, due to a combination of COVID-19 and lower temperatures. In April (under lockdowns), residential demand increased about 20 per cent, but by June, even with the colder winter temperatures, demand showed only a 10 per cent increase over the previous year.
- Business consumption in Q2 2020 was about 10-15 per cent lower on average than the same period last year, largely due to COVID-19. In April, SME demand was reduced by more than 30 per cent in some locations, particularly in the CBD as working from home became the new normal.

² <https://www.energynetworks.com.au/news/energy-insider/2020-energy-insider/mapping-the-impact-of-covid-19-on-electricity-demand/>

FIGURE 4 MAPPING THE IMPACT OF COVID-19 ON ELECTRICITY DEMAND



SOURCE: ENERGY NETWORKS AUSTRALIA – 2020 ENERGY INSIDER

Responding to the COVID-19 impacts on consumers

In response to early concerns about the potential for consumer financial stress, in March 2020, the AER released a Statement of Expectations to energy businesses setting out the priorities for supporting customers, and principles it expected energy retailers to follow to avoid imposing unnecessary hardship on the community. The AER updated these expectations in August and November 2020 as the pandemic in Australia evolved.

The focus of the Statement of Expectations on energy businesses over the COVID-19 pandemic period include:

- ensuring retailers meet the needs of customers in vulnerable circumstances, and that customers can access the energy they need
- protecting customers who may be unable to safeguard their own interests, including customers requiring life support equipment or who are experiencing financial difficulty
- actions needed to ensure the safety and reliability of energy supply
- being responsive to the rapidly evolving pandemic situation and preparing for our recovery.

The Statement of Expectations also requires retailers to:

- offer a payment plan or hardship arrangement to all residential and small business customers that indicate they may be in financial stress
- Work with customers who may be in financial stress to make payment plans and hardship arrangements sustainable by taking into account their capacity to pay, and ensuring customers are on the tariff most likely to minimise their energy cost.
- be ready to modify an existing payment plan if a customer's changed circumstances make this necessary
- not disconnect any residential or small business customer in financial stress. Initially a blanket ban on disconnection, retailers since August 2020 can disconnect customers for non-payment if the customer does not engage with the retailer about their debt
- for any customer disconnected for non-payment, reconnect the customer immediately following contact, and waive disconnection, reconnection and contract break fees
- defer any referrals of customers to debt collection agencies for recovery actions, or credit default listing until at least 31 March 21.
- Networks and retailers should waive disconnection, reconnection and/or contract break fees for small businesses that have ceased operation, along with daily supply charges to retailers, during any period of disconnection until at least 31 March 2021.
- prioritise clear communications with customers about the availability of retailer and other support
- Prioritise the safety of customers who require life support equipment and continue to meet responsibilities to new life support customers

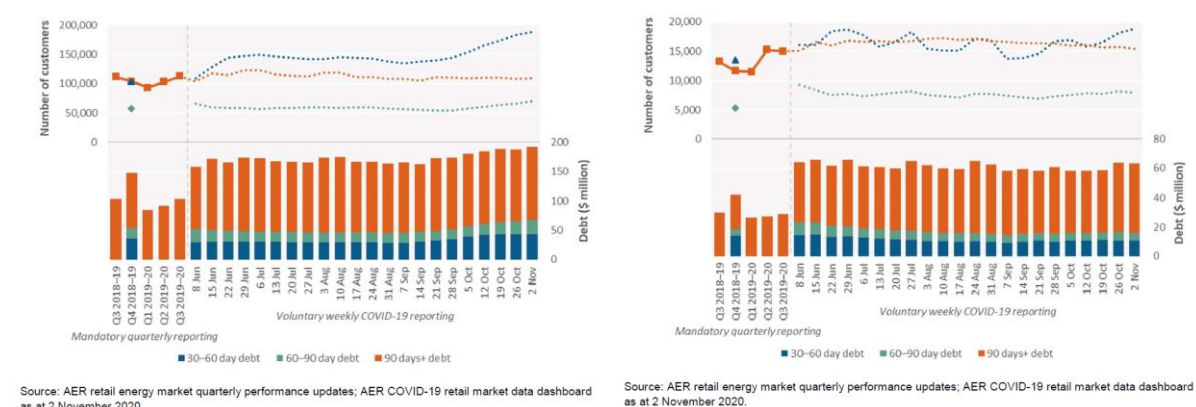
Recognising that these requirements may add risks and costs to energy businesses, the market bodies explored a range of options to support the energy businesses in meeting the expectations of customers.

- In May 2020 the AER proposed a rule change that would allow the deferral of network charges for up to 6 months by retailers if they relate to customers affected by the COVID-19 pandemic. This was progressed by the AEMC as an expedited rule change, that came into effect on 6 August 2020.
- In its 2020 Retail Competition Report the AEMC recommended the retailer-of-last-resort scheme be modified to make it more resilient to events like COVID-19 and to ensure better outcomes for consumers if their retailer fails. A review of specific recommendations is underway, with a final report due in February 2021.

To ensure continued monitoring of the impacts of COVID-19 on customers, the AER also initiated a voluntary approach to the collection of key retail market performance data relating to customer debt levels, payment plans and hardship programs, disconnections, credit collection, and call centre performance. This allowed the AER to assess the effectiveness of the statement of expectations and respond quickly when further issues arise. The AER have noted the efforts of industry by quickly introducing voluntary support for energy customers at the early stages of the pandemic.

The AER note in its Annual Retail Markets report for 2019-20 that energy debt³ levels for both residential and business customers increased sharply between January and June 2020 with business debt increasing from \$35m to \$40m and residential debt increasing from \$133m to \$156m. The AER notes that this increase was driven more by increases in the average amount of debt per customer rather than an increase in the number of customers in debt. The voluntary data provided by electricity retailers since June 2020 suggests that the number of residential and business customers in the 90 + days debt category has fallen however the amount of debt remains fairly steady (Figure 5).

FIGURE 5 HOUSEHOLD AND SMALL BUSINESS ELECTRICITY CUSTOMER DEBT



SOURCE: AER ANNUAL RETAIL MARKETS REPORT 2019-20

The AER note in its Annual Retail Markets report for 2019-20 that customers (excluding Victoria) on payment plans or hardship programs had fallen relative to 2018-19. This reflects that around 52,500 residential customers and 6,000 small business customers elected to defer payments by August 2020. Following the scaling back of deferred debt programs in August by some retailers, the AER expects that use of payment plans will increase over the coming months.

Due to the restrictions on disconnections under the AER's Statement of Expectations there were 43,000 fewer disconnections between April and November compared to the same period in 2019. Whilst a small number of retailers have recommenced disconnections for non-payment from 10 August 2020, the AER's Statement of Expectations makes it clear that customers in financial difficulty who are in contact with their retailer will not be disconnected – even if they cannot afford to pay anything right away.

Longer term trends in affordability and consumer satisfaction

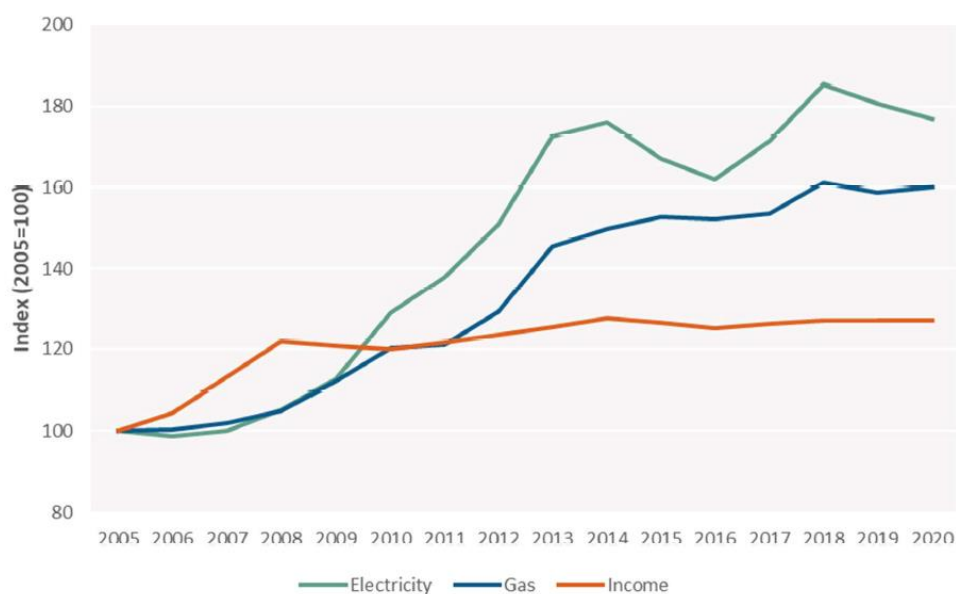
The AER's Annual Retail Markets report for 2019-20 found that:

- Energy costs in 2020 remained high by historical standards, but considerable savings can be made for consumers facing energy affordability issues
- From 1 July 2019 the Default Market Offer and Victorian Default Offer resulted in a significant reduction in median electricity standing offer prices in the jurisdictions where they apply.

³ Energy debt refers to electricity and gas debt that has been outstanding for 90 days or more.

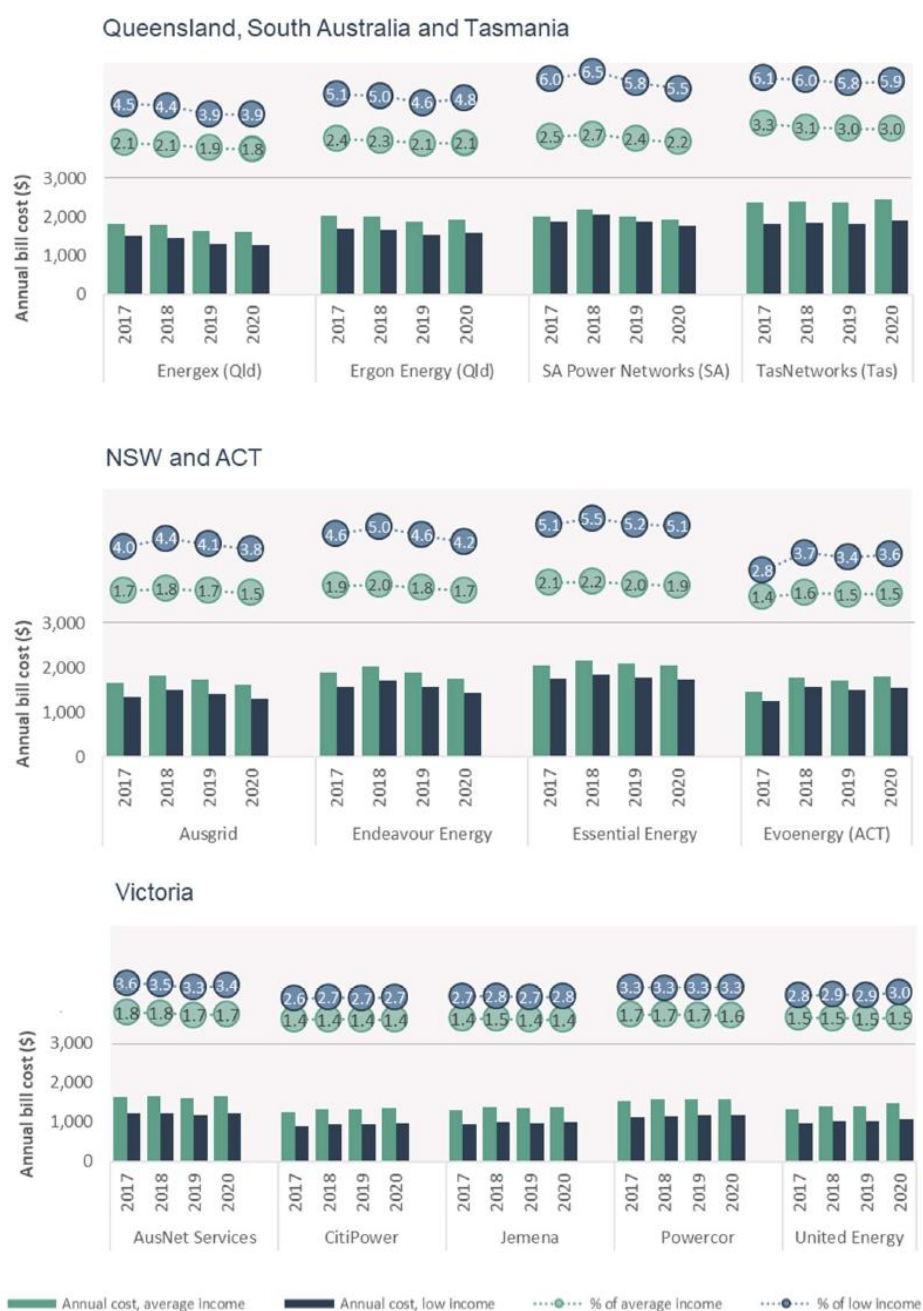
- Median electricity market offer prices fell between June 2019 and June 2020 in Queensland, NSW, South Australia and the ACT, but rose in Victoria and Tasmania. Prices in each jurisdiction were below their four-year peak.
- Electricity affordability outcomes were mixed during 2019–20. Affordability improved in NSW and South Australian network areas, where bills as a percentage of income were at their lowest levels in four years. (Figure 7)
- Electricity was generally less affordable for customers in regional areas due to higher network charges. (Figure 7)
- Low income households typically spent double the percentage of their disposable income on electricity and gas than did average income households. (Figure 7)

FIGURE 6 LONG TERM TRENDS IN ENERGY PRICES AND INCOME (INFLATION ADJUSTED)



SOURCE – AER ANNUAL RETAIL MARKETS REPORT 2019-20 - ELECTRICITY AND GAS INDEX – ABS, CONSUMER PRICE INDEX, VARIOUS YEARS; INCOME INDEX – ABS, HOUSEHOLD INCOME AND WEALTH, AUSTRALIA, VARIOUS YEARS.

FIGURE 7 ANNUAL BILL COST BY JURISDICTION AND NETWORK WITH % OF INCOME MEASURE



Note: Data at June of each year. Based on offers for residential customers in each jurisdiction. Average household consumption for the financial year ending June of each period was used in annual bill calculations. Per cent of income figures refer to mean disposable income of all and low income households respectively.

Source: Offer data from Energy Made Easy (AER) and Victorian Energy Compare (DELWP). Consumption estimates based on Economic benchmarking regulatory information notice (RIN). Income data are unpublished ABS estimates of household disposable income.

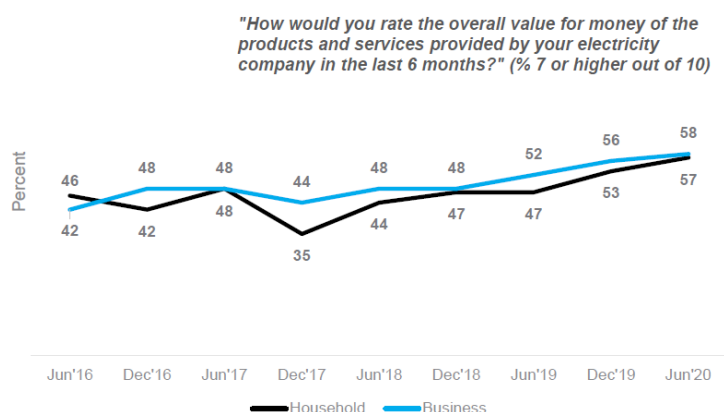
SOURCE – AER ANNUAL RETAIL MARKETS REPORT 2019-20

The AEMC will be publishing its Residential Price Trends 2020 report on 21 December 2020, which will provide greater insight into the outlook for retail prices, however this is expected to reflect the recent falls in wholesale prices.

In June 2020 the Energy Consumers Australia (ECA) released its six-monthly update on consumer sentiment. The key findings include that:

- Satisfaction with the overall delivery of electricity and gas services is up 8% (to 77%) for household consumers and 12% (to 71%) for small business.
- Household satisfaction with the value for money of their electricity service is up 10% (to 57%) - continuing an upward trend and reaching the highest rating since tracking started four years ago.
- Overall satisfaction with value for money from electricity companies has increased for small business consumers by 6% (to 58%) since this time last year - again the highest rating since tracking started four years ago.
- All states now rate value for money of their electricity service above 50% for the first time, and the national result on this measure was up 10% (to 57%).
- While the rise in satisfaction with value for money is positive, electricity still trails the next lowest rated essential service on this measure by 11% (gas and insurance were both at 68%).

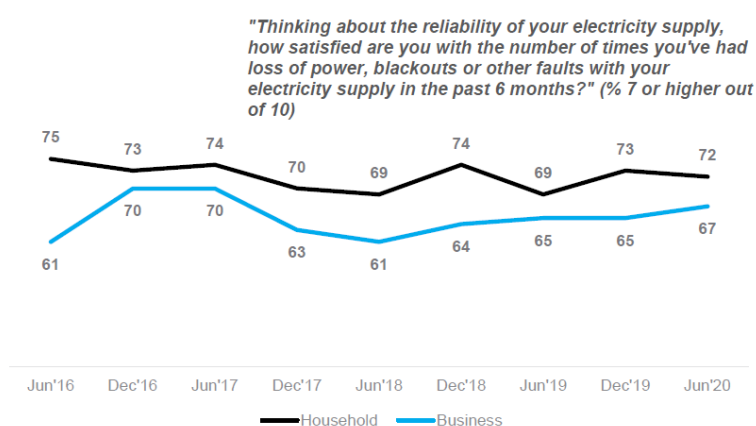
FIGURE 8 RATING OF OVERALL VALUE FOR MONEY (PERCENTAGE WITH 7 OR HIGHER OUT OF 10)



SOURCE – ENERGY CONSUMERS AUSTRALIA – ENERGY CONSUMER SENTIMENT SURVEY

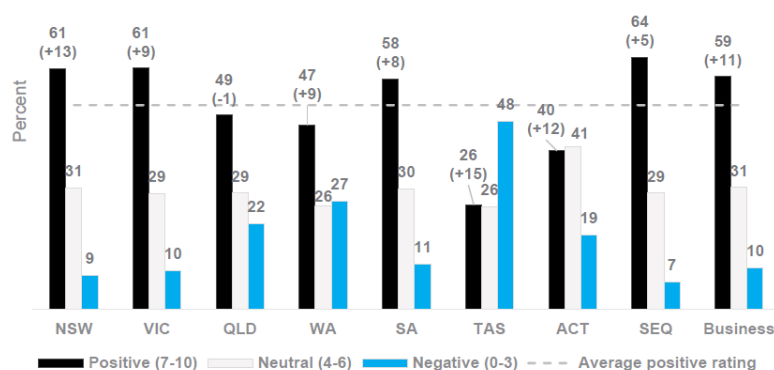
- Satisfaction with the reliability of electricity supply is steady for household consumers with 72% of satisfied with the number of times they have lost power. Comparatively 67% of small businesses are satisfied with the reliability of their electricity supply.

FIGURE 9 RELIABILITY OF ELECTRICITY SUPPLY OVER LAST 6 MONTHS (PERCENTAGE WITH 7 OR HIGHER OUT OF 10)



SOURCE – ENERGY CONSUMERS AUSTRALIA – ENERGY CONSUMER SENTIMENT SURVEY

FIGURE 10 SATISFACTION WITH THE LEVEL OF COMPETITION IN THE ENERGY MARKET



SOURCE – ENERGY CONSUMERS AUSTRALIA – ENERGY CONSUMER SENTIMENT SURVEY

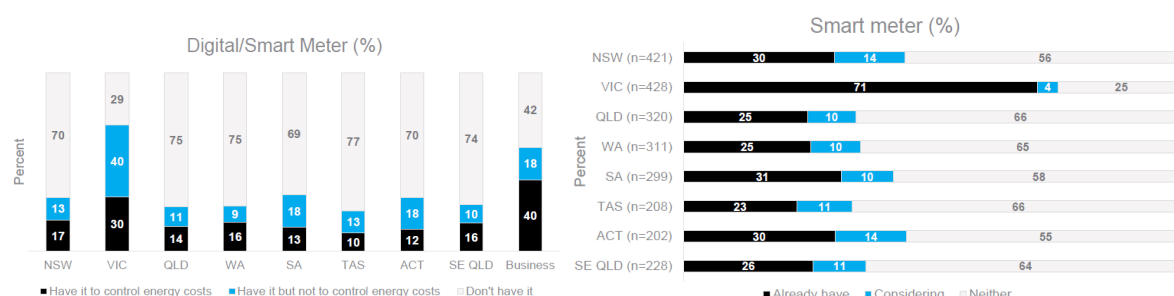
- Satisfaction with competition increased in New South Wales (up 13% to 61%), Victoria (up 9% to 61%), South Australia (up 8% to 58%), Western Australia (up 9% to 47%) and the Australian Capital Territory (up 12% to 40%). In Tasmania, which saw a new retailer enter the market in February 2019, satisfaction with the level of competition increased 15% (to 26%).
- Small businesses also recorded an increase of 11% in satisfaction with competition (to 59%).
- South East Queensland has the highest level of satisfaction on this question (64%, up 5%) but the overall Queensland outcome is stable at 49%.

1.2. Consumers are empowered to manage their demand and can access distributed energy and energy efficiency solutions

The June 2020 ECA Consumer Sentiment Survey also tracks the uptake of technology and the willingness to participate in energy efficiency programs. The report finds that the uptake of smart technology and energy management systems is modest but growing across most energy markets. In Victoria, smart meters were rolled out through a State Government program, but only 70% of household consumers report having one and just 30% say that

they use it to control energy costs. Small businesses also report a relatively high uptake of smart meters (58%) with 40% saying they use the device to manage their energy costs. In other states and territories, between 23% (TAS) and 31% (SA) report having a smart meter. Again, around half of households who have the device, use it to manage energy costs.

FIGURE 11 HOUSEHOLD AND SMALL BUSINESS USE OF DIGITAL AND SMART METERS HOUSEHOLD UPTAKE AND CONSIDERATION OF DIGITAL AND SMART METERS

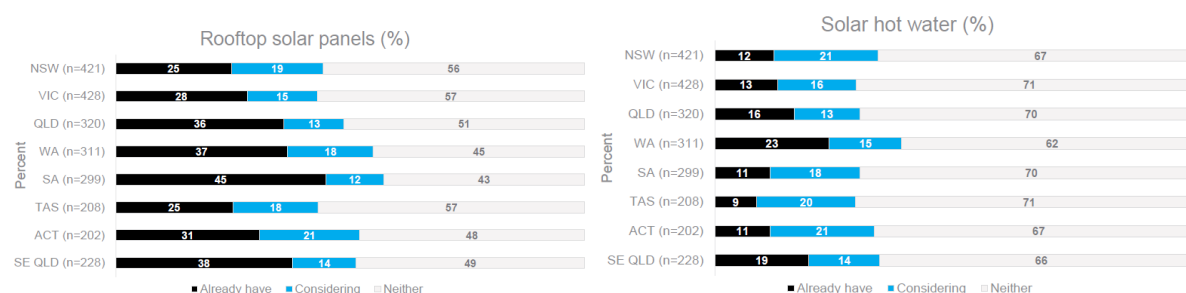


The June 2020 Energy Consumer Sentiment Survey asked respondents how they would respond to being asked to reduce their energy use during a very hot period. Depending on the jurisdiction, 70-81 percent of household consumers would respond to a campaign to lower energy use. That number is even higher among small businesses (82 percent). Over half of households in the ACT, Queensland and New South Wales would be prepared to reduce their energy usage without incentive. 52 percent of small businesses would take action without an incentive. Overall, about one in four household consumers would require an incentive to reduce their energy use during periods of very high demand and 30 percent of small businesses would require an incentive.

In relation to the uptake of other technologies the Energy Consumer Sentiment Survey found:

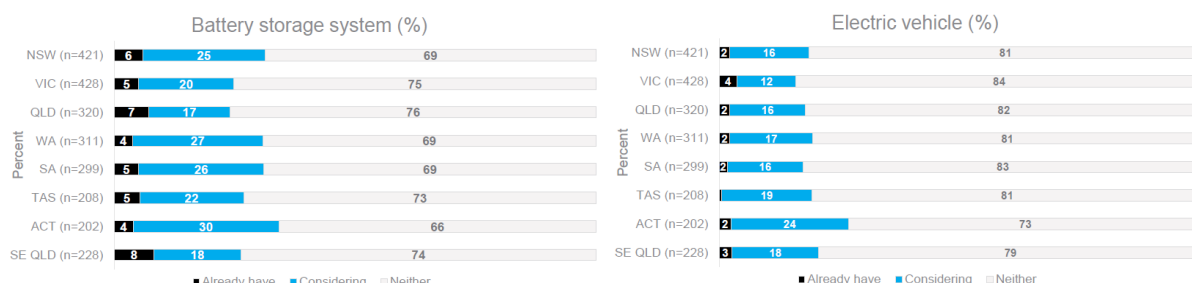
- Fewer than 1 in 10 households say they own a smart thermostat, compared to 38% of small businesses. The trend for households with interest in these products remained flat at around 17-18 percent.
- Uptake in rooftop solar remained high with around 25 to 45 percent of households owning rooftop solar and another 12 to 21 percent considering it (depending on jurisdiction). While ownership of solar hot water was between 10 and 15 percent in the NEM states with 15 to 25 percent of respondents considering uptake.

FIGURE 12 HOUSEHOLD UPTAKE AND CONSIDERATION OF ROOFTOP SOLAR HOUSEHOLD UPTAKE AND CONSIDERATION OF SOLAR HOT WATER



- Ownership of battery storage systems remained around 5 percent with 20 to 30 percent of respondents considering uptake. Households with electric vehicles were between 2 and 4 percent of respondents with 15 to 25 percent of respondents considering uptake.

FIGURE 13 HOUSEHOLD UPTAKE AND CONSIDERATION OF ROOFTOP SOLAR HOUSEHOLD UPTAKE AND CONSIDERATION OF ELECTRIC VEHICLES



Overall the proportion of respondents expressing confidence that the market will deliver technological advances to manage energy supply and costs has increased in all markets with more than 50 percent in most jurisdictions positive and around one third neutral with the balance negative.

Technological innovation is transforming the way in which we use energy. A critical part of empowering consumers to manage their demand and access distributed energy and energy efficiency solutions is through ensuring the market arrangements and regulatory frameworks support the use of new technologies. This includes ensuring that consumer protections adapt to suit the changing ways in which we source and use energy. The Energy Security Board (ESB) is addressing these issues as a component of its Post 2025 Market Design Work program. The ESB is scheduled to provide recommendations to the Energy National Cabinet Reform Committee by the middle of 2021.

1.3. Consumers are able to easily identify and secure the best deal for their circumstances

The ECA Sentiment Survey also sought feedback from respondents on their confidence in information, tools and a working market. The key findings of the survey in this area were that:

- Consumers' confidence that the market is working in their interests has tracked upwards, but slowly and from a low base – 36 percent of household consumers now saying they are confident the market is working in their interests (up 5 percent).
- Looking to the future, more consumers are confident that energy market outcomes will improve than in previous surveys.
- While consumers' confidence in the information and tools available to make decisions about energy has increased, new questions in this year's survey show that a large number of consumers think there is room for improvement in the communications they receive from their energy company.
 - Consumers' confidence in their ability to make choices about energy is tracking upward and has reached 64% for households and 63% for small business.
 - Confidence in the availability of easily understood information has also increased to 55 percent for households and 57 percent for small businesses.

- But most consumers could not clearly remember the latest information they received from their energy company

Continuing to improve Consumer access to information

In April 2020 the AEMC received a rule change request from the Minister for Energy and Emissions Reduction, the Hon Angus Taylor MP, to amend the Retail Rules to simplify energy bills. The intention was for households and small business owners to better understand and manage their bills and find a more advantageous energy deal.

Under the Retail Rules retailers are required to prepare an energy bill complying with 26 content requirements. The Minister considers the rules should be changed to contain an objective and outcome-based principles for energy bills, which would underpin a mandatory AER guideline with specific requirements on content and format. It also proposed that requirements are needed addressing how a bill is issued or delivered to small customers. A draft determination on this proposed Rule change is expected on the 17th December.

In October 2020, the ESB released a consultation paper on Data Strategy recognising that digitalisation and changes in the energy market are driving the need for more flexible and timely access to data. Digitalisation and data provide new opportunities for better consumer outcomes through greater transparency, innovation in services and systems, efficiencies in the supply chain, and mobilising and valuing flexible demand. Ultimately greater access to information and the analysis that access allows will help ensure that consumers are able to easily identify and secure the best deal for their circumstances.

The consultation paper highlights three broad areas of priority data gaps that need to be closed. The recommendations in two of these areas, Retail Transparency and Understanding Consumers and Demand are likely to be beneficial in supporting consumers and their ability to easily identify and secure the best deal. To see these recommendations see <http://www.coagenergycouncil.gov.au/publications/energy-security-board-data-strategy-submissions-consultation-paper-published>

Consultation on the ESB's Data Strategy consultation paper has recently closed and the ESB will provide recommendations to Energy Ministers in early 2021 about reforms to support the Data Strategy and ensure the energy sector is well positioned to meet emerging needs of the energy transition and capture the opportunities of a digitalised future

1.4. Vulnerable consumers are on suitable pricing plans, receiving concessions when needed, and can benefit from distributed energy and energy efficiency schemes

While wholesale prices have fallen over 2020 and retail prices are expected to follow, the impacts of COVID-19 are likely to have increased the number of vulnerable electricity customers and exacerbated some of the challenges they face. During the year the proportion of customers in debt increased, and while more recent trends from the AER's COVID-19 dashboard indicated that the number of customers with long term debt is falling, there are a growing number of customers with short term debt, suggesting that many customers are experiencing financial stress for the first time.

Throughout 2020, the AER took a number of important steps to support customers and energy businesses during the COVID-19 pandemic as discussed earlier. The AER also

published research⁴ conducted by the Consumer Policy Research Centre, on regulatory approaches to consumer vulnerability. This informed its approach to improving outcomes for consumers who experience vulnerability. The research examines the opportunities and benefits of different approaches to address consumer vulnerability in regulated markets and seeks to learn from different experiences and approaches globally.

As the energy system continues to transform it remains important that vulnerable customers are not left behind and provided with the same opportunities to use new technologies and any cost reductions they may provide. A transforming market also gives rise to the risk that vulnerable customers are exposed to gaps in the consumer protection frameworks. The AEMC's 2020 Retail Competition Review published analysis on consumer protections in an evolving market. This followed a 2019 review which noted the need for further analysis – particularly in terms of consumer protections applying to new energy products and services, and on the impact of digitisation on regulatory provisions.

⁴ <https://www.aer.gov.au/publications/corporate-documents/exploring-regulatory-approaches-to-consumer-vulnerability-a-report-for-the-aer>

2. Secure electricity system

Overall Assessment

System Security remains the most critical issue at present. The operation of the NEM requires the system to be maintained within defined physical limits, both under normal operation and through various faults. The important parameters in the NEM are frequency, voltage, inertia and system strength. Failure to maintain these security parameters can damage the power system and lead to major supply interruptions. Increasing penetration of variable renewable energy resources and distributed energy resources is making it more difficult to maintain security and low wholesale prices are reducing the incentive for traditional generators to remain online at all times. This will ultimately influence their decision to exit which is likely to be earlier than the technical life exit shown in Figure 14 below.

The current market arrangements do not value all services required to ensure security, including primary frequency response, fast frequency response, inertia, and system strength. The ESB is working to establish markets or arrangements to procure these services as part of its post 2025 Market Design project. The outlook of a secure system is improving with the prospect of new markets for essential system services and an increased ability for AEMO to ensure adequacy of system services ahead of time. Over the longer term reaching beyond 75% instantaneous renewable penetration will require continued technical innovation, however this is not seen as insurmountable.

Frequency refers to the number of cycles of current and voltage made per second in an AC system. The operational frequency of the NEM is 50 cycles per second (Hertz). The frequency of the power system varies whenever the supply from generation does not precisely match customer demand. Frequency control performance in the NEM has been declining over recent years.⁵ Recent data shows this is now improving with implementation of the mandatory primary frequency control arrangements.

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

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

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

⁵ AEMC, Frequency Control Frameworks Review, 2018

conditions following a disturbance. Reduced levels of synchronous generation is reducing supply and increased levels of asynchronous generation is increasing demand for system strength, together they are resulting in areas with below acceptable system strength, requiring AEMO to either constrain or dispatch generation out of merit order.

FIGURE 14 EXPECTED CLOSURE PROFILE (BASED ON TECHNICAL LIFE) FOR NEM COAL-FIRED GENERATION

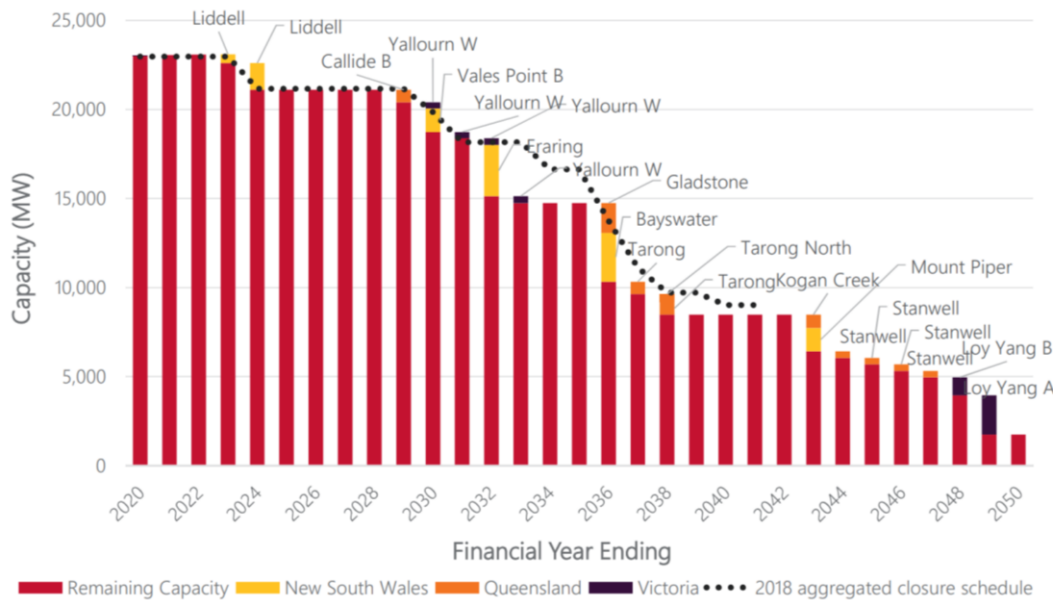


TABLE 3 SECURE ELECTRICITY SYSTEM

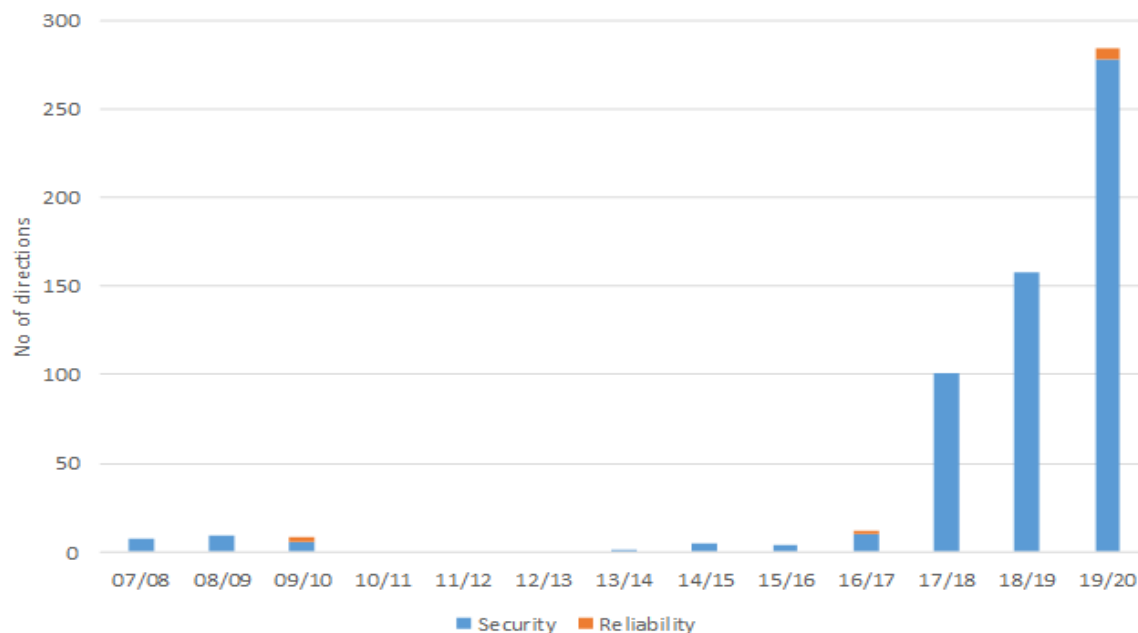
	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Markets operate safely, securely and efficiently, under a full range of operating conditions, with minimal intervention	Critical	Moderate-critical	Critical	Critical
System planning and development is informed by clear and transparent rules	Critical	Moderate-critical	Critical	Critical
Overall	Critical	Moderate-critical	Critical	Critical

2.1. Secure operations and interventions

AEMO directions to market participants about system security continue to grow. Each year in the Health of the NEM the ESB reports on the increasing requirement for AEMO to intervene

in the market to ensure that the system remains secure. This year the number of security related directions has exceeded 250, up from 158 directions in 2018-19. Many of the directions in recent years have been due to inadequate system strength in South Australia which should improve following installation of the synchronous condensers.

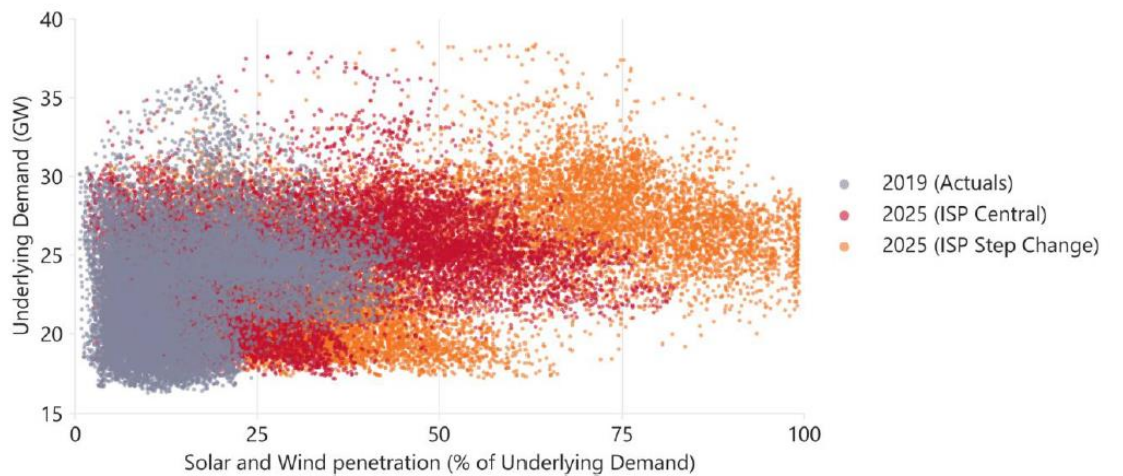
FIGURE 15 AEMO DIRECTIONS BY TYPE



SOURCE: AEMO

AEMO's Renewable Integration Study (RIS) explores the extent to which the Integrated System Plan's central and step change scenarios in 2025 might be achievable from a security perspective, and the actions needed to enable them. Figure 16 highlights the level of instantaneous penetration of renewable resources modelled under these scenarios. The findings from the RIS identified that, without further action, the maximum instantaneous penetration of renewable resources would be limited to between 50 and 60 percent. The findings of the RIS were incorporated into AEMO's Final 2020 ISP, ensuring the ISP presents a future power system that will be operable. At the current rates of installation of renewable resources and the level of ambition in the NEM, the market is likely to transform at a pace faster than the Step Change scenario.

FIGURE 16 INSTANTANEOUS PENETRATION OF WIND AND SOLAR GENERATION, ACTUAL IN 2019 AND FORECAST FOR 2025 UNDER ISP CENTRAL AND STEP CHANGE GENERATION BUILDS



Note: Penetration on this graph represent NEM half-hourly wind and solar generation divided by the underlying demand, which includes demand response, energy storage, and coupled sectors such as electrification of gas and transport. Actual 2019 penetration includes all lost energy; 2025 projections include network congestion but do not include system curtailment or participant spill.

SOURCE: AEMO

2.2. System planning and development

Power system security remains the biggest immediate challenge to the efficient operation of the market. As traditional assets age they will face cost pressures and will often be displaced by a mix of new resources in the market. In response, they may retire or operate differently, risking that some of the services they previously provided are no longer available throughout the normal operations of the market. In addition, the new resources are not necessarily incentivised to bring the services that are always needed.

Interim Security Measures

In March 2020 the former COAG Energy Council considered a range of actions to improve security in the NEM. Ministers agreed that the ESB should coordinate action across the market bodies to implement a range of interim measures that are now under consideration to improve visibility of, and confidence in system security services. The interim measures under consideration are:

- a) The provision of information from scheduled generation units of commitment timeframes, cost and operating information to assist potential intervention decisions.
- b) Semi-scheduled plant being required to continually inform AEMO of any restrictions on their available capacity due to physical factors, ambient weather conditions and their market intentions.
- c) Consideration to require large loads of a certain size and type to submit the intent to respond to spot markets.
- d) Clear notice periods and potential constraints on scheduled generators changing their commitment and decommitment decisions at short notice.
- e) That semi-scheduled generators to be obligated to follow their dispatch targets, in a similar manner to scheduled generators.
- f) That compensation mechanisms be reviewed to determine whether compensation should be payable if the generator in question changes its intentions to commit or

decommit at short notice and whether other refinements to the compensation regime are warranted.

On the 24th September the AER submitted a rule change request to the AEMC relating to information provision and dispatch targets for semi-scheduled generators (i.e. measure (e) above). This rule change request followed consultation undertaken by the AER between June and September. The AEMC treated this as a 'fast track' rule change process (the draft determination was released without an initial consultation paper) given the extensive consultation undertaken by the AER and released a draft determination on 19 November. The AEMC's draft determination requires that semi-scheduled generation meet a dispatch target, subject to the availability of their natural resource (such as wind or solar). The AER also concluded that Rule changes were not required for measure (b) at this point in time.

AEMO took the lead on the remaining interim measures and is in the process of finalising advice on the next steps.

Renewable Integration Study

In April 2020, AEMO released Stage 1 of its Renewable Integration Study which highlighted the operating challenges that are expected over the next five years as higher levels of renewable resources enter the system. The report identified that:

- The continued transformation to world-leading levels of renewable generation will test the boundaries of system security and current operational experience.
- If the recommended actions are taken to address the regional and NEM wide challenges identified, the NEM could be operated securely with up to 75 percent instantaneous penetration of renewable resources and if not operational limits will limit the maximum instantaneous penetration to between 50 and 60 percent.
- Beyond 2025 there are no insurmountable reasons why the NEM could not operate at higher levels of penetration of renewable resources given the progress in technology worldwide.
- Given the pace and complexity of change in the NEM the market and regulatory frameworks need to be flexible to support the rapid evolution of the power system and the technology that supports it.

The Renewable Integration Study identified key challenges that would continue to grow as the instantaneous penetration of renewable resources increased.

Key Challenges identified in Stage 1 of the Renewable Integration Study

System operability - Ability to operate the power system within security and reliability standards

The increasing penetration of wind and solar operating in the system is pushing the limits of the system. The real-time workload for operators to keep the system secure and balance interdependent factors is a critical and growing challenge. Without effective and standardised operational process, tools, and training to schedule system strength and inertia services, the risk of human error grows, and the level of intervention becomes increasingly unsustainable. The market design needs to adapt so all essential security and reliability services are provided efficiently, when required, and without operator intervention. *The growth in wind and solar is increasing the complexity of the system.* The tools and processes used to model the system, assess outages, and measure system performance are becoming increasingly computationally complex and more costly in time and resources.

Integration of Distributed Solar PV - Balancing increasing levels of small, distributed generation with power system requirements

The aggregate performance of the Distributed Solar PV fleet is becoming increasingly critical as penetrations increase. Without action, the largest regional and NEM contingency sizes will increase due to Distributed Solar PV disconnection in response to major system disturbances.

Governance structures for the setting of DER technical performance standards, and enforcement of these standards, are inadequate. No formal pathway to ensure power system security and other industry requirements are accounted for within technical standards set by consensus. Inconsistent compliance with technical performance standards across the Distributed Solar PV fleet today and a lack of clarity around enforcement.

System dispatchability is decreasing as invisible and uncontrolled DPV increases to levels not experienced elsewhere globally. In 2019, South Australia operated for a period where 64% of the region's demand was supplied by Distributed Solar PV; by 2025, all mainland NEM regions could be operating above 50% at times.

Frequency management - Ability to set and maintain system frequency within acceptable limits

There has been a decline in the primary frequency response provided by generation in the NEM. This has reduced the power system's resilience to events at a time when events are becoming more complex and less predictable. It has also resulted in a lack of effective control of frequency in the NEM under normal operating conditions. A lack of consistency and certainty of PFR delivery from generation has impacted AEMO's ability to effectively model and plan the system, understand the cause of power system incidents, and design emergency frequency control schemes.

NEM inertia levels could drop by 35%. Historically, NEM mainland inertia has never been below 68,000 megawatt seconds (MWs). By 2025, inertia could drop to as low as 45,000 MWs. This will increase the required volume and/or speed of frequency sensitive reserve following a contingency event, and the power system will operate in configurations where the system dynamics are different to those experienced today.

Distributed Solar PV behaviour, inverter-based resources behaviour, and run-back schemes are making the system more complex. These emerging issues will further exacerbate post-contingent outcomes for credible and non-credible events. Non-credible contingencies are expected to result in higher rate of change of frequency, the effect of which is not yet fully understood for the NEM.

Stable voltage waveform (system strength) - Ability to maintain the voltage amplitude, waveform and phase angle under system normal and contingent conditions within specifications

Key Challenges identified in Stage 1 of the Renewable Integration Study continued

The NEM is at the international forefront of managing issues associated with low system strength. AEMO has so far declared system strength gaps and worked with local transmission NSPs (TNSPs) to address shortfalls in South Australia, Tasmania, Victoria, and Queensland. Localised system strength challenges are also creating increasing hurdles for generators seeking to connect in weaker parts of the grid.

Resource adequacy (managing variability and uncertainty) - A sufficient portfolio of energy resources to balance supply and demand in every 5-minute interval

The magnitude of peak ramps (upward/downward fluctuations in supply/demand) is forecast to increase by 50% over the next five years as a result of increasing wind and solar penetration. Operators need to ensure there is adequate system flexibility to cover increased variability across all times.

There is a limit to the accuracy of deterministic forecasts of expected ramps, even using current best practice approaches. Forecasting limitations increase uncertainty and the need for greater ramping reserves.

Ensuring sufficient flexible system resources are available to enable increased variability at times of high wind and solar penetration will become increasingly challenging. Times characterised by low interconnector headroom (spare capacity) or 'cold' offline plant will be particularly difficult to manage.

In working to solve these challenges there are three broad areas of work that are currently being undertaken by the ESB and Market bodies:

1. Steps to Improve System Operability

Following the Renewable Integration Study AEMO is:

- working to identify and evaluate standard operational process, control room tools, and operator training to operationalise intervention (directions/instructions) for system strength and inertia services under the current framework.
- seeking to redevelop existing scheduling systems to better account for system needs.
- developing a detailed proposal for high-speed monitoring to allow better visibility of performance of the system and help operators to understand the changing power system.
- collaborating with industry and other world-leading operators to develop new operational capability.

Through the Post 2025 Work Program the ESB has also indicated support for the implementation of a unit commitment for security process⁶ as well as continuing to explore voluntary ahead markets to procure and/or trade relevant system services (with or without energy).

⁶ An analytical tool that seeks to give AEMO an enhanced ability to identify and address security and reliability shortfalls in the operational pre-dispatch timeframe.

2. Better Integration of Distributed Solar PV

Following the Renewable Integration Study, AEMO is collaborating with Distribution Network Service Providers to establish aggregated predictability or real-time visibility requirements for distributed solar PV systems available for curtailment, and consistent real-time SCADA visibility for all new commercial scale systems.

In June 2020 AEMO also began consultation on a short duration undervoltage disturbance ride-through test procedure, which may be incorporated into Distribution Network Service Providers technical standards for inclusion in connection agreements as required. This is a priority in South Australia following analysis of recent power system events and the possible contingency sizes associated with tripping of distributed solar PV following a credible fault.

Inverter standard AS/NZS 4777.2 2020 is currently being voted on and if endorsed is expected to be published in December 2020/January 2021. This will provide a nationally consistent standard that will address a number of system security issues for a power system with high penetration of Distributed Energy Resources, including the ability of DER to ride-through voltage disturbances.

Rule change proposals

In May 2020 AEMO submitted a rule change request to the AEMC to amend the National Electricity Rules and National Energy Retail Rules to allow it to create an initial set of minimum technical standards that will apply to new Distributed Energy Resources across the national electricity market. In response on the 3rd of December the AEMC made a draft rule that requires all new or replacement micro-embedded generators connecting to distribution networks to be compliant with the DER Technical Standards specified in the National Electricity Rules. The newly defined DER Technical Standards will comprise the Australian Standard AS 4777.2:2015 and a new schedule to the rules which incorporates AEMO's short duration under voltage response test requirements)

In August 2020, in expectation that a rule would be made that allows AEMO to set an initial minimum technical standard for Distributed Energy Resource, AEMO began consultation with industry on the initial Distributed Energy Resource minimum technical standard. AEMO will continue to consult during December and January with a final report due in February/March 2021.

In September 2020, the ESB submitted a rule change request to the AEMC, that would establish a new ongoing governance arrangement for the setting of minimum technical standards for Distributed Energy Resources in the National Electricity Rules.

3. Actions Underway to Improve Access to Essential System Services

System strength and inertia minimum requirements and shortfall declarations

- **Delivery of synchronous condensers fitted with flywheels in South Australia.** A system strength shortfall in South Australia was declared by AEMO in 2017 and a shortfall in inertia in 2018. In August 2019, the AER approved funding to Electranet for the capital cost of the synchronous condensers in South Australia, fitted with flywheels to address both the system strength and inertia shortfalls. Two synchronous condensers will be installed at Davenport and two at Robertstown. These are expected to be in place for the 2020-21 financial year.
- **Contracting of system strength and inertia services in Tasmania.** In 2019, AEMO declared system strength and inertia shortfalls in the Tasmania region for the

planning horizon from 2020 to 2025. TasNetworks has since announced procurement of services to meet the shortfalls by contracting with existing synchronous machines and through delivery of new operating procedures and processes. These arrangements are expected to be reviewed prior to the contract end date of 2024.

- **Delivery of system strength services in Victoria.** Following the 2019 declaration of a system strength shortfall at the Red Cliffs node in West Murray, Victoria, AEMO has announced engagement of system strength services to address the shortfall as part of its role as jurisdictional transmission planning body for Victoria.
- **Ongoing work to meet system strength needs in Queensland.** In April 2020 AEMO announced a system strength shortfall at the Ross node in northern Queensland. Powerlink entered into a short-term agreement with CleanCo Queensland to provide system strength services using CleanCo assets in Far North Queensland, up until the end of December 2020. Powerlink is continuing to assess the longer-term options and is required to provide a solution by August 2021.
- **Ongoing work to meet a new inertia shortfall in South Australia.** In August 2020 AEMO declared a new inertia shortfall in South Australia as a result of findings from the South Australia islanding events in early 2020, anticipated levels of distributed PV affecting the daytime credible contingency event size, and the implications of declining minimum daytime demand in the region. ElectraNet is investigating options to address the shortfall, and in the meantime operational arrangements will continue to be used to manage the South Australia power system if it is islanded.

AEMO expects to release the 2020 System Strength Report and 2020 Inertia Report by the end of 2020.

Other actions to enhance access to essential system services

In early 2020 Powerlink committed to the installation of a synchronous condenser for which the costs would be recovered from committed and future connecting large scale renewable generators. This was recognised as a first for the 'system strength as a service' model and is being undertaken to meet the 'do no harm' requirements for new connecting generators.

Following the 2019 declaration of a system strength shortfall in West Murray, AEMO has worked collaboratively to find solutions to the challenges presented in the zone. This work has resulted in lifting the generation constraints on five impacted solar farms, the provision of a short term solution to system strength issues and the publishing of a methodology to define system strength zones.

In 2020, AEMO on behalf of the Victorian Government, completed the System Integrity Protection Scheme procurement process. Under the contract, AEMO will reserve 250 MW from Neoen's 300 MW battery to operate in a control scheme to increase the capability of the Victoria to New South Wales Interconnector and respond to unexpected network outages in Victoria from November 2021. South Australia has had a similar scheme in place since December 2017 following the recommendations of AEMO as a result of the 'system black' event in 2016.

AEMO expects to release a report on the 2020 Network Support and Control Ancillary Services (NSCAS) review by the end of 2020.

Rule change proposals and the Post 2025 Market Design Work Program

In response to the declining level of primary frequency response provided by generation in the NEM, in March 2020 the AEMC made a final rule to require all scheduled and semi-scheduled generators in the NEM to support the secure operation of the power system by responding automatically to changes in power system frequency, with this arrangement proposed to sunset by 2023.

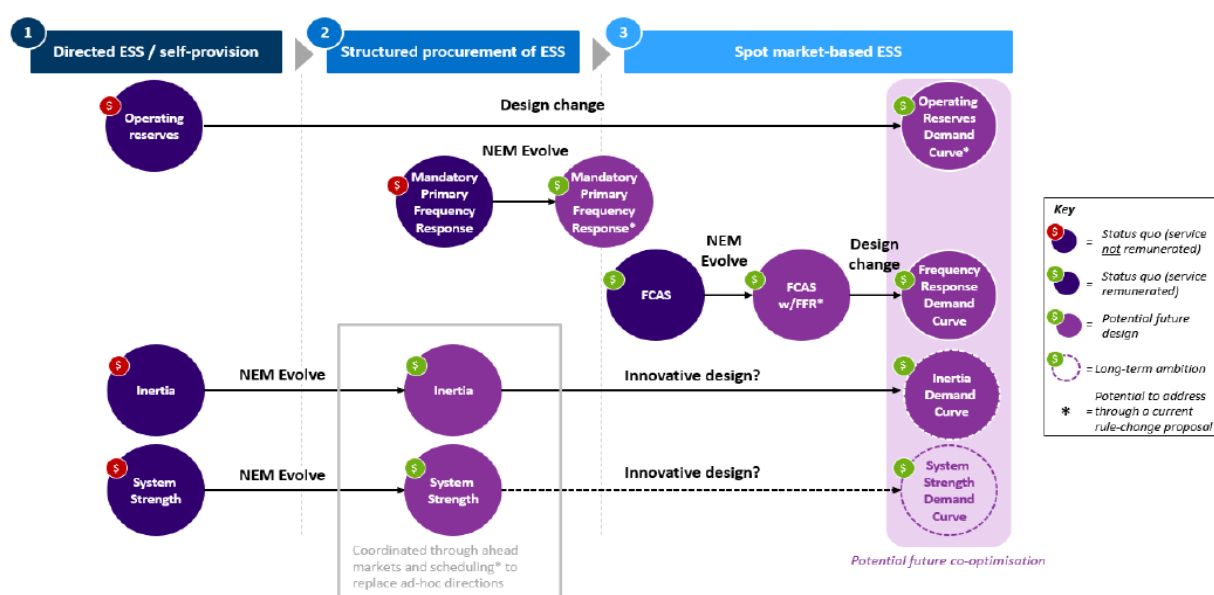
More broadly, in regard to Essential System Services, the ESB Post 2025 Work Program is exploring options to

- establish an operating reserve procured by a spot market with a demand curve framework
- support ahead-scheduling and co-ordination of the provision of system strength alongside structured procurement arrangements
- incentivise primary frequency response ahead of the mandatory primary frequency response sunset in 2023.
- support the provision of faster frequency response within the existing NEM framework.
- support ahead-scheduling and co-ordination of the provision of inertia alongside structured procurement arrangements
- establish a co-optimised spot market for inertia in a Post 2025 NEM

A possible high level roadmap for the evolution of the procurement and scheduling of Essential System Services from the ESB's September consultation paper is shown in Figure 17. In December 2020, the ESB will release a Directions Paper that responds to feedback from stakeholders and provides an indication of the direction that the ESB is heading under the Post 2025 Market Design Work program. The ESB is scheduled to provide recommendations to the Energy National Cabinet Reform Committee by the middle of 2021.

The AEMC has a number of system services rule change requests under consideration which offer opportunities to action the thinking and assessment done within the ESB work program.

FIGURE 17 A POSSIBLE ROADMAP OF PROCUREMENT AND SCHEDULING OPTIONS FOR ESSENTIAL SYSTEM SERVICES



Source: adapted from FTI's ESS Report

SOURCE: ESB POST 2025 MARKET DESIGN CONSULTATION PAPER

In October 2020, the AEMC delivered a final report investigating system strength frameworks in the NEM that made recommendations on both the supply side and demand side of system strength.

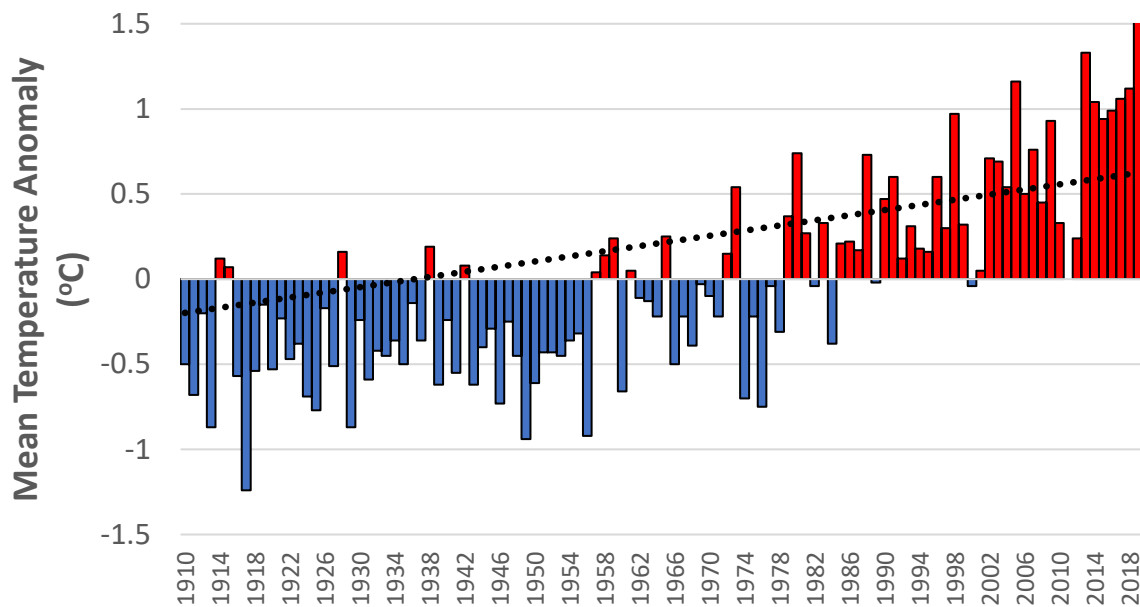
- On the supply side, TNSPs, working with AEMO would face an obligation to proactively provide volumes of system strength needed to maintain security. The model is designed to deliver efficient volumes of system strength.
- On the demand side, the recommendation is to incorporate two new technical standards that would apply to all generators connecting to the power system, such that they would use efficient amounts of system strength.
- That the demand and supply sides are coordinated through the system strength mitigation arrangements which better support power system operations with new asynchronous generation.

This report will help contribute to the work being undertaken by the ESB under the Post 2025 Work Program.

Resilience

As noted in last year's Health of the NEM, last summer's horrific bushfires continue to emphasise the importance of electricity system resilience as extreme weather events become more frequent and intense. This needs serious attention in the years ahead as further extreme events including fire, flood and high temperatures can be expected. Mean temperatures in Australia have been steadily increasing over the last century as Figure 18 shows.

FIGURE 18 AUSTRALIAN MEAN TEMPERATURE ANOMALY



SOURCE: AUSTRALIAN BUREAU OF METEOROLOGY

The Commonwealth Government funded Electricity Sector Climate Information project has been working to improve climate and extreme weather information for the electricity sector. The project is designed to improve the reliability and resilience of the National Electricity Market to the risks from climate change and extreme weather.

The project will tailor climate change data and information to ensure it's usable by the people who need it, to support improved long-term climate risk planning for electricity infrastructure.

The work is funded through the Department of Industry, Science, Energy and Resources and is being undertaken by CSIRO and the Bureau of Meteorology in collaboration with the Australian Energy Market Operator (AEMO). Importantly, it is expected to provide tailored climate data and information, including high-resolution projections of selected climate variables, to better assist planning within the electricity sector by the end of the 2020-21.

As information becomes available from this project it is important that it informs the efficient planning of the network and resources needed to support the reliability and security of the NEM.

3. Reliable and low emissions electricity supply

Overall Assessment

To assess whether or not the electricity system is reliable and delivering reduced emissions two objectives are examined. The first is whether the electricity sector is delivering its share of emissions reduction to meet national requirements while maintaining reliable supply. The second objective is whether investors are sufficiently managing risk to support investment, ongoing operations, generation retirements, and required innovation.

The current status improved to Moderate from Critical. There are no immediate reliability concerns, and measures are now in place to give AEMO greater control (the Interim Reserve). The outlook remains Moderate. The need for future investment in renewables and dispatchable generation is largely driven by the diminishing role of existing thermal assets. The timing of the retirement of thermal generation remains uncertain and significant investment is required.

TABLE 4 RELIABLE AND LOW EMISSIONS ELECTRICITY SUPPLY

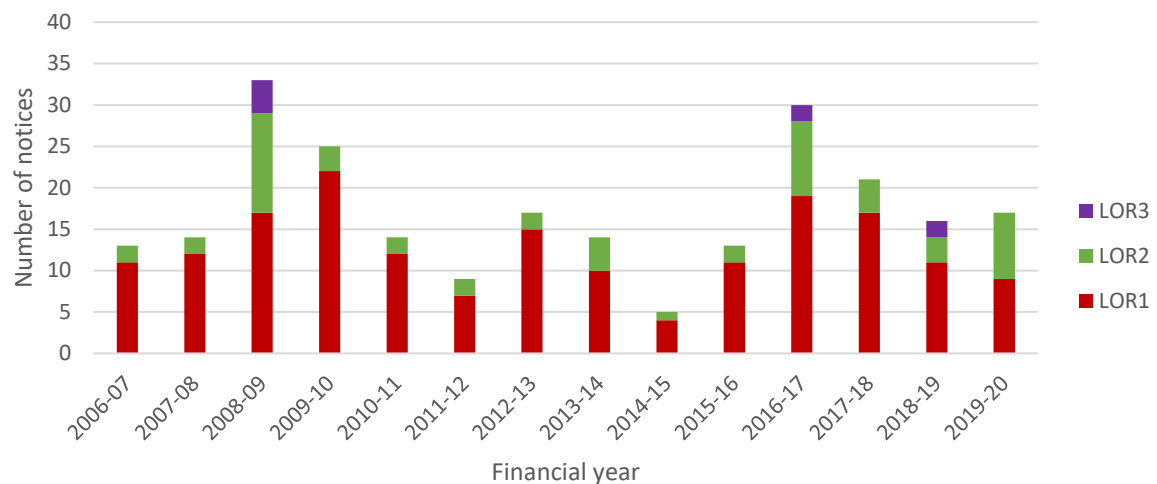
		2020 Ratings		Last Year's Ratings	
		Current status	Outlook	Current status	Outlook
Electricity and gas sectors efficiently deliver at least their share of emissions reduction target/s while ensuring reliable supply	Emissions	Moderate (emissions)	Good-moderate (emissions)	Moderate (emissions)	Moderate (emissions)
	Reliability	Good-moderate (reliability)	Moderate-Critical (reliability)	Critical (reliability)	Moderate-Critical (reliability)
Investors efficiently manage risk to support investment, operation, retirement, and innovation decisions		Critical	Moderate-Critical	Critical	Moderate
Overall		Moderate	Moderate	Critical	Moderate

3.1. Reliability and emissions reduction

Over the past four years the reliability of the NEM has raised concerns amongst many stakeholders. Reserves have tightened following the closure of several units and the number of Lack of Reserve notices have increased compared to the prior five years (as shown in Figure 19). Involuntary load shedding occurred in South Australia in 2016-17, and then in Victoria and South Australia in 2018-19 (Figure 20). The procurement of Reliability and Emergency Reserve Trader contracts and its activation has increased (Figure 21) with 2017-18 the first year since the start of the NEM that it has been activated.

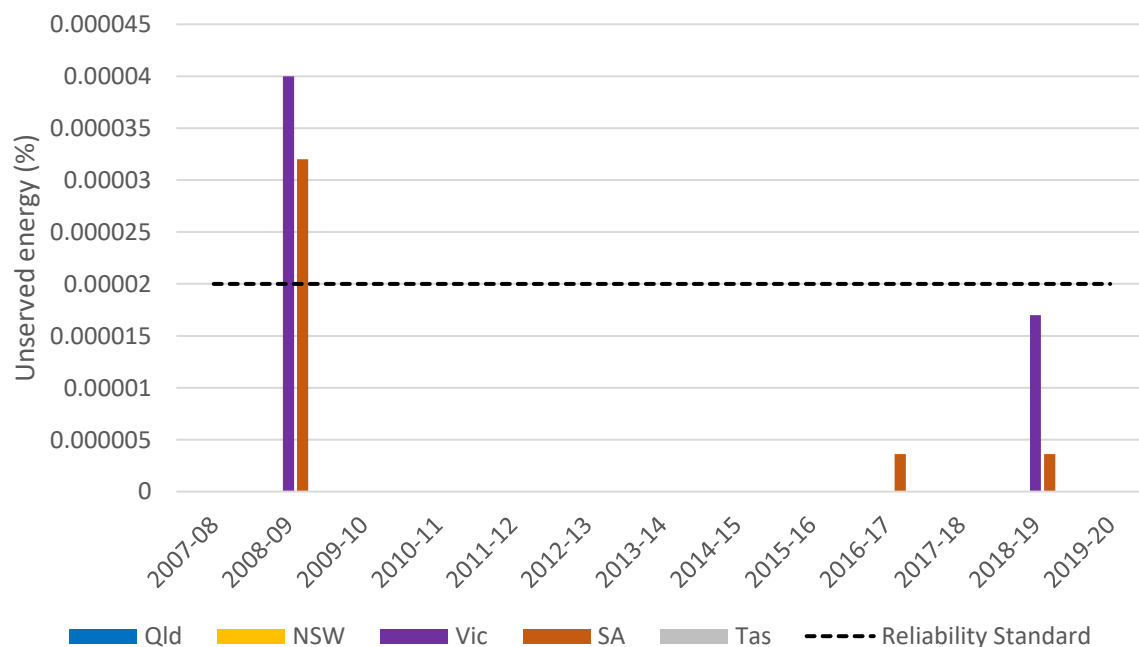
The current reliability standard is based on expected unserved energy (USE) within a given financial year not exceeding 0.002% in a region. Because this standard averages the annual USE over all possible outcomes, it effectively averages out the risk of experiencing extreme events which can cause involuntary load shedding. The changing demand profile from the grid, due to the rapid growth in rooftop solar since 2010, has also shortened the number of hours over which peak demand is reached and means that more involuntary load shedding events are likely for a given average outcome.

FIGURE 19 LACK OF RESERVE NOTICES 2006-07 – 2019 - 20



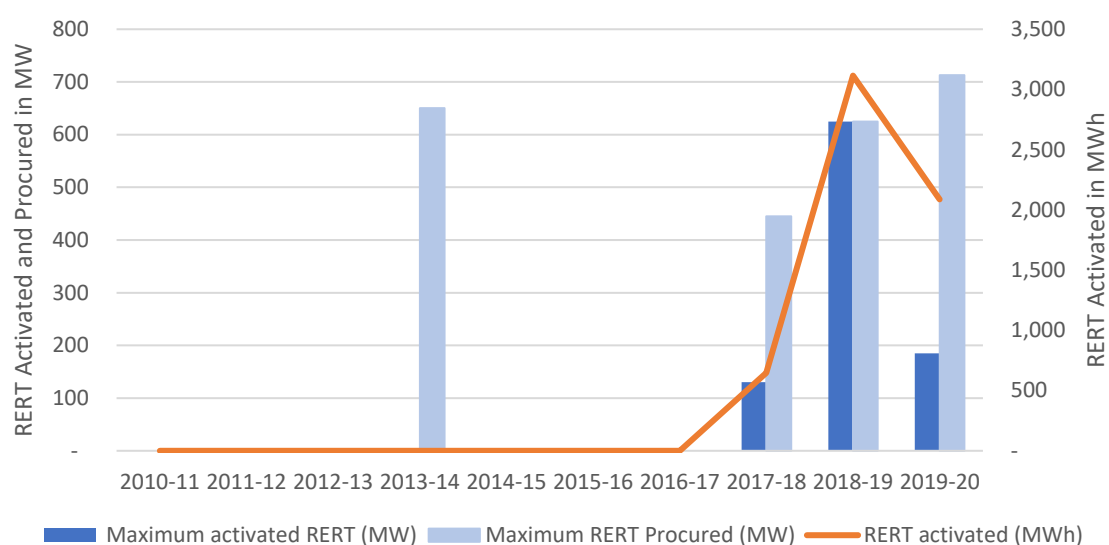
SOURCE: AEMO

FIGURE 20 PERFORMANCE AGAINST THE RELIABILITY STANDARD



SOURCE: AEMO

FIGURE 21 RELIABILITY AND EMERGENCY RESERVE TRADER ACTIVATION



SOURCE: AEMO

At its meeting in November 2019, the former COAG Energy Council requested the ESB provide advice on the implementation of interim measures to preserve reliability and system security, including reviewing the reliability standard, during the transition to the post-2025 Market Design. The ESB undertook a review of the reliability standard between November 2019 and February 2020.

The review examined reliability measures, reliability standards and mechanisms (from a resource adequacy point of view) and the costs and benefits of moving to a higher reliability standard. In undertaking the review, the ESB commissioned analysis to determine whether there is an economic benefit in changing the reliability standard using the latest available data on costs and benefits and modelling to provide indicative figures on the market price cap required to bring on additional capacity to achieve a higher standard.

The analysis by the ESB showed that a jurisdiction that was expected to just meet the reliability standard (0.002% USE) could expect load shedding one in every three years on average – absent an intervention mechanism such as the Reliability and Emergency Reserve Trader.

At the March 2020 meeting of the former COAG Energy Council, the ESB presented the findings and recommendations from its Review of the Reliability Standard⁷. The COAG Energy Council agreed to implement an interim out of market reserve that could be sourced by AEMO if expected unserved energy exceeded the interim reliability measure (0.0006% expected USE). The ACIL Allen⁸ modelling that supported the work by the ESB, highlighted that the benefits were likely to exceed costs for this interim reliability measure and this measure would best meet the expectation of Ministers that electricity supply remains reliable during a 1 in 10-year summer.

⁷ <http://www.coagenergycouncil.gov.au/reliability-and-security-measures/review-reliability-standard>

⁸ <http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/ESB%20Consultation%20-%20ACIL%20Allen%20Report%20to%20ESB%20on%20Reliability.pdf>

The ESB recommended that, if Energy Ministers agreed a higher standard were necessary to meet community expectations, a combination of amended and existing mechanisms were required. These included:

- Amending the Retailer Reliability Obligation trigger to align with a higher standard.
- Delinking the requirement for a T-3 trigger to enable a T-1 trigger under the Retailer Reliability Obligation.
- Establishing an additional out of market capacity reserve to replace long notice Reliability and Emergency Reserve Trader on a temporary basis.
- Continuing to use short and medium notice Reliability and Emergency Reserve Trader to manage unexpected contingencies under the current Reliability and Emergency Reserve Trader framework.
- Leave the market price settings unchanged

Energy Ministers agreed to these and during 2020 related rule changes were proposed, consulted on, and implemented to facilitate these recommendations. The exception was the delinking of the requirement for a T-3 trigger to enable a T-1 trigger, which has been deferred for consideration under the Post 2025 Market Design work program due to the close interrelationships with the Resource Adequacy Mechanisms market design initiative.

The Post 2025 Market Design work program was established to respond to the rapid changes in the energy system and ensure that the market design for the NEM will deliver secure and reliable power at least cost to consumers into the future. In September 2020, the ESB released a consultation paper⁹ that presented a number of potential solutions to a range of identified problems and opportunities. In December 2020, the ESB will release a Directions Paper that responds to feedback from stakeholders and provides an indication of the direction that the ESB is heading under the Post 2025 Market Design Work program. The ESB is scheduled to provide recommendations to the Energy National Cabinet Reform Committee by the middle of 2021.

The Reliability Panel will also shortly commence a detailed review of the reliability settings that will apply from 1 July 2024 as a part of requirement to conduct a four-yearly review. This review is due to be completed by 30 April 2022.

Key insights from AEMO's 2020 Electricity Statement of Opportunities:

The expected reliability outlook has improved for summer 2020-21 onwards, due to lower forecast peak demand, minor generation and transmission augmentations, and significant development of large-scale renewable resources. However, the uncertainty range of this outlook has increased compared to previous years and the risk of involuntary load shedding remains, particularly if peak demands reach the 10% probability of exceedance (POE) levels and coincide with low renewable generation, or prolonged generation or transmission outages. While COVID-19 has reduced peak demand and energy consumption expectations for the coming summer, it also creates a significant new uncertainty as no history is available to guide how a global pandemic will affect a modern economy.

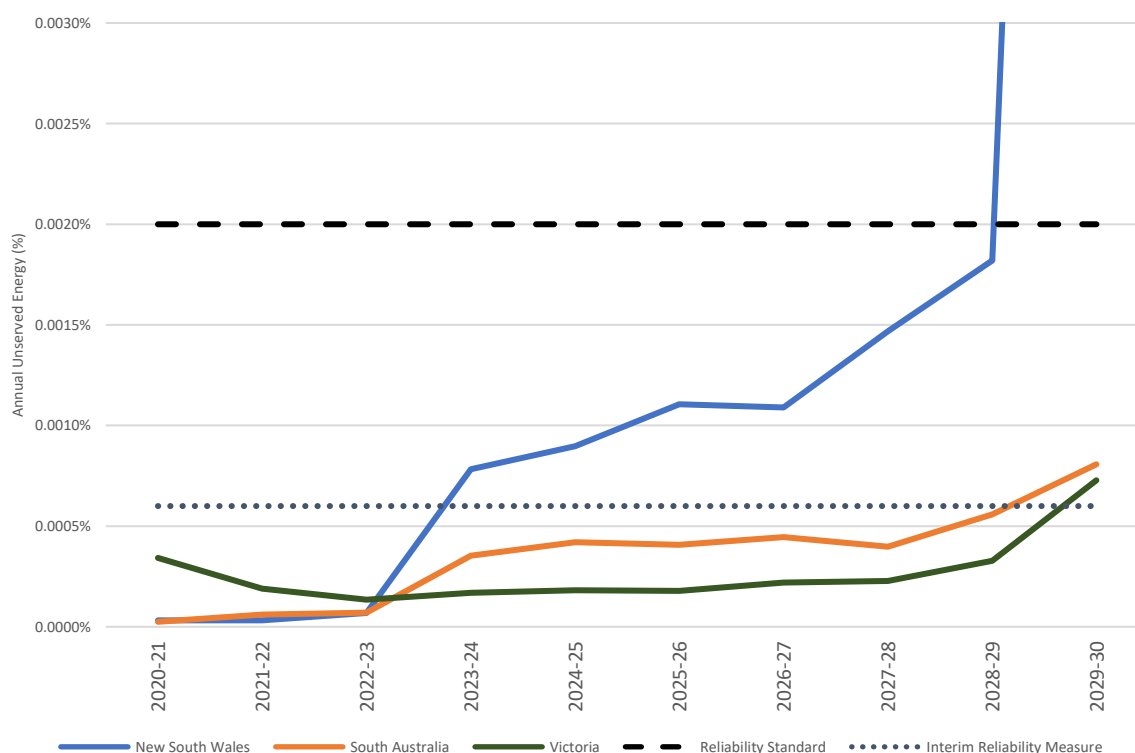
Beyond this summer, New South Wales' reliability outlook, after the Liddell Power Station retires, has improved since the 2019 ESOO. This improvement is a result of the committed

⁹http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/P2025%20Market%20Design%20Consultation%20paper.Final_.pdf

augmentation of the Queensland to New South Wales Interconnector (QNI) in 2022-23. This QNI work is progressing well. The development of local new renewable generation (900 MW) is also an important addition to supply.

Absent additional investment, NSW is forecast to exceed the Interim Reliability Measure from 2023-24 onwards, and to be vulnerable to the coincidence of high demands, generator outages, and low renewable generation until Snowy 2.0 and related transmission augmentations are commissioned. From 2023-24 onwards, expected USE levels increase in New South Wales, and to a lesser extent in Victoria, as coal-fired generation is projected to become less reliable as plant ages. The spike in unserved energy (Figure 22) in NSW in 2029-30 coincides with the expected retirement of Vales Point Power Station, this closure is likely to be offset by new investment in capacity that would replace the lost output. The inclusion of the HumeLink Actionable ISP Project would reduce the expected Unserved Energy in New South Wales below the Interim Reliability Measure from 2025-26 onwards.

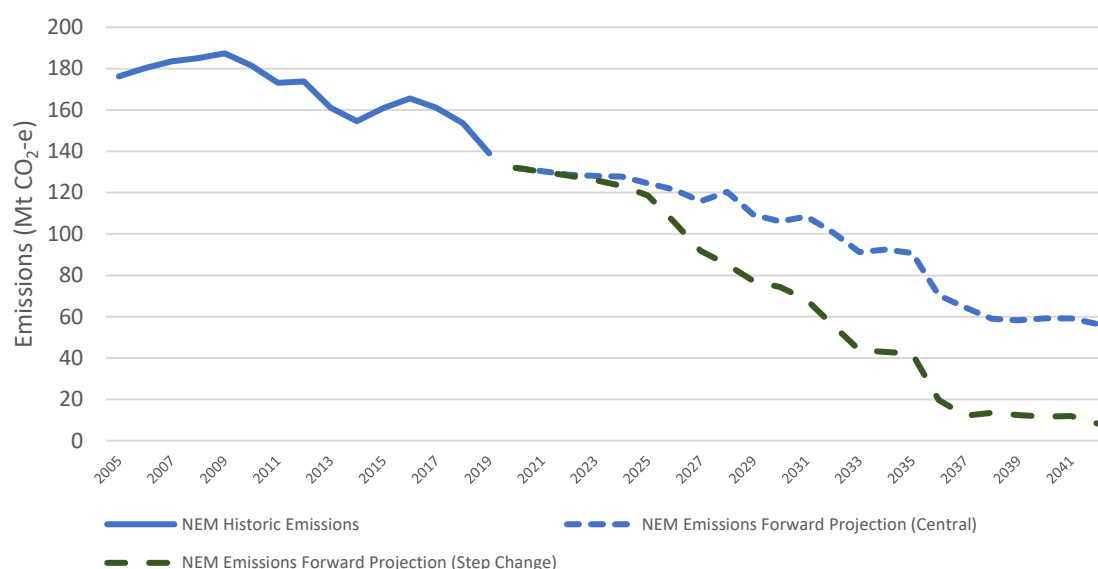
FIGURE 22 FORECAST UNSERVED ENERGY OUTCOMES



SOURCE: AEMO, ELECTRICITY STATEMENT OF OPPORTUNITIES, 2020

By the end of 2020 emissions across the NEM are expected to be approximately 25 percent below 2005 levels. Based on the 2020 Integrated System Plan Central and Step Change scenarios by 2030 emissions are projected to be between 40 and 58 percent below 2005 levels and between 68 and 95 percent below by 2042. At the current pace the NEM is trending at or above the Step Change scenario. This trend in emissions reflects the continued rapid commitment to investment in renewable generation and the subsequent decline in production from coal and gas fired generation.

FIGURE 23 NEM EMISSIONS - HISTORIC AND FORWARD PROJECTION



SOURCE: DEPARTMENT OF INDUSTRY (HISTORICAL), AEMO 2020 ISP (PROJECTIONS)

3.2. Investment

As recognised in past reports on the Health of the NEM, along with most other global power systems, the NEM is transforming at a rapid pace. In the International Energy Agency's (IEA) most recent World Energy Outlook¹⁰ it highlights that renewables are expected to meet 90% of the growth in electricity demand over the next two decades under its stated policies scenario. This is driven by continued high levels of solar deployment. It notes that the *“structural transformation of the energy sector will require massive investment in new, more efficient and cleaner capital stock”*. In the NEM this is precipitated by the declining competitiveness of an ageing fleet of thermal coal fired power stations that inevitably need to be replaced or refurbished over the next 15 – 20 years.

The IEAs 2020 World Energy Outlook highlights that it is critical as solar and wind generation rise that a *“strong premium is placed on robust and well-functioning electricity networks”* and that *“storage ... plays an increasingly vital role in ensuring the flexible operation of power systems”*.

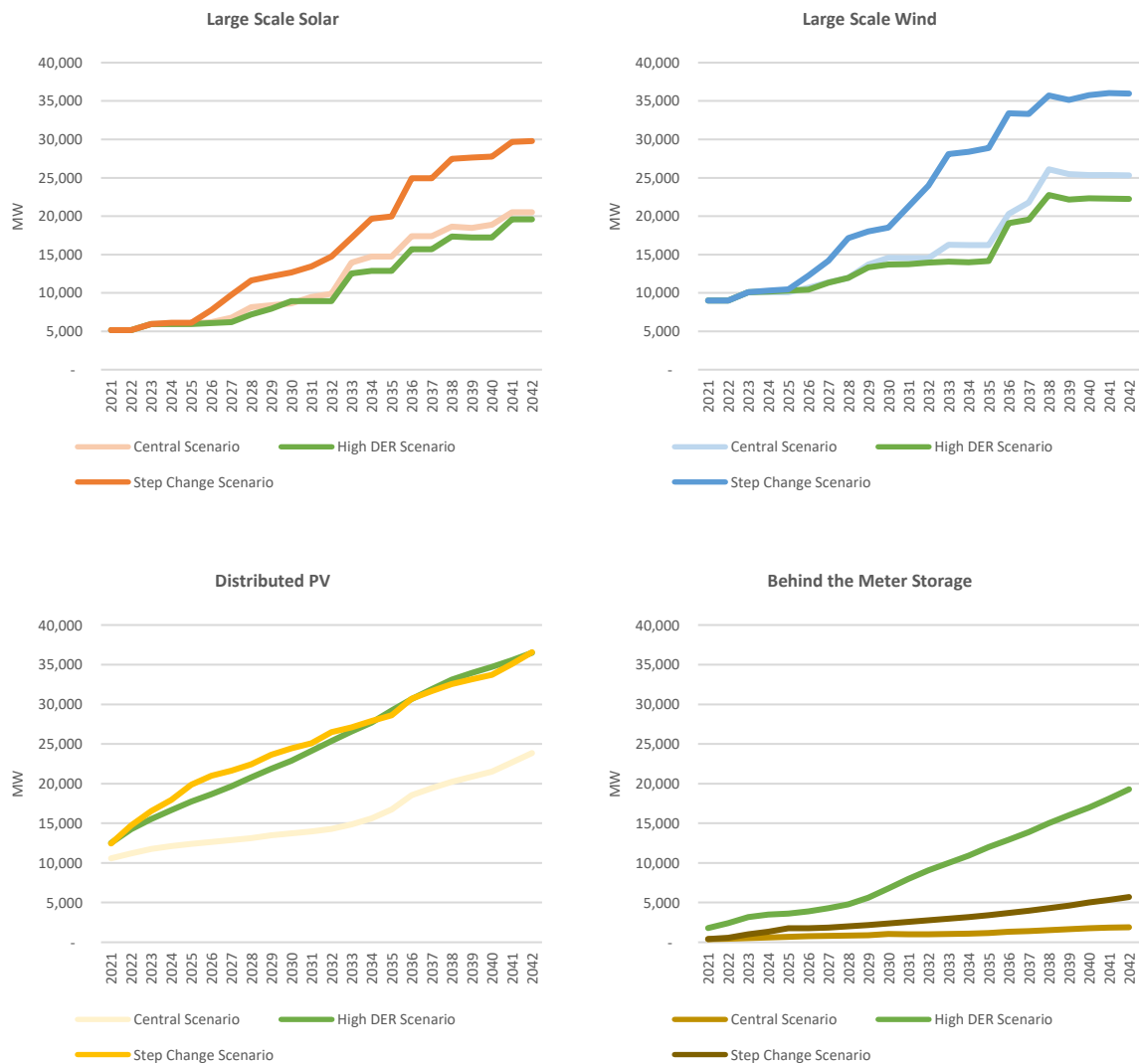
Providing important context for the NEM, the 2020 Integrated System Plan highlights that Large Scale and Distributed renewables will increase from approximately 25,000 MW in 2021 to between 70,000 and 100,000 MW by 2042 while Dispatchable and Behind the Meter Storage will increase from approximately 2,000 MW to between 16,000 and 40,000 MW.

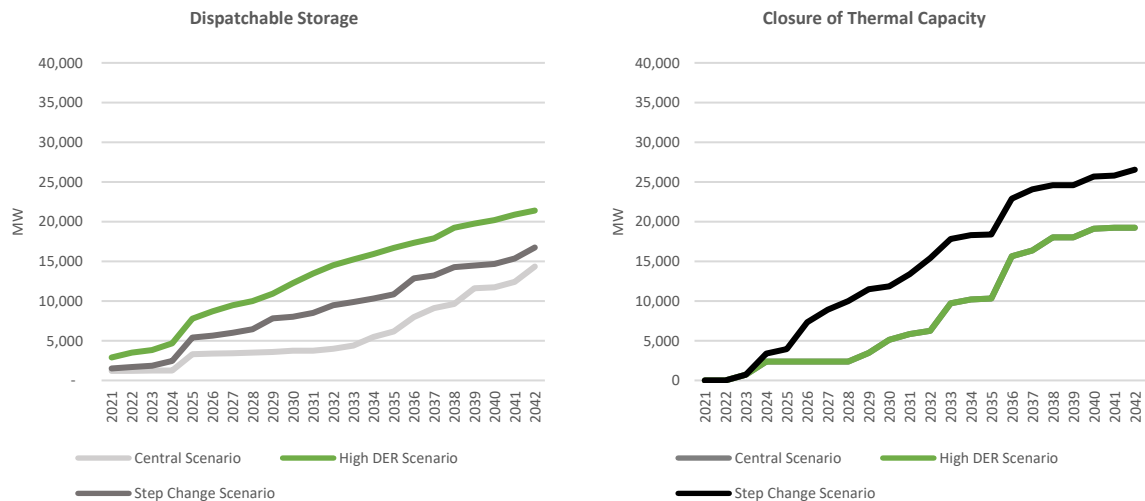
¹⁰ The Stated Policies Scenario reflects the impact of existing policy frameworks and today's announced policy intentions. The aim is to hold up a mirror to the plans of today's policy makers and illustrate their consequences for energy use, emissions and energy security.

Looking at the Central, High Distributed Energy Resource (DER) and Step Change Scenarios Figure 24 projects that:

- Large scale solar will increase from approximately 5,000 MW to between 20,000 and 30,000 MW by 2042
- Large scale wind will increase from approximately 10,000 MW to between 22,000 and 35,000 MW by 2042
- Distributed PV will increase from approximately 11,000 MW to between 24,000 and 37,000 MW by 2042
- Behind the Meter Storage will increase from 400 MW to between 2,000 and 20,000 MW by 2042
- Dispatchable Storage will increase from 1,200 MW to between 14,000 and 21,000 MW by 2042

FIGURE 24 RENEWABLE & STORAGE DEVELOPMENT AND THERMAL CLOSURE PROJECTIONS – CENTRAL, HIGH DER AND STEP CHANGE SCENARIOS





SOURCE: AEMO 2020 ISP

Given the scale of the transformation that is likely to occur, the Post 2025 Market Design work program recognises that the energy system is changing and that the current set of systems, tools, market arrangements and regulatory frameworks is no longer entirely fit for purpose and able to meet the changing needs of the system and customers. It is an important aspect of this work that the market settings support investor confidence and that this allows them to efficiently manage risk in a way that supports investment, operation, retirement, and innovation decisions. The Market Design Initiatives on Resource Adequacy Mechanisms, Ageing Thermal Generation and Transmission Access collectively examine how the market can encourage appropriate investment and help integrate these new sources of generation and storage.

The Post 2025 Market Design Work Program also recognises that various government interventions and policy announcements have influenced, and will likely continue to influence, the mix of resources and the pace at which the NEM is transformed. These interventions are generally designed to either speed up the transition to cleaner energy or underpin concerns about reliability or both. Regardless of the form of intervention (e.g. early entry through government ownership or financial incentives delivered outside the market), they all are likely to alter the signals set by the market and alter other party's investment decisions. The Post 2025 Market Design must be able to accommodate the entry of new capacity and orderly exit of existing capacity through such mechanisms and maintain reliability and security at the lowest cost to consumers.

4. Effective development of open and competitive markets

Overall Assessment

To assess whether or not the electricity market is developing into a more open and competitive market four criteria are examined.

1. Are wholesale and retail markets competitive and are they delivering efficient outcomes for consumers?
2. Are the financial markets for electricity and gas related services deep, liquid and transparent?
3. Is there access to efficiently priced fuel and transport?
4. Are there incentives for innovation to enable value from new technologies?

Overall the current status assessment improved to good from moderate in the previous year. The outlook remains Good-Moderate, noting some risks associated with the future demand and supply of coal and gas. The timing of exit for existing assets is uncertain and, as replacement technologies fall in cost, decisions become more uncertain. Some technologies are just starting to become commercially viable.

TABLE 5 EFFECTIVE DEVELOPMENT OF OPEN AND COMPETITIVE MARKETS

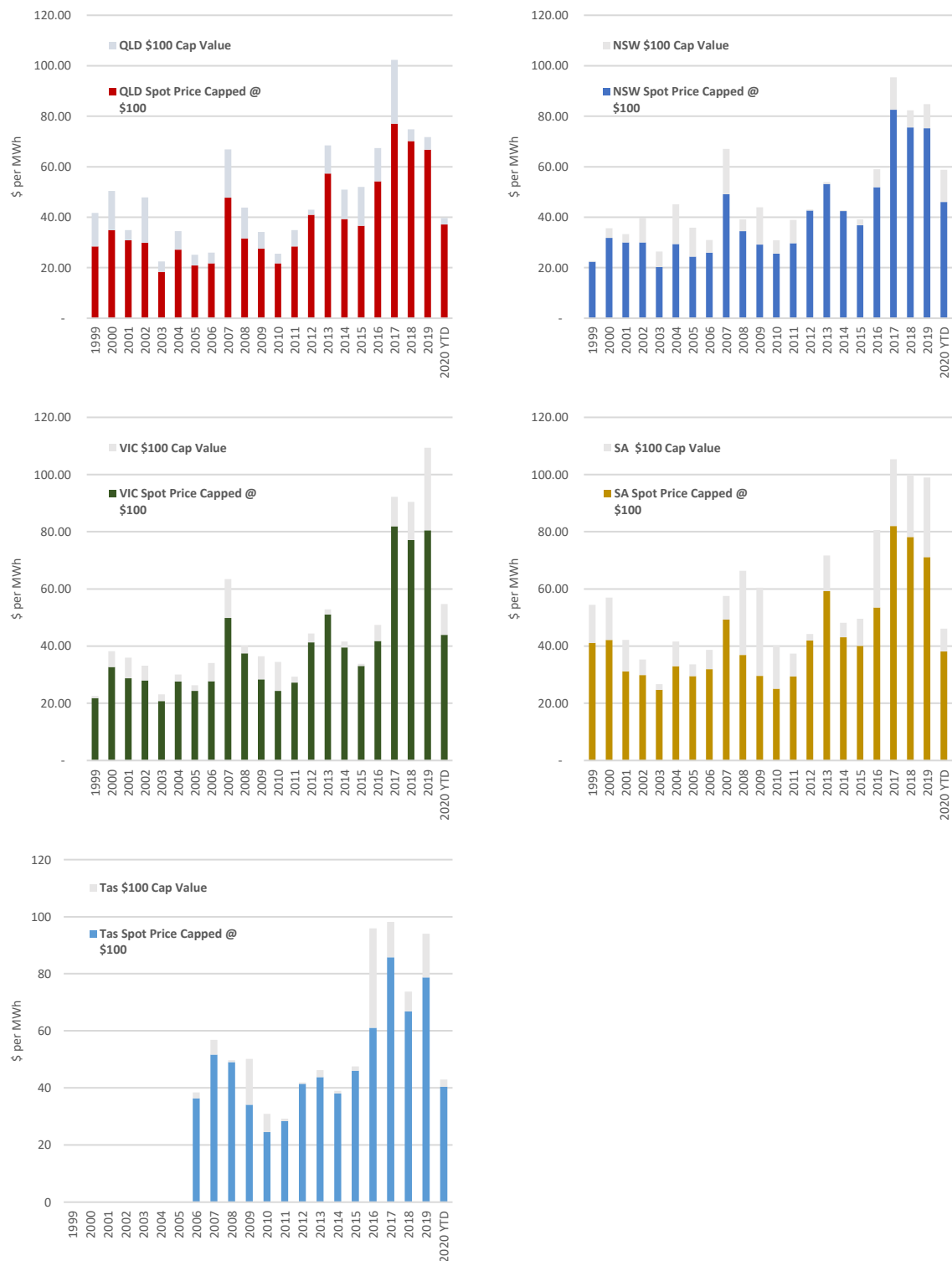
	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Competition in wholesale and retail markets	Good	Good	Moderate-critical	Moderate
Deep, liquid and transparent financial markets for electricity	Good	Good	Moderate	Good
Access to efficiently priced fuel and transport	Good	Moderate	Moderate	Moderate
Innovation is incentivised and enables value from new technologies	Moderate	Good	Moderate	Good
Overall	Good	Good-Moderate	Moderate	Good-Moderate

4.1. Wholesale and Retail Market Competition

Wholesale Competition

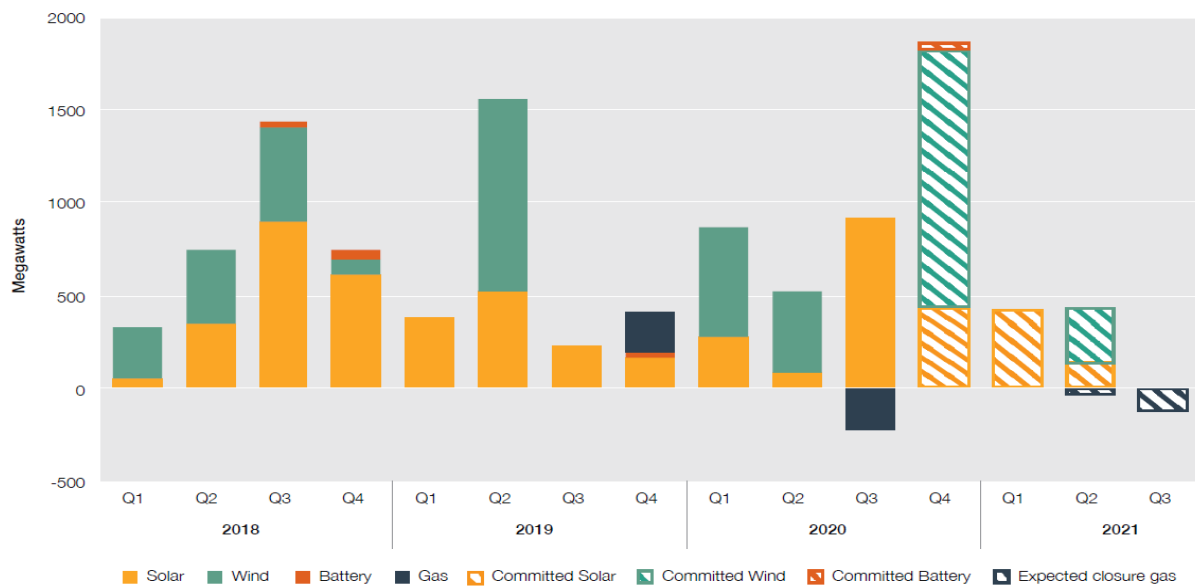
Following several years of elevated prices across the NEM, spot prices have returned to the levels not seen since 2015, and in some regions to levels that are close to the lowest in a decade. A range of factors are attributed to driving these falls, but key factors include; the volume of renewable generation that has commenced (Figure 26), the continued uptake in rooftop solar PV (Figure 27), falling coal and gas prices (Figures 37 and 39), lower demand (Figure 28) and increased availability across the thermal generation fleet. The increased availability is in part influenced by the deferral of planned outages due to COVID-19.

FIGURE 25 ANNUAL AVERAGE SPOT PRICES IN THE NEM (CAPPED AND UNCAPPED)



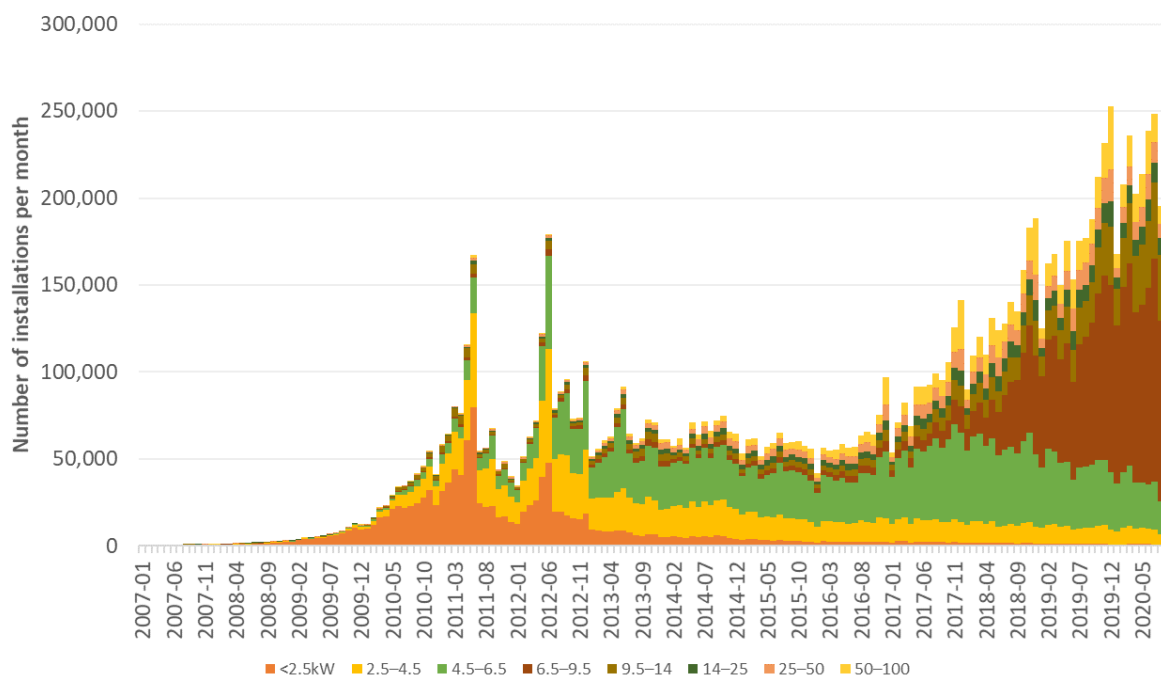
SOURCE: ESB USING AEMO DATA

FIGURE 26 GRID CONNECTED NEW ENTRY AND EXIT BY FUEL TYPE ACROSS THE NEM



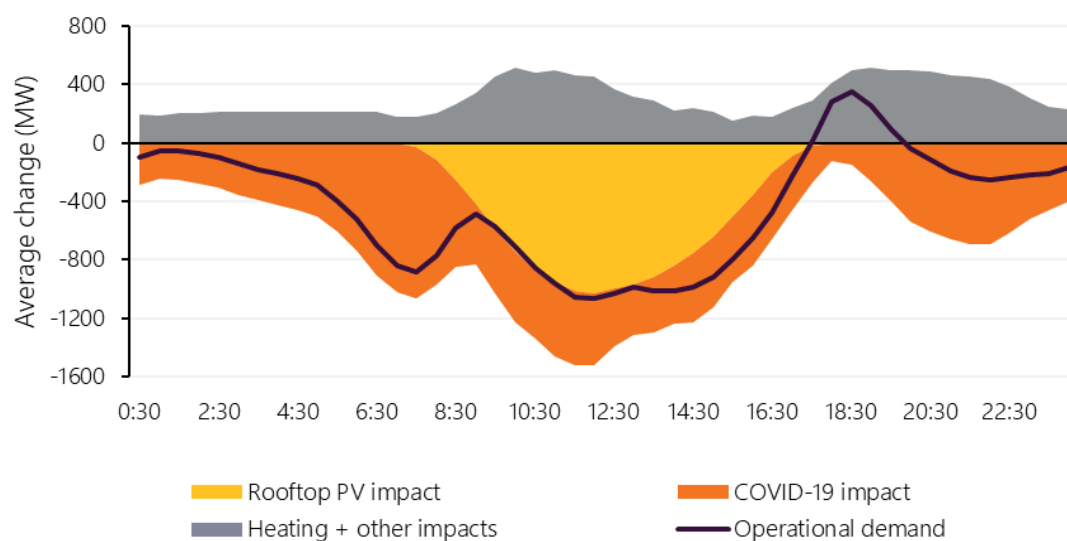
SOURCE: AER

FIGURE 27 NUMBER OF SMALL SCALE SOLAR INSTALLATIONS BY SIZE IN kW SINCE JAN 2007



SOURCE: AUSTRALIAN PV INSTITUTE

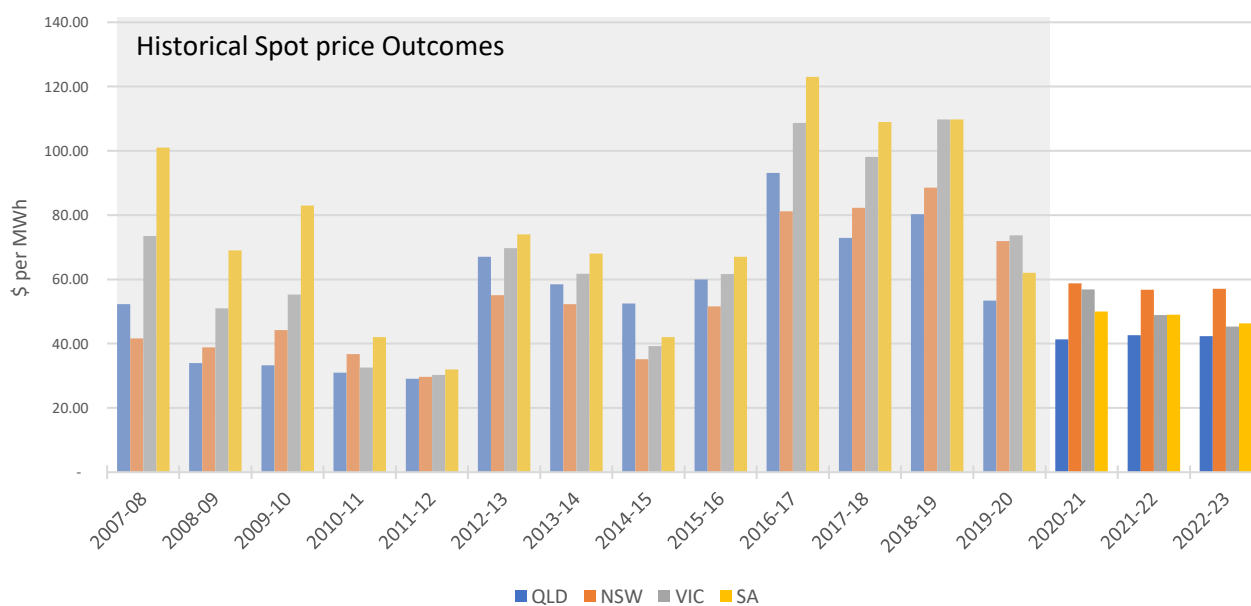
FIGURE 28 CHANGE IN NEM-AVERAGE OPERATIONAL DEMAND BY TIME OF DAY (Q2 2020 VERSUS Q2 2019)



SOURCE: AEMO Q2 2020 QUARTERLY ENERGY DYNAMICS

Figure 29 below highlights that for at least the next three years wholesale prices are expected to continue the trend observed between 2018-19 and 2019-20 with current forward prices between \$40 and \$60 per MWh across all regions between now and 2022-23. There is minimal forward market activity beyond 2022-23 to provide a clear guide of expectations beyond that, however the continued development of large-scale renewable generation and the installation of rooftop solar PV is expected to keep wholesale prices subdued, at least during periods of high renewable generation. The development of dispatchable generation, such as storage or peaking generators, to replace thermal power stations as they exit will be important in keeping wholesale prices at sustainable levels outside the “renewable dominant” periods.

FIGURE 29 HISTORICAL AND FORWARD PRICE OUTLOOK, JANUARY 2020 BY FINANCIAL YEAR



SOURCE: AEMO, ASX

On the 14th December 2020, the AER released the 2020 Wholesale Electricity Market Performance report¹¹. The report finds that:

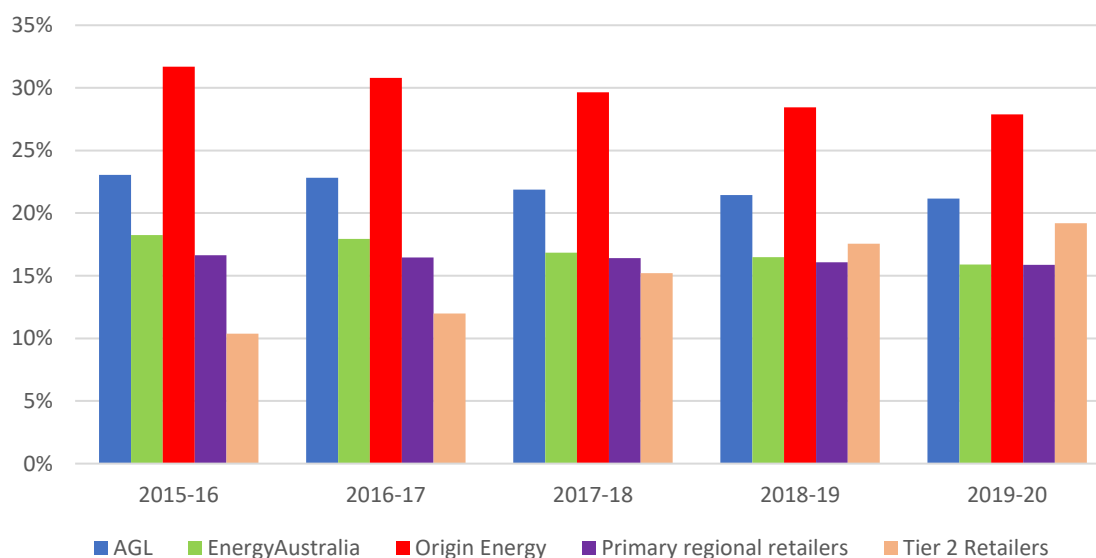
- NEM prices have fallen due to the falls in input costs and increased competition from large-scale solar and wind generation which have been reflected in lower average offers from generators.
- While prices have fallen, they currently remain sufficient to encourage further investment in new generation and storage.
- The current transformation of the NEM has slightly lessened market concentration, as well as affected how participants offer their capacity, price signals for new investment, and markets for managing fluctuations in frequency.
- Flexible generation is becoming more important in firming fluctuations in intermittent renewable generation and is now setting the price more often in the peak demand periods.
- While the report did not find any concerning exercise of market power by generators, there are still elements of the market that are vulnerable to the exercise of market power.
- The AER's continued monitoring of the performance of the wholesale market, as it evolves, will need to focus on the implications for competition and efficiency of increased penetration of intermittent renewable generation and the role of flexible generation particularly in evening peaks. It will also need to monitor and report on how major policy reforms and interventions are changing competitive dynamics in the NEM

Retail Competition

Falling wholesale prices have continued to improve the growth opportunities for smaller retailers, as the costs of holding and managing hedging positions reduce. The most recent retail electricity market share data shows that Tier 2 retailers continued to gain market share. This increase was spread across multiple retailers.

¹¹ <https://www.aer.gov.au/wholesale-markets/performance-reporting/aer-wholesale-electricity-market-performance-report-2020>

FIGURE 30 RETAIL ELECTRICITY MARKET SHARE TREND (NEM RESIDENTIAL CUSTOMERS EXCL VICTORIA)¹²



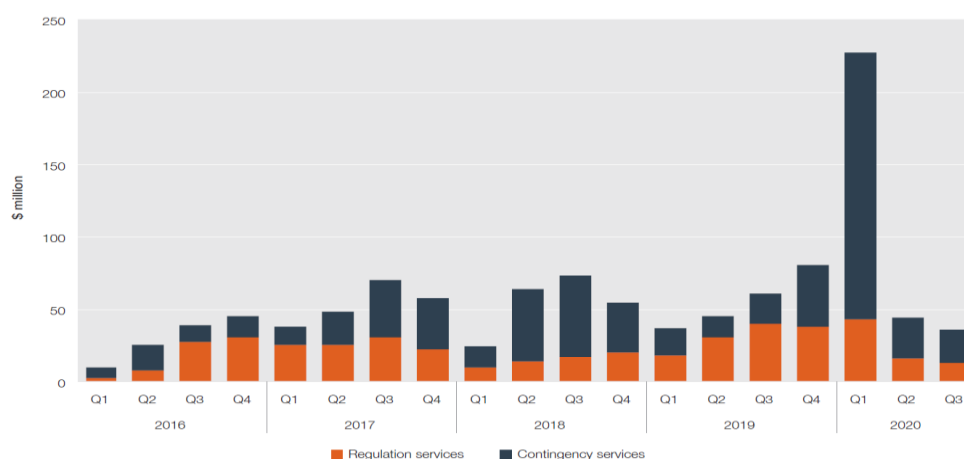
SOURCE: AER

Frequency Control Ancillary Services (FCAS)

There was a spike in costs associated with FCAS in the first quarter of 2020 largely due to the extended separation of the South Australian and Victorian power systems. During Quarter 2 and 3 2020 there was a marked decline in the cost of regulation services in the market. In AEMO's Q3 2020 Quarterly Energy Dynamics report this fall is attributed to the expansion of supply (largely coming from battery developments), the return to market of some thermal units and generally lower underlying energy prices. The implementation of mandatory primary frequency control with a very narrow band may also have contributed to this fall in costs.

¹² Tier 1 retailers include Origin Energy, AGL and EnergyAustralia, as they collectively service the majority of the retail markets in NSW, South Australia and south-east Queensland. Primary regional retailers include Ergon Energy, ActewAGL and Aurora Energy. Tier 2 retailers include all other retailers.

FIGURE 31 TOTAL FCAS COSTS BY QUARTER



SOURCE: AER

4.2. Transparent and liquid contract markets

Electricity Market

Since contract volumes reached record lows for the past decade in 2017–18, the contract markets associated with the NEM have exhibited considerable growth, particularly over the 2019-20 period. This increased level of activity has continued to be observed over the past 3-6 months and is expected to remain for now.

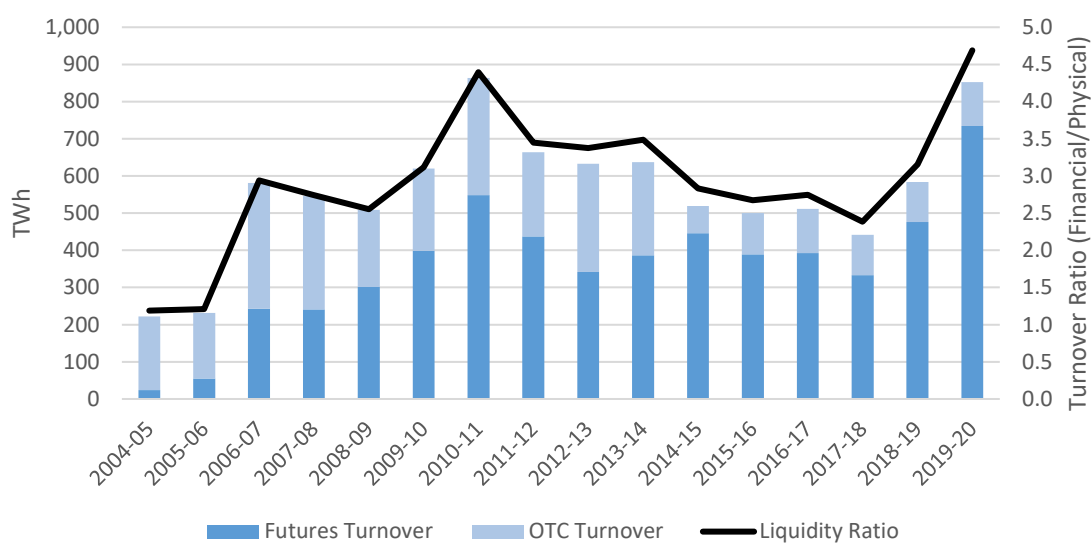
‘Over the counter’ (OTC) bilateral contracting markets have remained relatively stable since 2015-16, with AFMA’s survey¹³ of annual OTC volumes estimating annual turnover between 110 and 120 TWh over the period. This turnover is well below the 338 TWh observed in 2006-07 when volumes in the survey peaked. In contrast exchange traded volumes have grown significantly, whilst also fluctuating, since the listing of new Australian Electricity Futures products in 2002. Over this time, exchange traded volumes have grown from less than 50 TWh per annum to the 2019-20 high of 735 TWh. The increase in 2019-20 exchange traded volumes from 2018-19 was greatly influenced by the increased volume in exchange traded options which increased from 168 TWh to 330 TWh.

The ACCC’s 2018 Retail Electricity Pricing Inquiry raised concerns about the transparency of prices, contracting and retail performance in the context of affordability for consumers and recommended action. Following this report, the ESB was asked to advise the former COAG Energy Council on several of the recommendations. Following consultation, in late 2018 and early 2019, the ESB advised Energy Ministers that it supported a proposed expansion of the AER’s powers and removing limits on its ability to gather contract information. Through the ESB’s work on Data Strategy, that was released in October 2020, the ESB is continuing to pursue the discussion about the role of AER and transparency of the contract market. It is also seeking to progress work on the tracking of the prices faced by large energy users through the expansion of the AER’s information gathering powers.

13

<https://afma.com.au/data/electricity/2020%20Electricity%20Derivative%20Turnover%20Survey%20Final.xlsx>

FIGURE 32 CONTRACT MARKET TURNOVER AND LIQUIDITY RATIO, NEM (EXCL TAS)

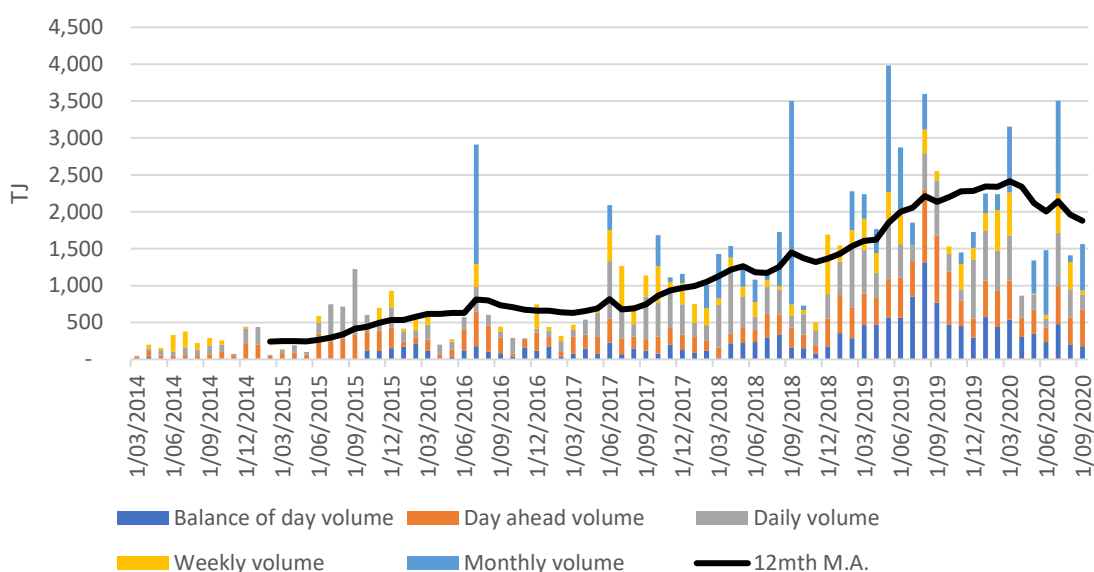


SOURCE: AFMA, ASX, AEMO

Gas Market

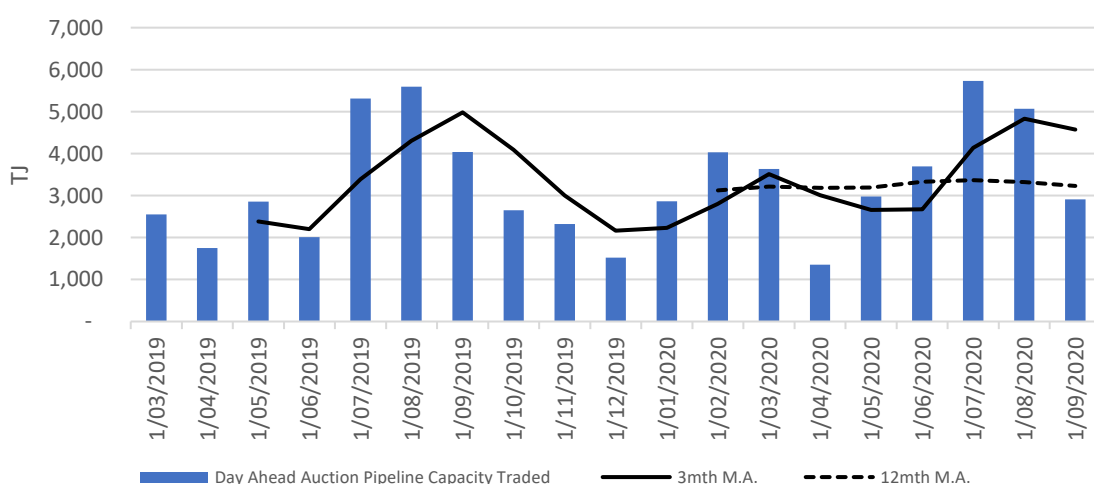
During 2020 volumes traded on the Gas Supply Hub have slightly decreased. However, activity in the Day Ahead Auction for pipeline capacity, that started in early 2019, has remained relatively stable on an annual average basis. The decline in Gas Supply Hub volumes is not unsurprising as gas generation output has declined in Victoria, South Australia and New South Wales following increased availability across the black and brown coal fleet.

FIGURE 33 GAS SUPPLY HUB – MONTHLY TRADE VOLUMES BY PRODUCT



Source: AER

FIGURE 34 DAY AHEAD AUCTION FOR PIPELINE CAPACITY – MONTHLY TRADE VOLUMES



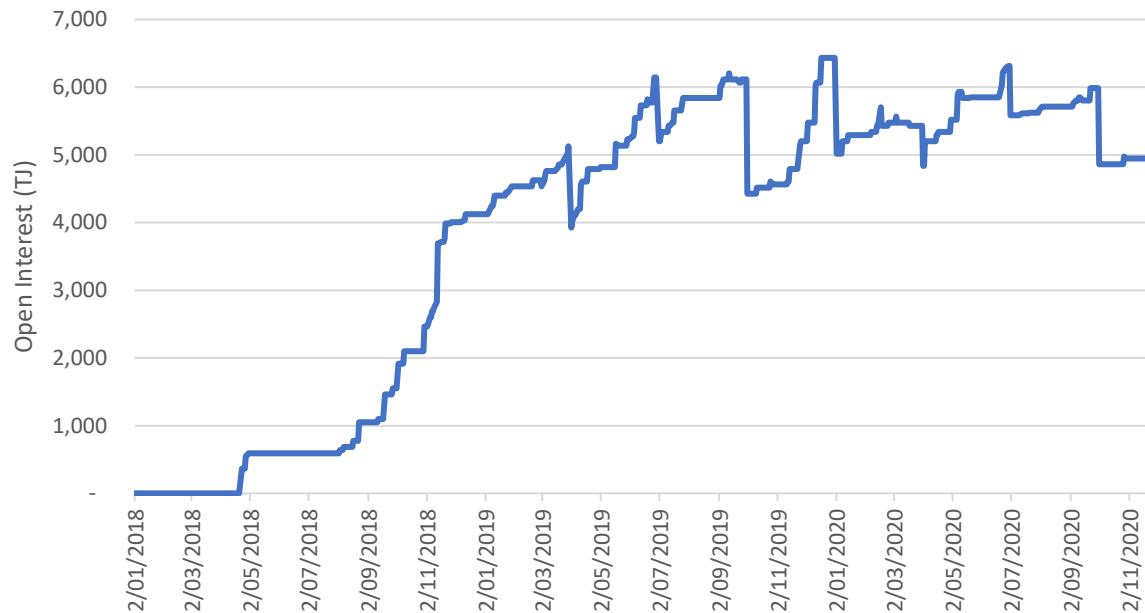
SOURCE: AER

In March 2020, Energy Ministers endorsed a range of measures to improve transparency in the eastern and northern Australian gas markets, with new reporting obligations across gas sector. Building upon the existing Gas Bulletin Board and Gas Statement of Opportunities, the reforms include a range of measures relating to gas and infrastructure prices, supply and availability of gas, gas demand, infrastructure used to supply gas to end-markets, and wider powers for AER to monitor gas contract markets and large gas users. These measures have been endorsed but are still being implemented.

More generally liquidity and transparency in the gas contract markets are improving with forward and futures contracts trading across a range of different products. Figure 35 highlights the growth in open interest in Victorian Gas Futures contracts since the start of 2018. Figure 36 also highlights the fall in activity since early March. This may be due to the

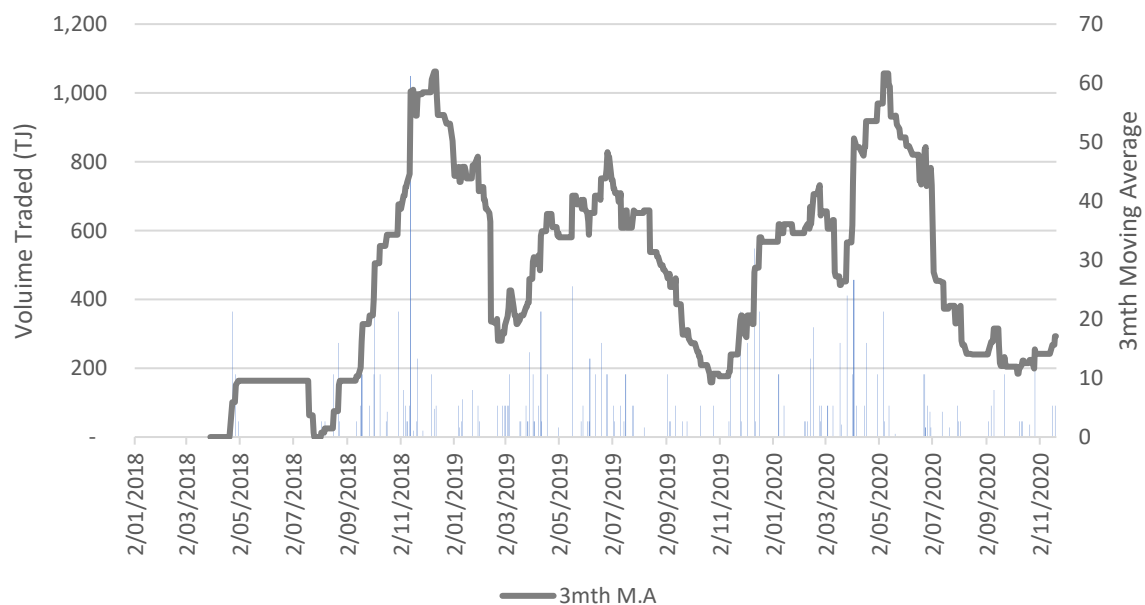
uncertainty driven by COVID-19 on global gas markets generally. Beyond the futures market, growing interest is occurring in 'Over the Counter' products following the publication of the AFMA's Cash Settled Gas Trading Addendum in February 2018.

FIGURE 35 OPEN INTEREST IN VICTORIAN GAS FUTURES



SOURCE: ASX

FIGURE 36 VICTORIAN GAS FUTURES TRADING VOLUMES



SOURCE: ASX

4.3. Access to efficiently priced fuel and transport

Coal

Over 2020, global coal prices have continued the downward trend observed since late 2018. This has been exacerbated by the impacts of COVID-19 around the world. As a result, thermal coal prices reached levels that had not been seen since 2006 and several of the world's coal producers are operating at levels which provide little to no financial return.

Many black coal fired generators in the NEM increased their exposure to global coal pricing dynamics as long term contracts rolled off in the mid 2010's. As a result, the fall in coal prices since late 2018 has likely led to lower costs and lower spot price outcomes in the NEM. However, this has been partially offset by continued coal quality issues at a range of mines in NSW that have affected the amount of coal available to several of that region's generators.

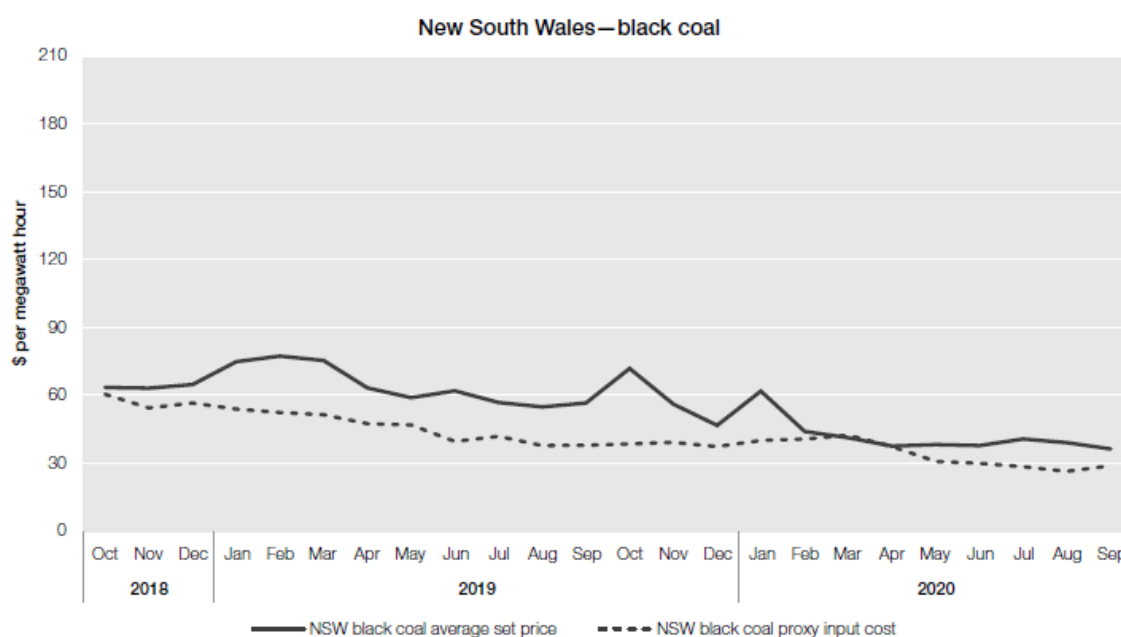
Looking forward to the period between 2022 and 2026, many of the thermal black coal generators will begin to negotiate new contracts as their current arrangements roll off. These negotiations are likely to continue to be influenced by global trends. In the recent 2020 World Energy Outlook, the IEA sees global coal production falling sooner and faster than it envisaged in 2019, however Australian producers are likely to be more resilient to falling demand than other export focused countries. Regardless it is unlikely that coal prices can remain at current levels given the challenging financial situation for many producers. It is also concerning that the risk of continued coal quality issues could impact the availability of coal for generation in the NEM. Combined these issues present a risk to the upside with regard to wholesale prices in the NEM.

FIGURE 37 INTERNATIONAL REFERENCE PRICE FOR NEWCASTLE SPOT THERMAL COAL



SOURCE: VARIETY OF SOURCES

FIGURE 38 AVERAGE PRICE SET AND NSW BLACK COAL PROXY INPUT COST

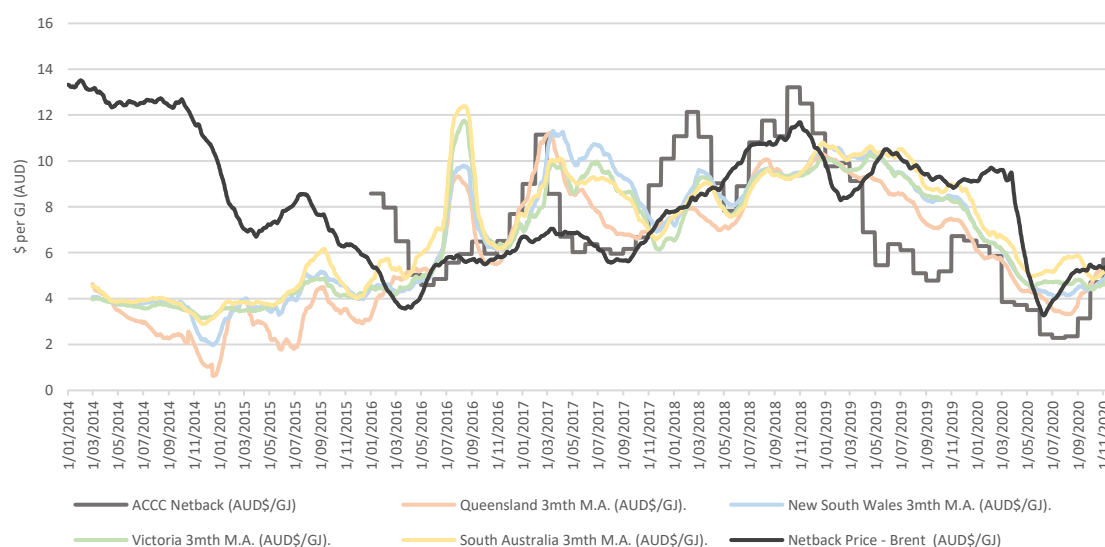


SOURCE: AER

Gas

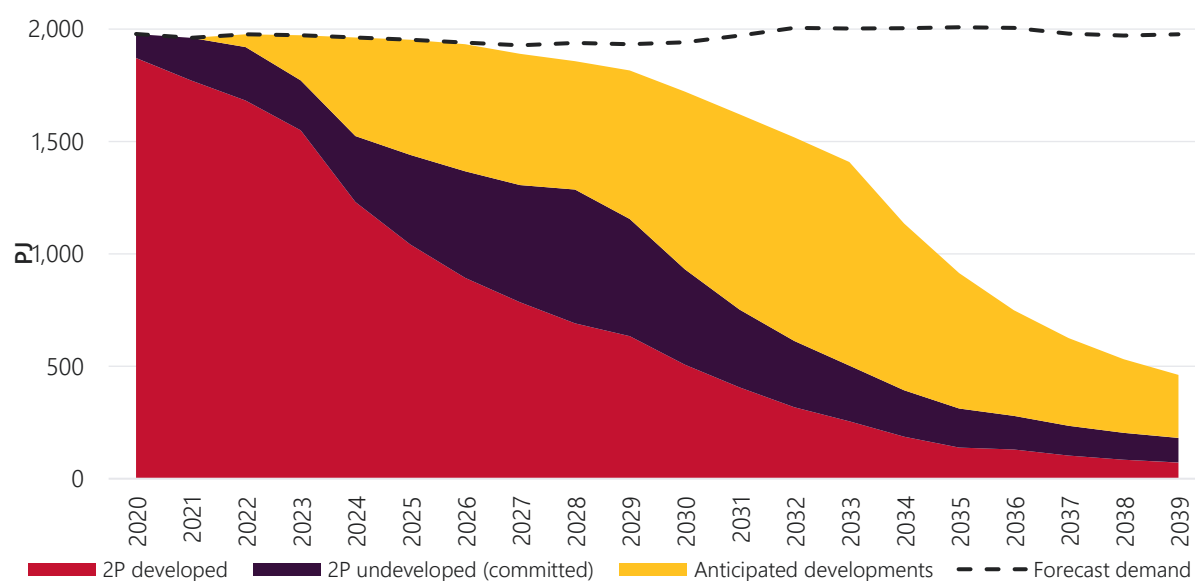
Like coal prices, gas prices have also fallen considerably since 2018 to levels not seen on the east coast since 2015-16 when oil prices fell to just under USD\$30 per barrel. Currently near-term gas prices across the domestic gas markets are trading in a range of \$5-\$6 per GJ. The current outlook for domestic gas prices is for a general trend back towards \$6-\$7 per GJ by 2022 as global gas markets recover from the impact of COVID-19. According to AEMO's 2020 Gas Statement of Opportunities (GSOO), which was released in March, the southern supply from existing and committed gas developments will reduce by more than 35% over the next five years. Unless additional southern supply sources are developed, LNG import terminals are progressed, or pipeline limitations are addressed, then challenges may arise in meeting peak winter demand from 2024 onwards. Figure 40 from the AEMO GSOO highlights that anticipated gas field projects (considered likely to proceed within the outlook period) will support resource adequacy until at least 2026 if developed, however due to the location of most of the anticipated projects they are unlikely to address the peak winter demand from 2024 onwards.

FIGURE 39 DOMESTIC AND LNG NETBACK GAS PRICES.



SOURCE: AER

FIGURE 40 PROJECTED EASTERN AND SOUTH-EASTERN AUSTRALIA GAS PRODUCTION (EXPORT LNG AND DOMESTIC), 2020-39; EXISTING PROJECTS, AND COMMITTED AND ANTICIPATED DEVELOPMENTS, CENTRAL SCENARIO



SOURCE: AEMO 2020 GSOO

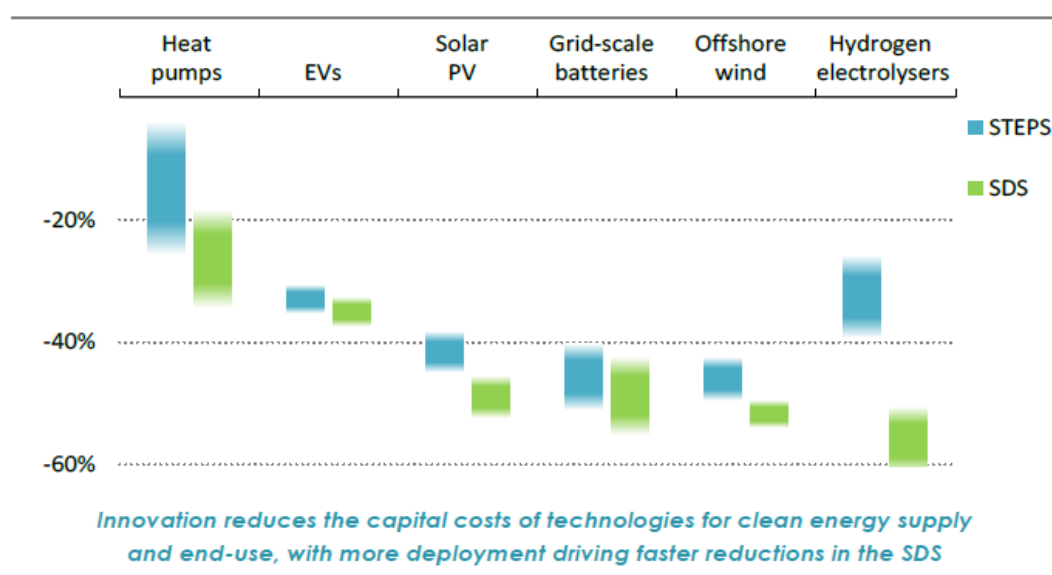
4.4. Innovation is incentivised and enables value from new technologies

Technological Innovation

The IEA's 2020 World Energy Outlook highlights that *"The pace at which technologies improve and move from the laboratory to the market, with associated reductions in cost, is an important variable that will play a big part in shaping future energy systems."* The expected fall in capital costs for critical energy technologies are shown in Figure 48. The IEA

expects renewables to meet about 80% of the growth in global electricity generation over the next decade.

FIGURE 41 CAPITAL COSTS FOR SELECTED ENERGY TECHNOLOGIES IN 2040 RELATIVE TO 2019¹⁴



SOURCE: FIGURE 2.11 WORLD ENERGY OUTLOOK 2020, INTERNATIONAL ENERGY AGENCY

Continued innovation and the subsequent cost reductions in the likes of electric vehicles, hydrogen electrolyzers, batteries and fuel cells have the potential to fundamentally reshape the future as these technologies are increasingly paired with solar and wind. Ultimately the reliance on more traditional forms of electricity generation will decline. In the context of the COVID-19 pandemic the inherent uncertainty in innovation is likely to have increased as investors, during an economic downturn, tend to seek safer and lower risk investments. This presents a challenge for the NEM as existing power stations age and need to be replaced or refurbished while there is increasing ambition to reduce emissions.

In September 2020, the Commonwealth Government released its Low Emissions Technology Statement as a part of its Technology Investment Roadmap. This statement outlines five priority technology areas where the Commonwealth will focus research and development funding, through ARENA, the CEFC and the CER. The aim is to accelerate low emissions technologies and/or technologies that support lower emissions. These are Clean Hydrogen (under \$2/kg), Energy Storage (firming under \$100/MWh), low emissions steel (\$900/t) & aluminium (\$2,700/t) production, CO₂ capture and storage (\$20/t), and soil carbon (\$3/ha).

Retail and Contract Market Innovation

It is also important to recognise that while innovation in technologies reshape the energy system these changes are also influencing business models across the sector, as well as the way in which participants manage risk in the NEM.

¹⁴ EV – Electric Vehicles, STEPS – Stated Policies Scenario – assumes a V shaped economic recovery, a range of stated policy ambitions, including the energy components of announced stimulus or recovery packages (as of mid-2020), SDS – Sustainable Development Scenario – Key outcomes are based on the United Nations Sustainable Development Goals including effective action on climate change by limiting global average temperature increases to well below 2° C.

The contract markets are progressively evolving to reflect the changing balance of risks in the wholesale market as renewable resources increase. Old products like Super Peak¹⁵ contracts have re-emerged whilst new products that are related to the weather or the output of types of renewable generation are seeing new interest. It is expected that these products will continue to evolve as participant's exposures change. The ESB continues to monitor developments in this space.

Increasingly the NEM, particularly in the retail market, is seeing the entry of new participants that are growing through their innovation in either retail products or by bringing new technologies to market.

In the retail context, the AEMCs 2020 Retail Energy Competition Review considered how the retail market is changing based on new technology and digitalisation and considered regulatory changes needed to make consumer protections "fit for purpose" in the future and analyse how electric vehicles are being integrated into the market. The AEMC considers that the growing diversity in the market is likely to require more diversity in the regulatory approaches that are used, to strike the right balance between facilitating innovation and consumer protection and will continue to look for opportunities to move to these different regulatory approaches to suit the current and emerging market conditions, which in part is being considered through the two sided markets work in the Post 2025 Market Design Work Program.

More broadly the Post 2025 Market Design Work Program recognises that the energy system is changing and aims to better integrate new and existing resources into the system and reward them for the services they can provide. All the changes occurring mean that the current set of systems, tools, market arrangements and regulatory frameworks is no longer entirely fit for purpose and able to meet the changing needs of the system and customers. To address these matters, the Energy Security Board (ESB) is tasked by the former COAG Energy Council to develop a market design for the NEM that delivers secure and reliable power at least cost to consumers and accommodates the changes underway and expected in the future. In December 2020, the ESB will release a Directions Paper that responds to feedback from stakeholders on its most recent consultation paper and provides an indication of the direction that the ESB is heading under the Post 2025 Market Design Work program. The ESB is scheduled to provide recommendations to the Energy National Cabinet Reform Committee by the middle of 2021.

¹⁵ A Super Peak Contract in the wholesale contract market allows buyers and sellers to agree a price for the evening peak all year and the morning peak during the winter periods.

5. Efficient and timely investment in networks

Overall Assessment

To assess whether investment in networks has been timely and efficient three objectives are examined:

- Are investment solutions optimal across all resources?
- Is regulation of monopoly infrastructure efficient?
- Do the networks have incentives to be efficient platforms for energy services?

Overall the current status is rated Good-Moderate. Critical ISP projects are on track and Actionable ISP rules are in place. Interim rules for REZ development are being considered and stage 1 rules are expected to be implemented shortly. A DER Integration Roadmap and workplan is in place and the Post 2025 Market Design is underway.

Overall the rating for the outlook is Moderate. Network investment is critical to the integration of renewables and DER. Challenges will emerge in getting the new network built, including planning issues, community concerns, and reluctance by networks to take risk and cope with financing very large projects. Inefficient network investment will unnecessarily increase customer costs but alternatives that become too complex may deter investment or not deliver resources fast enough to replace exiting generation.

TABLE 6 EFFICIENT AND TIMELY INVESTMENT IN NETWORKS

	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Investment solutions optimal across all resources	Good-Moderate	Moderate	Critical	Moderate
Efficient regulation	Moderate	Moderate	Moderate	Moderate
Networks incentivised to be efficient platforms for energy services	Moderate	Moderate	Moderate-critical	Moderate
Overall	Good-Moderate	Moderate	Moderate-critical	Moderate






5.1. Investment solutions are optimal across all resources

In March 2020 the former COAG Energy Council approved changes to the National Electricity Rules to make the Integrated System Plan actionable. These changes recognise the rapid transformation being experienced in energy systems across the globe and, as the International Energy Agency identified in its most recent World Energy Outlook, “*the importance of robust and well-functioning electricity networks ... in ensuring the flexible operation of power systems*”. These rule changes aim to streamline regulatory processes, ensuring that unnecessary delays are prevented.

In July 2020, AEMO released its second Integrated System Plan (ISP). The ISP is a whole of system plan that aims to facilitate strategic transmission investments and deliver the least cost mix of resources to supply secure and reliable energy to consumers under a range of plausible futures.

The 2020 ISP identifies six actionable ISP projects that are critical to address cost, security and reliability issues. These projects are either already progressing or are to commence soon. In addition there are six actionable ISP projects that require preparatory activities and future decisions will be made whether to proceed based on necessary pre conditions. These twelve projects are in addition to the three committed projects underway and three future ISP projects that will be needed to deliver additional Renewable Energy Zones (Figure 49). As at publication date the timing of all committed and actionable ISP projects remain consistent with the indicative timing identified in the 2020 ISP. While some challenges currently exist in relation to the financing of large-scale transmission projects recommended in the ISP, the AEMC is currently considering the request for rule changes and the AER is undertaking a work program that is focused on the efficient and timely delivery of actionable ISP projects. It is also important to note, as the ESB and market bodies work through these issues, that the Commonwealth and relevant State jurisdictions are working together to underwrite and support these critical projects.

FIGURE 42 INVESTMENT IN TRANSMISSION

Classification	Project	Indicative timing	2020
 Committed Committed ISP projects. These are critical to address cost, security and reliability issues, and are underway and have already received their regulatory approval.	SA System Strength Remediation	2021-22	
	QNI Minor	2021-22	
	Western Victoria Transmission Network Project	2025-26	
 Actionable¹ Actionable ISP projects. These are also critical to address cost, security and reliability issues, and are either already progressing or are to commence immediately after the publication of the 2020 ISP10. These projects have not yet completed their regulatory approval process.	VNI Minor	2022-23	
	Project EnergyConnect	2024-25	
	HumeLink	2025-26	
	Central-West Orana REZ Transmission Link	Mid-2020s	
	VNI West ²	2027-28	
	Marinus Link ² - Cable 1 - Cable 2	2028-29 to 2031-32 2031-32 to 2035-36	
 Preparatory Activities Required Actionable ISP projects with decision rules. These projects are also critical to address cost, security and reliability issues. The decision rules for these projects can be assessed during the RIT-T process and will be confirmed by AEMO during an ISP feedback loop process with the TNSP once the decision rules eventuate.	QNI Medium & Large	2030s	
	Central to Southern QLD	Early-2030s	
	Reinforcing Sydney, Newcastle and Wollongong Supply	2026-27 to 2032-33	
	Gladstone Grid Reinforcement	2030s	
	New England REZ Network Expansion ³	2030s	
	North West NSW Network Expansion ⁴	2030s	
 Future ISP Projects Future ISP projects. These projects would reduce costs and enhance system resilience and optionality. They are not yet 'actionable' but are expected to be so in the future and are part of this ISP's optimal development path.	Far North QLD REZ	2030s	
	South East SA REZ	2030s	
	Mid North SA REZ	2030s	
			2040

¹ Estimated practical completion including any subsequent testing - projects may be delivered earlier

² Decision rules may affect timing

³ May be accelerated by government initiatives

⁴ Not shown on map. AEMO requires that preliminary engineering designs be completed by 30 June 2021

SOURCE: AER – TNSP OPERATIONAL PERFORMANCE DATA

Given the importance of efficient and timely investment in networks to power system flexibility, and the integration of renewables and distributed energy resources (DER), the ESB remains focused on continued reform. Two key Market Design Initiatives in the Post 2025 Market Design Work Program that continue to progress the longer-term vision for the NEM are Valuing Demand Flexibility and the DER Integration, and Transmission Access and the Coordination of Generation and Transmission.

The Valuing Demand Flexibility and Integrating DER Market Design Initiative is considering the changes required to the technical, regulatory and market settings that would enable effective integration of DER so that these resources can be used for the benefit of all energy system users. The Transmission Access and the Coordination of Generation and Transmission Market Design Initiative is looking at reforms that are intended to support efficient and timely capital investment, efficient system operation and reduce costs to consumers.

In mid-December 2020, the ESB will release a Directions Paper that responds to feedback from stakeholders on its recent consultation paper and provides an indication of the direction

that the ESB is heading under the Post 2025 Market Design Work program. The ESB is scheduled to provide recommendations to the Energy National Cabinet Reform Committee by the middle of 2021.

As an interim measure in March 2020 the ESB recommended, to the former COAG Energy Council, arrangements to support the development of a small number of Renewable Energy Zones in the NEM ahead of longer-term access reforms. The ESB proposed a two-step process with the first step focussed on the planning elements of the REZ framework and the second step focussed on the development of a policy framework for the staged development of REZs within a REZ development plan.

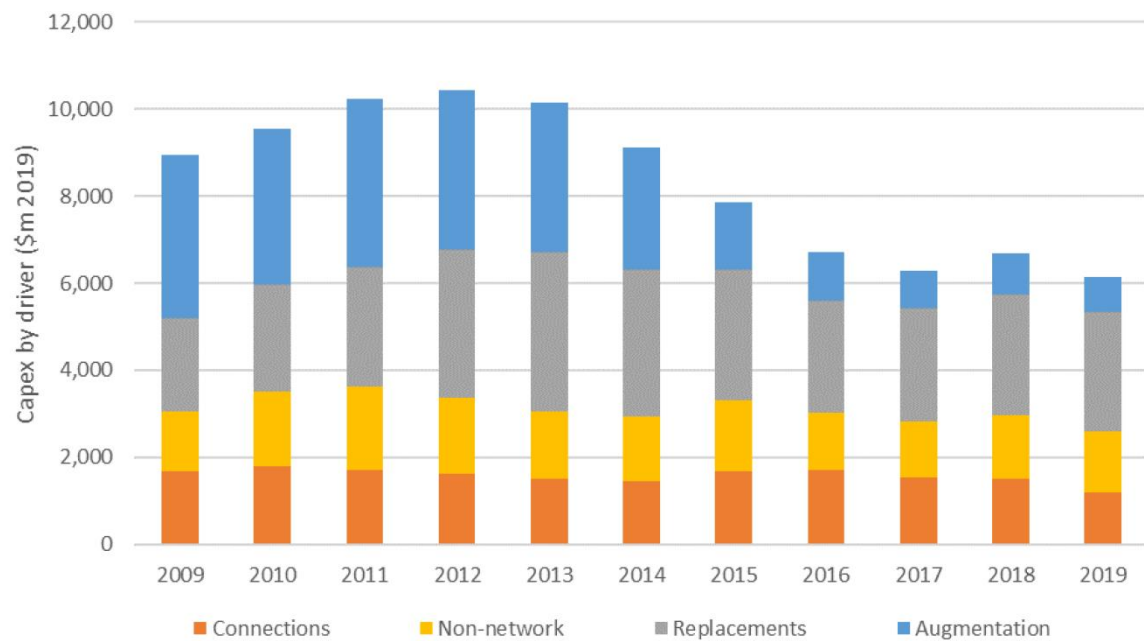
Ministers requested that the ESB prepare rule changes to support the development of REZs in accordance with the two-step process. Consultation on Step 1 has occurred, and proposed rules changes are in the process of being considered by Energy Ministers. Consultation on Step 2 will be released in Mid-December.

5.2. Efficient regulation of monopoly infrastructure

The AER's 2020 electricity network performance report highlights that network regulation is improving outcomes for consumers. In particular, the AER observes that:

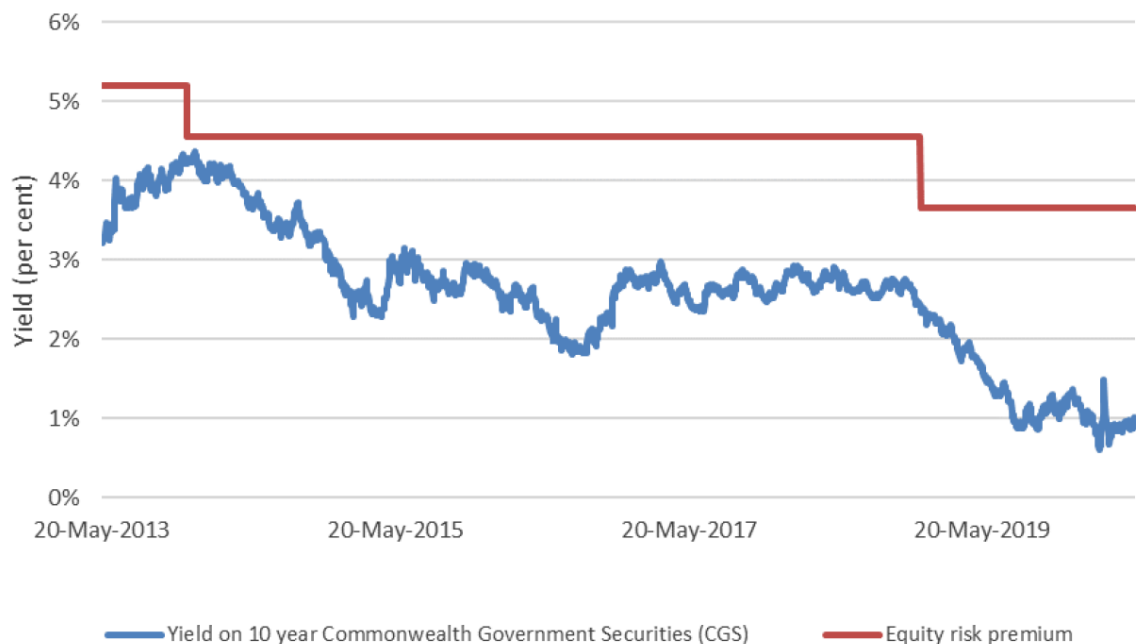
- In total, consumers are spending less on network services than they have done in previous years, largely driven by reductions in allowed rates of return.
- The trend of declining returns is expected to continue as many Network Service Providers have their allowed returns reset to reflect lower interest rate conditions.
- Total network expenditure is substantially down from its peak in 2012. There has been a minor increase in 2019 compared to 2017 and 2018.
- Network reliability has improved over recent years, both in terms of frequency and duration of network outages. However, there were on average longer and more frequent outages in 2019 compared to 2018 which largely reflects the influence of a few high impact supply interruptions.
- There has been a significant increase in the capacity of the electrical supply system since 2006. At the same time, peak demand has been growing at a slower rate. This has meant that utilisation of networks is lower than in 2006, although there has been a modest increase in utilisation in the past three years as network investment has slowed.
- Regulated Network Service Providers have become less profitable in recent years, following reductions in allowed rates of return.
- Nonetheless, the AER's analysis of market evidence suggests that investors continue to view allowed returns as being at least sufficient to attract efficient investment.

FIGURE 43 CAPITAL EXPENDITURE BY DRIVER – TOTAL DNSPs AND TNSPs



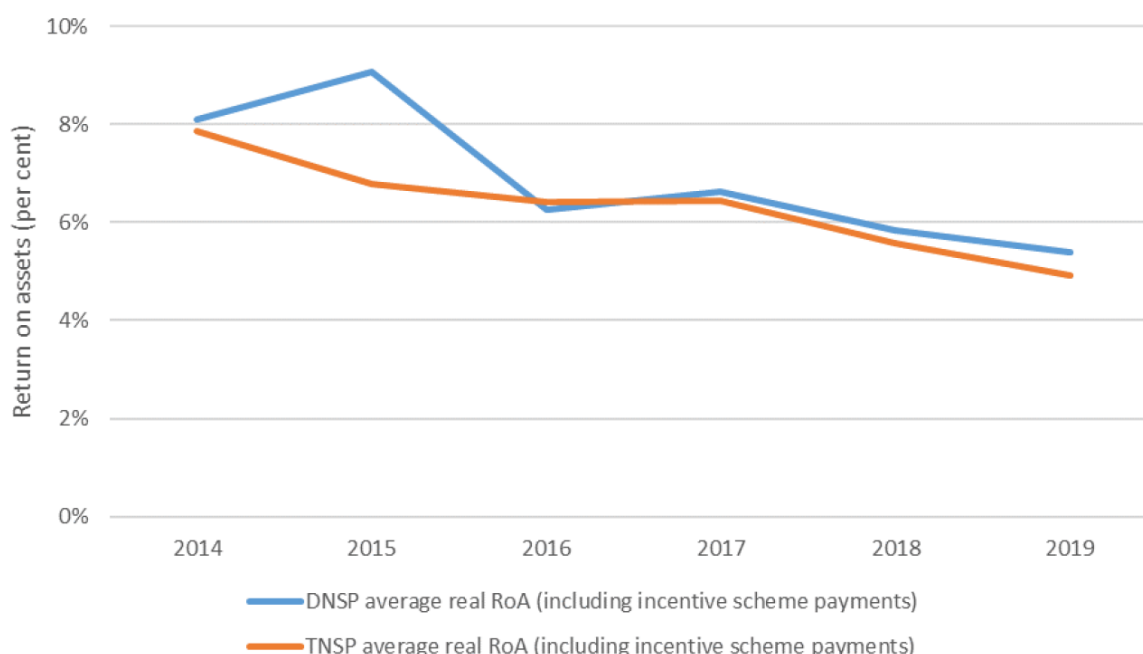
SOURCE: AER – ELECTRICITY NETWORK PERFORMANCE REPORT 2020

FIGURE 44 RISK FREE RATES & EQUITY RISK PREMIUM



SOURCE: AER – ELECTRICITY NETWORK PERFORMANCE REPORT 2020

FIGURE 45 RETURN ON ASSETS



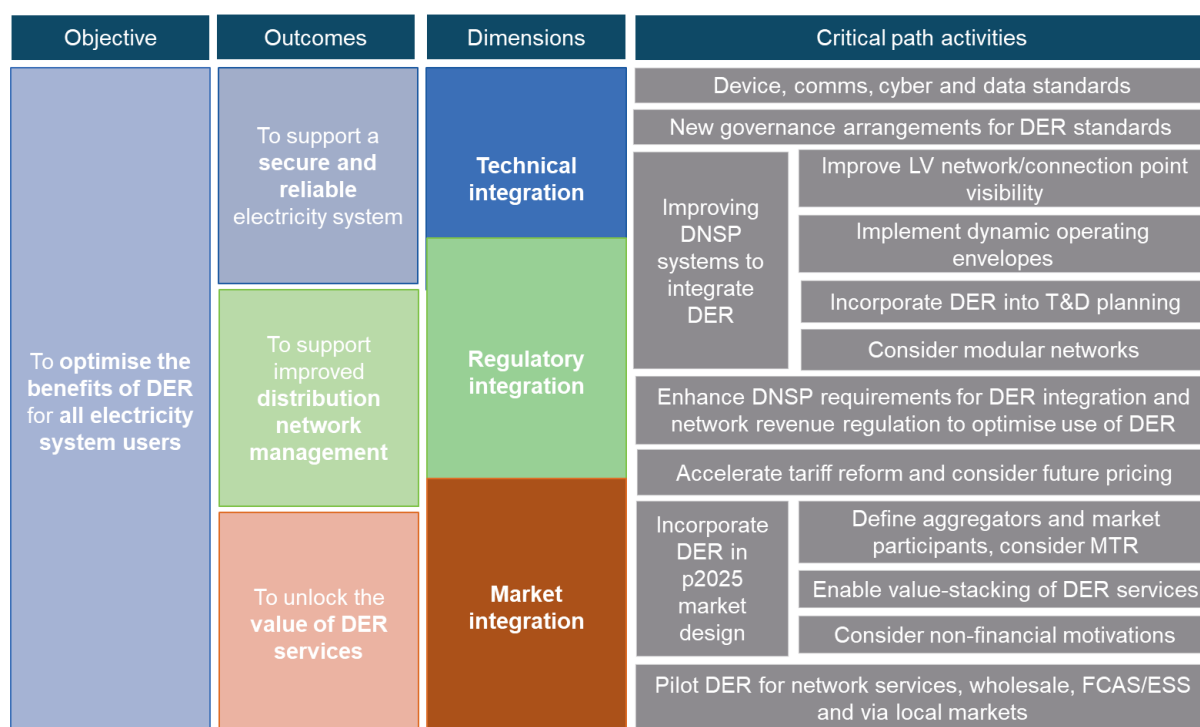
SOURCE AER – ELECTRICITY NETWORK PERFORMANCE REPORT 2020

This downward trajectory in network costs may be challenged as the system continues to transition. As identified by the IEA in its 2020 World Energy Outlook, a well-functioning and robust network is critical to ensuring the flexibility of power system as we continue to integrate increasing levels of renewable and distributed energy. The IEA notes that globally the expansion of electricity networks over the next decade will be about 80% more than over the past decade and that around 30% of the increase in transmission lines and 20% of the increase in distribution networks are attributable to the increase of renewables. For the NEM this can be seen to some extent in the outcomes of the Integrated System Plan. Significant transmission investment will be required and its timing will be influenced by the exit of ageing plant and the rates at which renewable resources are brought online. Significant investment will also be required in distribution networks to support the integration and operation of Distributed Energy Resources. As discussed earlier the ESB is considering these issues in the two Market Design Initiatives in the Post 2025 Market Design Work Program on Valuing Demand Flexibility and the DER Integration, and Access and Transmission.

5.3. Networks incentivised to be efficient platforms for energy services

Whilst the development of Post 2025 Market Design continues, work on the integration of DER in the interim is underway. In September 2020, the ESB published the DER Integration Roadmap and Workplan which sets out a vision for DER integration. The Roadmap provides a narrative about how all the critical path activities across technical, regulatory and market integration come together.

FIGURE 46 ESB DER INTEGRATION ROADMAP



SOURCE: ESB DER INTEGRATION ROADMAP AND WORKPLAN

Technical integration of DER is fundamental. Electricity systems were not designed with DER in mind and there are increasing technical challenges and opportunities arising as the infrastructure adapts to multi-way flows of energy. Increased visibility is needed by both DNSPs and AEMO to support management and planning of the system. AEMO has a major focus on technical integration and has documented the detailed challenges in a number of reports.

Regulatory integration is primarily about updating the rules and regulations to support the changing consumer, communications and technology landscape. The National Electricity Rules (NER) were not written with DER in mind and regulatory reform is needed to align responsibilities and incentives for DER integration. Regulatory reform could also cover how DER should be taken into account in DNSP and TNSP planning.

Tariff and pricing reform is critical for DER market integration and there are further elements to consider. Prices that reflect the supply/demand balance, and tariffs that signal network constraints are important, especially for shifting load into the middle of the day when solar generation is high. In the longer term, machine-machine tariffs may automatically optimise the use of DER across network services, wholesale and essential system services markets.

Critical pieces of work that have been completed in 2020 to deliver on this roadmap are:

- Minimum DER Technical Standards proposed by AEMO and rule change submitted to AEMC
- After a review and consultation, an ESB Governance of DER technical standards rule change was submitted to AEMC

- LV Voltage report commissioned and published: UNSW report first comprehensive investigation of voltage across low voltage (LV) networks showing major pre-existing issues with high voltages across the NEM
- DEIP Operating Envelopes workstream established with ARENA, ANU and SAPN
- Operating envelope implementations approved in SA and Victoria – via AER Reset decisions
- Distribution-level storage report commissioned and published
- DEIP DER Access and Pricing process resulted in three Rule Changes
- VaDER report commissioned and published - review of Value of Distributed Energy Resources (VaDER) for AER
- AEMO published two knowledge sharing reports on its VPP trials

Critical pieces of work for 2021 are:

- The AEMC's consideration of AEMO's Minimum Technical Standards Rule Change and the ESB's Governance of Technical Standards Consultation
- The AEMC's consideration of Access, Pricing and Incentive Arrangements for Distributed Energy Resources rule change request
- Enhancements to DER modelling under the Integrated System Plan
- Development of data, interoperability and cyber-security standards
- AEMC's 2021 ENERF Electricity network economic regulatory framework review
- The AER's update of its DER Expenditure guidelines, using use of the VaDER methodology
- The AER's review of Distribution ring-fencing guidelines to be completed
- Two DER marketplace trials: Project Edge in Victoria and Project Symphony in WA

6. Strong but Agile Governance

Overall Assessment

Good governance is essential to deliver the National Energy Objective and ensure that the NEM operates in the long term interest of consumers. With so much change occurring in the NEM good governance has never been more important.

The Finkel Review in 2017 made fourteen recommendations aimed at improving governance. Three areas of focus were emphasized.

- Better coordination between market bodies, and between market bodies and the former COAG Energy Council;
- A greater sense of shared accountability for energy outcomes among these groups; and
- More expeditious timing of rule changes and a streamlining of rule management.

There has been some progress in each of these three areas during 2020. First the market bodies, the ESB and senior government officials have made considerable efforts to improve coordination. Evidence of a more collegial approach between the market bodies is clear in the progress made on a number of major policy initiatives. The most recent example is the Post 2025 Market Design work that involves considerable collaborative effort by all the market bodies. The collaborative action taken on the ISP and the development of the Retail Reliability Obligation are also examples.

Accountability across the NEM is enabled by COAG Energy Council approval in 2019 of a Strategic Energy Plan. The objectives of that Plan are reflected in pending updates of the Statement of Expectations or equivalent strategy documents of the market bodies. The AER recently adopted its five year strategic plan centred on the COAG Energy Council Strategic Energy Plan and similar documents in all the market bodies need to be finalised so the Strategic Energy Plan objectives are reflected in the day to day operations of the market bodies and allow performance to be assessed against related Key Performance Indicators. Maturity in the application of these plans and strategy can now develop further.

Governance at the COAG Energy Council level (now the Energy National Cabinet Reform Committee (ENCRC) and its related Energy Ministers Meeting) would improve with a commitment to review and renew the Australian Energy Market Agreement. This step was recommended by the Finkel Review. This agreement does not preclude independent government action at both a state and federal levels, but it sets out a commitment by each government to the NEM and a requirement to notify the Energy Council (now the ENCRC) of independent government action that may impact the NEM. Being mindful of this Agreement would strengthen the NEM, particularly as each government pursues their own initiatives.

Finally, the timing of the rule change process improved and work by the ESB and the AEMC continues to add further improvements. By way of example these changes assisted with the implementation of the Integrated System Plan and the timely introduction of the rules ensuring that generators give three year notice of closure. A review of the rules has been conducted during 2020 by the ESB and the market bodies and various measures are underway to simplify and streamline the Rules so they are easier to use and understand.

The current status and the future outlook for governance have both improved and with the pace of change in the NEM it is vital that this improvement continues. Policy that is driven by

independent government actions rather than government coordination across the NEM does make NEM operations and oversight more difficult. A number of market participants have commented that the more uncertain and unpredictable environment adds risk to the investment process.

This report rates the current status of Governance within the NEM as Moderate, maintaining last year's improvement but strengthening its conviction. (See Table 7.) The improved coordination among the market bodies during 2020, the introduction of a Strategic Energy Plan, and the changes made to the rule processes have led to greater confidence in this rating. The outlook is also rated as moderate though the governance changes that need attention during 2021 are a challenge and pose some risks. Getting the ENCRC and related bodies to function well, deciding the future of the ESB, and integrating new leadership at both the AEMC and AEMO are all matters requiring attention in 2021.

TABLE 7 STRONG BUT AGILE GOVERNANCE

	2020 Ratings		Last Year's Ratings	
	Current status	Outlook	Current status	Outlook
Overall	Moderate	Moderate	Moderate	Moderate

6.1. Governance in the NEM

The primary governance body in the NEM, until May 2020, was the COAG Energy Council. This Council was chaired by the Commonwealth Energy Minister and its members comprised the Energy Ministers from the states and territories. The Energy Council was replaced by a new Energy National Cabinet Reform Committee. This Committee meets as a Committee of National Cabinet and an additional Energy Ministers Meeting is to manage ongoing regulatory and other responsibilities outside this National Cabinet system.

The NEM is managed by three 'market bodies': the Australian Energy Market Commission (AEMC); the Australian Energy Market Operator (AEMO) and the Australian Energy Regulator (AER). Each of the market bodies has a specific but related role.

The AER's task is to regulate the NEM and oversee compliance by participants. It regulates networks and covered gas pipelines; it enforces NEM laws and the Retail Law to protect the interests of households and small business; and it drives effective competition where this feasible and regulates where competition is not feasible. The regulatory changes needed to manage a high penetration of large scale and small scale variable renewables is the ongoing regulatory design challenge and common to energy regulators globally.

As the operator of the system AEMO's role is to deliver power when it is demanded via a NEM that is secure and affordable. With so much variable renewable generation entering the NEM in an uncoordinated manner this challenge is difficult to overstate. AEMO's role encompasses planning (through for example the Integrated System Plan), system operations and market operations. This requires AEMO to forecast changes to the power system and advise on the impact of those changes. AEMO provides information to the industry including forecasts (in the ESOO and PASAs) and these are important for participants as a guide to likely futures. Similarly the Integrated System Plan is a very important document for grid planning in the NEM. The recent Renewable Integration Study

provides information for all participants in the NEM about the issues they will face as renewables penetration increases.

In general terms the AEMC has responsibility for the setting of rules in the NEM and for undertaking reviews and providing market development advice to Ministers and individual jurisdictions if requested. Any law changes must come through Ministers and rule changes can come from Ministers and/or any interested stakeholders. In practice about half of all rule changes come from the market bodies responding to the changes in the NEM they are managing. The Reliability Panel (serviced by the AEMC) also forms part of the institutional arrangements. The panel reports on the safety, security and reliability of the national electricity market.

The Energy Security Board (ESB) was established by the COAG Energy Council in 2017 for a three year period. The ESB has five members - two independent members, a Chair and Deputy Chair, and the Chair of the AER, the Chair of the AEMC, and the CEO of AEMO. Its role is to oversee the implementation of the approved recommendations in the Finkel Review, to improve the coordination between the market bodies and to oversee the system and report on its operations annually in the Health of the NEM Report.

6.2. Work underway

There are a number of governance changes underway or being considered. As noted earlier the COAG Energy Council was replaced by the ENCRC in October. This step followed a report on COAG Councils and Ministerial Forums by Mr Peter Conran AM for the newly formed National Cabinet. Encouraged by the effective national response to Covid-19, the National Cabinet sought to ensure that all COAG Councils, including the Energy Council, are responsive to issues, make decisions efficiently with minimal bureaucracy, and focus on critical regulatory and policy work programs.

The outcome of the Conran Report has led to changes. The new ENCRC (replacing the COAG Energy Council) meets as a Committee of National Cabinet. It is intended to be task oriented and time limited, and to work on specific short term and strategic reforms assigned by National Cabinet. Being a Cabinet Committee there are protocols about confidentiality and attendance that apply. An additional Energy Ministers Meeting is to manage ongoing regulatory and other responsibilities outside the Cabinet system. A detailed division of responsibility between the Energy Ministers Meeting and the ENCRC has been initially set up and the intention is to avoid duplication and to work within the existing laws and rule that have developed since the establishment of the NEM. The prominent role of expert advisory groups within the new federal state architecture is noted in the Conran Report but the way expert advice will be considered within the new arrangements for energy governance is not clear. Transparency about policy directions developed by the ENCRC is also an important requirement in the NEM where many stakeholders are private sector companies and investors.

As well as the Conran Report there was another relevant report on energy governance this year. In mid year the Energy Security Board was reviewed by Mr Rhys Edwards. This Review made an assessment of the ESB's performance and whether or not the ESB should continue beyond its proposed three year life. This report followed a Finkel Review recommendation that the ESB be reviewed towards the end of its proposed three year life. The ESB was judged to have significantly accomplished the task of overseeing the implementation of the Finkel Review recommendations and it was recommended that the ESB continue until the end of 2021. The reason for extending the life of the ESB was to

allow the then COAG Energy Council to consider and agree the market design proposals coming from the ESB's post 2025 Market Design work. The ESB is to report on this work to the ENCRC.

An orderly wind up of the ESB in the last six months of 2021 was envisaged by the Edwards report. The extension of the ESB's life has been accepted by Ministers as it completes the post 2025 design work and several other tasks. During 2021 Ministers will need to decide whether or not to accept the Edwards' recommendation to wind up the ESB after December 2021 – and if so whether or not a formal coordinating and market development advisory committee should be established as suggested by the Edwards review.

To continue the improvement in accountability it is important that the Strategic Energy Plan evolves along with the metrics used to assess how strategy is going. For better coordination this Plan must become more embedded in the individual strategies and work of the market bodies as well as that of the Energy Council...now the ENCRC. This governing work has commenced.

The NEM rules are being reviewed by the ESB as part of the Finkel recommendation implementation. This review is not a thorough examination of the rules but instead aimed at some simplification and streamlining. At this stage of the transition it was thought that a thorough review of the rules should wait, and that the main focus should be on making the rule change process more agile and timely. Rule changes are tending to occur in 'bundles', such as those related to the Retail Reliability Obligation and the Integrated System Plan, and to make matters manageable for all parties prioritising these types of changes, at the expense of one off unrelated rule change requests that can be delayed, is now possible.

A more thorough review of the rules and their processes is advisable once the pace of change becomes more manageable. At that time many rules may be changed to guidelines so they can then be varied more easily, for example when technology changes. Some simple changes have been made but (for example) data requirements that are too specific continue. Many of these rules were set before the digital age. It is also notable that the rule change process has been speeded up in response to NEM transition requirements. This has improved matters but can be improved further.

As part of the Post 2025 Market Design work the ESB established working groups with members from all three market bodies. These groups work well and indicate the progress that can be made with better collaboration and coordination between the market bodies. Earlier examples include the working group pulling together draft rule changes to facilitate the actionable ISP and the ESB work to develop the Distributed Energy Resources Workplan published in November. Whether or not the ESB continues as an institution after December 2021 this type of approach to market development work by the market bodies should continue.

6.3. Governance Outlook

Beyond 2020 the outlook for governance in the NEM is positive but there are a number of risks that need attention in order to maintain and improve governance. As noted the governance changes at the ENCRC level need to be bedded down during 2021 along with the role of the Ministers Meeting and where and how expert advice can best be offered. During 2021 the future of the ESB needs to be settled and any committee required for advice on market development and better coordination between the market bodies and senior officials should be established.

The improved coordination among the market bodies has been noted and there is no reason why this should not continue. The new Chair at the AEMC commences early in 2021 and a new CEO at AEMO is expected to be appointed shortly. Their smooth integration into NEM leadership is essential.

In operational terms the transition would be less difficult if there was an agreed national emissions reduction trajectory at the ENCR level. This would allow the market bodies and NEM market participants to plan their future actions. In the absence of such agreement the emissions targets of each of the state and territory governments provide some common features to assist in planning. What is not agreed among these jurisdictions is the trajectory to reach their targets and as each state and territory pursues its own target out to 2030 and beyond to 2050, governance of NEM operations is an ongoing challenge.

To mitigate the risks of poor outcomes for consumers, as noted earlier, governments should reconfirm their commitment to the national market (or not) and agree to inform the ENRC and Ministers Meeting of policy measures taken in their jurisdiction that may have a NEM wide impact. This would enable better NEM wide policy advice by the market bodies and the ESB and it would lessen the uncertainty felt by market participants.

With the progress made on the Strategic Energy Plan a credible long term vision for the NEM can now be the focus. Such a strategic view can be made operational through the Post 2025 Market Design work and other policy initiatives. By the end of 2021 the Strategic Plan should reflect these policies and be a future guide in the rapidly changing market. The lack of a strategic direction has led to stakeholders commenting about their uncertainty and deferring investment in the maintenance and construction of new generation, especially in flexible dispatchable generation. This has increased reliability and security risks, impacted affordability and slowed progress on emissions reduction.

Finally, the improvements to the rule change process and some simplification of the rules has been noted. In the future this work needs to continue at significant depth and thoroughly. Now is not the appropriate time for this to occur but by 2025 a thorough review of the rules and the rules process may be very beneficial.

Appendix A - Finkel Review Progress

Below is a timeline of the Finkel Recommendations by each of the respective bodies.

The status is reflected as;

- || Under consideration / Hold
- ◆ Underway
- On track
- ✓ Complete

1. Preparing for next summer	
1.1 Third party review of AEMO's demand forecasts and preparedness.	✓
2. Increased Security	
2.1 Adopt package of Energy Security Obligations.	✓
2.2 Consider the need for a market based mechanism for fast frequency response.	✓
2.3 Investigate rule changes to synchronous generators settings and frequency of the power system.	✓
2.4 Revise black system restart plans for each NEM region.	✓
2.5 Review regulatory framework for system security relevant to distributed energy resource participation.	✓
2.6 Consider a data collection framework for distributed energy resources	✓
2.7 Develop regular assessments of the resilience of the NEM.	
2.8 Update regulatory framework and funding to test new technologies.	✓
2.9 Continual proof-of-concept testing for grid-scale solutions.	●
2.10 Develop an annual cyber security report.	●
2.11 Develop a strategy for extreme weather.	●
2.12 Facilitate a national assessment of future workforce requirements for the electricity sector.	✓
3. A reliable and low emissions future - the need for an orderly transition	
3.1 Develop a whole-of-economy 2050 emissions reduction strategy.	●
3.2 Agree to implement an orderly transition: NEM emissions reduction trajectory	
3.2 Clean Energy Target	
3.2 Require all large generators to provide 3 years' notice of closure.	✓
3.3 Implement a Generator Reliability Obligation.	✓
3.4 Assess whether SA licencing arrangements should be applied elsewhere.	✓
3.4 Assess the need for a Strategic Reserve as an enhancement or replacement to RERT.	✓
3.4 Consider the benefits of a day-ahead market.	✓
4. More efficient gas markets	
4.1 Require generators to provide information on fuel resource adequacy	✓
4.2 AEMO given last resort power to enter into agreements with gas-fired generators.	●
4.3 Governments adopt evidence based regulatory regimes.	●
4.4 Compile information on gas projects in an easily accessible format.	✓
5. Improved system planning	
5.1 Develop an integrated grid plan.	✓
5.2 Identify potential projects that governments could support if market is unable to deliver investment in renewable energy zones.	●

5.3 Review ways in which AEMO's role in transmission planning can be enhanced.	✓
5.4 Implement reforms to the Limited Merits Review regime	✓
5.5 Review of the Regulatory Investment Test for transmission.	●
6. Rewarding consumers	
6.1 ACCC to make recommendations on improving transparency and clarity of electricity retail prices.	✓
6.2 Health of the NEM report to include impact of changes made in the market on long-term retail contracts.	✓
6.3 Facilitate improved customer access to, and rights to share, energy use data.	●
6.4 Health of the NEM report to include affordability issues and emerging issues. Annual report ongoing	✓
6.5 Accelerate work on consumer protections.	●
6.6 Improve low income household access to distributed energy resources and energy efficiency programs.	●
6.7 Recommend a mechanism on demand response in the wholesale market	✓
6.8 Financial modelling of the incentives for investments by distribution network businesses	✓
6.9 Review of regulation of individual power systems and microgrids.	✓
6.10 Accelerate the roll-out of broader energy efficiency measures.	●
7. Stronger governance	
7.1 Agree to a Strategic Energy Plan that is informed by the blueprint.	✓
7.2 Form an Energy Security Board.	✓
7.3 Agree to a new AEMA.	
7.4 Commence annual public reporting on COAG EC priorities to COAG	N/A
7.5 Issue new Statements of Expectations to the AER and AEMC	●
7.6 Commence an annual 'Health of the NEM' report.	✓
7.7 Comprehensive review of the rules in light of changing NEM conditions.	◆
7.8 Recommendations of the Vertigan Review to expedite the rule-making process be implemented.	✓
7.9 Optimise rule change process.	●
7.10 Issue a Statement of Policy Principles to the AEMC.	
7.11 Ensure the AER and ESB are adequately funded.	✓
7.12 AEMO's Constitution updated to reflect a new skills matrix for directors.	✓
7.13 Reduce length of cooling off period for Independent Directors.	✓
7.14 Develop a data strategy for the NEM. Stage 1	✓
7.14 Develop a data strategy for the NEM. Stage 2	●