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1 The energy system in transition

State of the energy market is the AER's annual summary of 'the year that has been' across electricity and gas supply chains, including wholesale markets, transportation and retail. Chapter 2, the market overview, sets out a short summary of key outcomes. Chapters 3 through 7 set out analysis of each supply chain component. In combination, they give a broad and relatively comprehensive picture of market outcomes since publication of the last *State of the energy market*.

Australia's energy systems are undergoing rapid technological and economic transition alongside national efforts to decarbonise the economy. To put annual analysis in context of the fundamental transformation taking place, this first chapter summarises major developments and challenges in progress towards the energy transition. It does so using the Strategic Energy Plan's vision for a future energy market as a reference point. The Strategic Energy Plan was developed in 2020 by the COAG Energy Council in consultation with the Energy Security Board (ESB). The Strategic Energy Plan has 5 objectives which, taken together, point to a transition through which the future energy market is able to provide:

- › affordable energy and satisfied consumers
- › a secure gas and electricity system
- › reliable and low-emissions energy
- › effective development of open and competitive markets
- › efficient and timely network investment.

This chapter is structured around these objectives as a way to summarise the status of the transition today, to point to the future and to summarise some of the key challenges and work underway to address them.

1.1 2023 in summary

The energy system in 2023 has so far experienced fewer shocks and better outcomes than in 2022. Electricity and gas wholesale market prices declined from record highs in 2022, supported by more favourable market conditions alongside government interventions in coal and gas markets. Governments across Australia provided substantial short-term support to ease pressure on consumers, and worked with market bodies to progress vital policy reform to support transition.

Nonetheless, despite these improvements over 2023, many of the vulnerabilities observed in 2022 remain. Supply-demand balances in both electricity and gas markets are tight and continue to interact. Heightened wholesale electricity prices exerted major upward pressure on retail prices for 2023–24. This has occurred in economic conditions where consumers are not well placed to absorb bill increases due to broader increases in costs of living.

There are also major and urgent pressures for investments to keep pace with the energy transition and retirement of coal generation. 2023 has seen the exit of a major power station from the NEM with the closure of Liddell Power Station in April. New entrant generation and favourable market conditions meant this went smoothly. There are 4 further coal-fired power stations scheduled to close in the next decade and urgent investment in generation, storage and transmission is needed to prepare for this.

Planning for these requirements is being informed to a growing extent by the interconnectedness of electricity and gas markets. As more states and territories seek to shift drivers of gas demand into electricity demand, for example replacing gas heating with reverse cycle air-conditioning, demand pressure will ease in gas markets and grow in electricity markets. Other variables, such as the rate of take-up of electric vehicles, will also have material impacts on electricity demand and as a result the required scope and timing of new generation and network investment.

New generation and transmission investment to support the transition has faced numerous challenges, including:

- › the scale and coordination of investments required
- › rapidly accelerating costs across the infrastructure supply chain and higher costs of capital
- › the importance of properly engaging and reflecting the views of communities that will host these assets in planning and developing projects.

Both the investments themselves and reforms to facilitate them are being supported by significant involvement from governments of all levels. This includes numerous joint initiatives between the Australian Government and state and territory governments. The scale of required investment is significant and timing is pressing. As a result, it requires comprehensive coordination and planning.

This planning will be guided in part by the expansion of the national electricity, gas and retail objectives to include emissions reduction as part of the long-term interests of energy consumers alongside price, quality, reliability, safety and security of supply.

1.2 Affordable energy and satisfied customers

Energy should be affordable and accessible for all consumers. This means that as a community we are concerned not only about the cost of energy, but also about the ability of consumers to manage their energy usage, access consumer energy resources such as solar and batteries and navigate the market. Consumers should feel confident in the choices they make in energy markets, get help and support when they need it and be protected from harm. All consumers, including those of different income and preferences and those experiencing vulnerabilities, should have equitable access to these abilities, benefits, supports and protections.

1.2.1 Affordability and consumer satisfaction in 2023

Energy affordability had been improving in recent years but has been impacted in 2022-23 by energy market shocks intersecting with wider increases in costs of living. In SEC Newgate's Mood of the Nation report for August 2023, the number one issue among the Australian public is reducing cost increases for household bills and other additional expenses. According to the report, 82% of Australians are extremely or quite concerned about electricity bills and 57% extremely or quite concerned about gas bills.¹

In the immediate term, the Australian Government in partnership with state and territory governments has established the Energy Bill Relief Fund, ranging from \$175 to \$700 for eligible consumers in different regions. This recognises that the components of energy costs vary between jurisdictions. State and territory governments have also introduced targeted measures for low-income households to reduce their energy bills, such as the Victorian Household Energy Savings Package, the ACT's Home Energy Efficiency Program and the Queensland Cost of Living Rebate.²

Surges in wholesale electricity and gas prices over 2022 are putting immediate upward pressure on retail prices available to consumers. Wholesale prices have eased over 2023 in response to more favourable market conditions and significant interventions to stabilise markets. Nonetheless, they remain above levels seen before 2022.

In coming years, multiple factors risk putting upward pressure on costs: inflation outcomes (e.g. affecting annual network tariffs), global supply chain disruptions, labour shortages, and potential uplifts for the cost of capital (related to higher interest rates) and for other adjustments (related to maintaining social licence). These issues are discussed more extensively in chapters 4 and 6. In combination, they will pose pressures for affordability.

1.2.2 Action on key challenges

Managing energy costs remains the main concern for consumers

Upward pressure on energy costs has been challenging for consumers. In the recent sentiment survey by Energy Consumers Australia (ECA), 52% of households are more concerned about paying their energy bills than they were a year ago, up 15% from the same measure in 2022.³

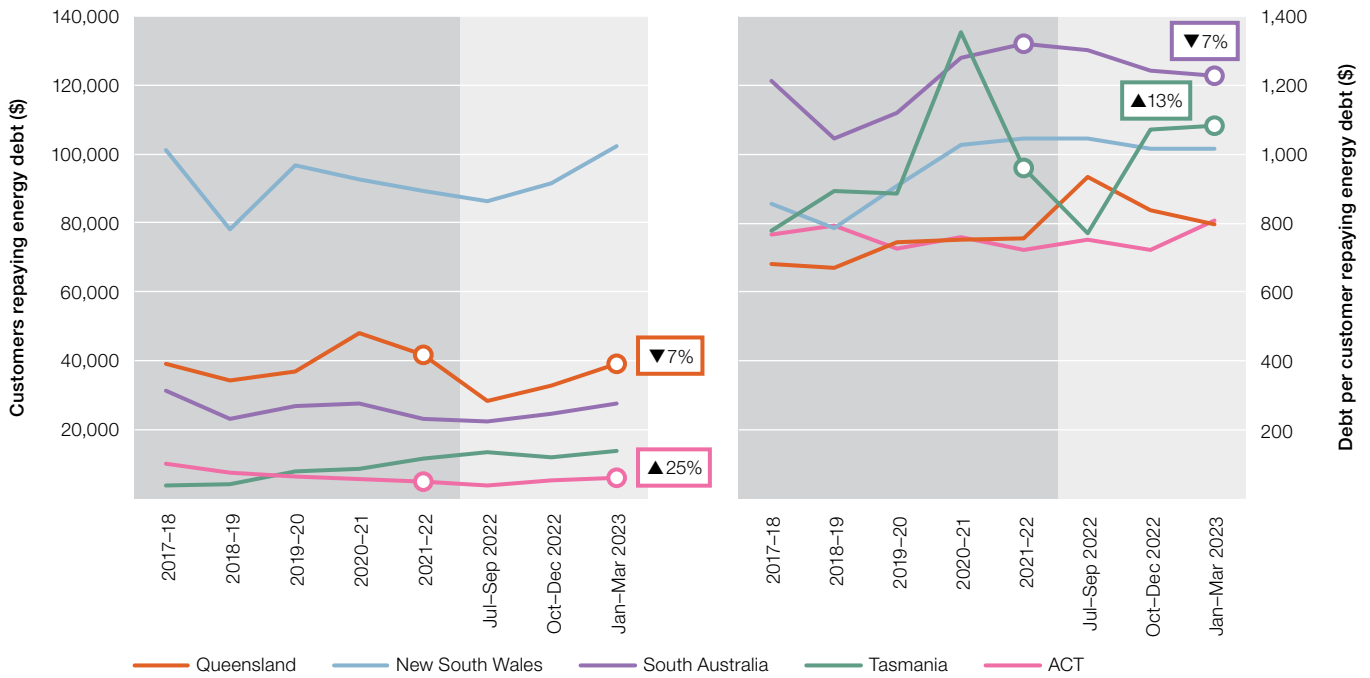
Energy debt levels have varied between jurisdictions, but we have generally seen growing numbers of customers in energy debt across most jurisdictions since mid-2022. Over the same period, average energy debts have increased in some jurisdictions and decreased in others.

¹ SEC Newgate Australia, [Mood of the nation](#), August 2023.

² South Australia's Retailer Energy Productivity Scheme offers free or discounted energy efficiency and energy productivity activities, but it is not specifically targeted at low-income households.

³ Energy Consumers Australia, Consumer Sentiment Survey, June 2023.

Figure 1.1 Residential customers in energy debt



Note: Based on electricity and gas customers with an amount owing to a retailer that has been outstanding for 90 days or more. Excludes customers that have entered into hardship programs.

Source: AER, *Quarterly retail performance report*, Q3 2022–23, June 2023.

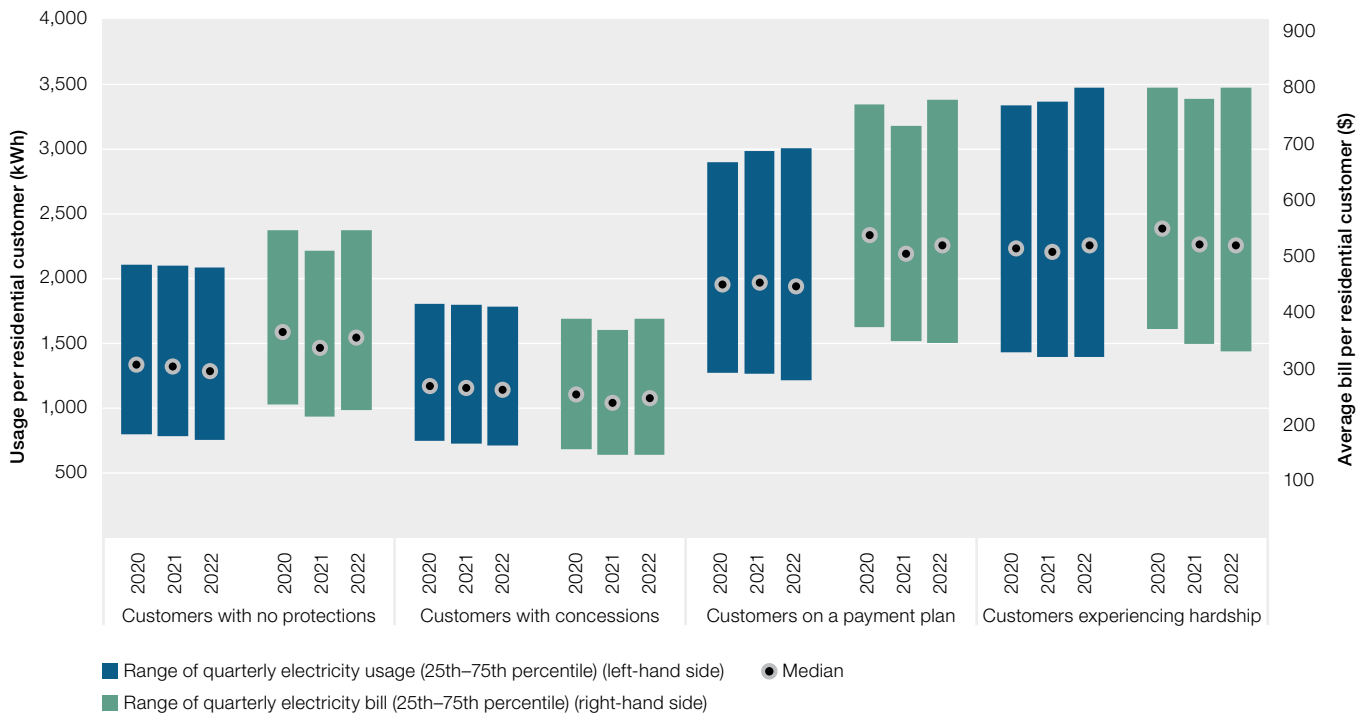
In the short term, bill relief provided by governments should mitigate the immediate effects of price increases for many customers, but there will likely remain pressure since costs of living are increasingly rapidly. Customers will also need to adjust to new prices as this temporary relief ends.

Higher bills will create additional debt pressure on customers, particularly those facing financial hardship or who face other limitations on their ability to manage costs.

Energy costs and savings are not shared evenly across consumers

Low-income consumers bear a higher cost burden for energy than other consumers. Firstly, they have less income available to pay for energy costs. For low-income earners, electricity bills as a proportion of income are at least double that of average income earners.

Figure 1.2 Electricity use and average bill by residential customer type



Note: kWh: Kilowatt hour.

Source: ACCC, [Inquiry into the National Electricity Market](#), June 2023.

Secondly, their energy costs and/or use can be higher than average due to challenges investing in consumer energy resources or energy efficient home improvements, due to up front costs or renting. In most states, energy bills are also higher for customers in regional and remote areas, where network costs tend to be higher and can be recovered from fewer customers than in urban networks.

Irrespective of financial constraints, consumers may still struggle to engage in the energy market given its complexity. One example of growing complexity is in respect of smart meters. Smart meters allow for more flexible and sophisticated tariff structures, which for many consumers may offer opportunities to manage electricity costs. However, navigating the advantages of smart meters is complex and there is evidence that many consumers are not receiving the benefits. ECA’s most recent consumer behaviour survey found that over a third of respondents in Victoria— where smart meters have been installed in up to 99% of homes – indicated they were either unsure or stated they did not own a smart meter. Another third indicated they do not use their meter to help control energy costs.

To maximise and widen the benefits of consumer energy resources, immediate work is required on data capabilities and integration of technologies

To best share the benefits of consumer energy resources across all consumers, they should be optimised at a system-wide level so that:

- › demand reductions, especially at peak periods, are maximised – taking pressure off generation requirements and local network constraints
- › any network investments required to integrate consumer energy resource are efficient and cost-effective.

By effectively integrating these resources, it is possible to avoid the need for more costly grid and generation investment. Increasingly, energy service providers are entering the market offering energy services that enable consumers to sell their electricity back into the grid at times when it is needed. However, the success of these services will require consumers to have trust and confidence that these new services will work for them and that they are protected from harm.

In 2021, the ESB released the Consumer Energy Resource Implementation Plan, which outlines reforms that are required to unlock the benefits of the rapid uptake of consumer energy resources, while also reducing the risks created by the speed and scale of the change. Key objectives of the plan include:

- › rewarding consumers for their flexible demand and generation

- › supporting energy market innovation
- › ensuring effective consumer protections are in place
- › allowing networks to accommodate consumer energy resources and manage security
- › providing visibility and tools to the system operator to operate a safe, secure, reliable system.

In addition, the AER has been undertaking a review to understand potential gaps that may emerge in the consumer protections framework as a result of the evolving energy market. In October 2022 the AER published an options paper in its Review of consumer protections for future energy services.⁴ Through its review, the AER has concluded there is a strong case for reforming the National Energy Customer Framework (NECF). The AER concluded that energy consumers need additional protection as the market evolves and that this won't be provided by the scope and regulatory approach in the existing framework.

Following the October 2022 release of the options paper setting out various options for regulatory reform, the AER has undertaken extensive stakeholder consultation and a thorough risk analysis. This has guided development of the AER's final advice on the need to reform the NECF, which will be provided to Energy Ministers before the end of 2023.

As the ESB's term draws to a close in 2023, it remains important that market and regulatory arrangements support integration of consumer energy resources, demand-side participation and new technologies, and do so in a way that empowers and protects consumers. Harnessing consumer energy resources and the new energy services that they enable is critical for an orderly, equitable and cost-effective energy transition.

1.3 Secure gas and electricity system

A key element of effective energy markets is their ability to remain in a secure operating state. That is, they must be able to respond quickly and remain stable in response to unexpected changes. System security is critical to ensuring energy reaches consumers.

In electricity supply, the energy transition will reshape how the power system achieves this capability. In a coal, gas or hydro generator, the rotation of turbines contribute to the ability of the power system to remain in a secure operating state. Many system security services are provided as a by-product of synchronous generation sources with large spinning turbines, such as coal and gas generators. However, much new renewable generation connects to the system in a different way, via power electronics, and is not currently capable of providing these services. As the spinning plants age and reach retirement, these services will need to be provided through new mechanisms and technologies.

A more detailed discussion of these essential system services can be found in AEMO and the AEMC's joint paper – *Essential system services and inertia in the NEM* and AEMO's *Engineering Framework*.^{5 6}

1.3.1 Security of gas and electricity system in 2023

Maintaining system security continues to be challenging and costly as the pace of the energy transition accelerates. However, there is some evidence of positive progress.

The AEMC is leading consideration of how to improve security frameworks for the energy transition as one of a series of rule changes at a system level to improve management of electrical characteristics such as frequency, voltage, system strength and inertia.⁷ Following feedback from stakeholders in 2022, the AEMC is focusing on simple and flexible mechanisms to maximise benefits and reduce costs.

In gas markets, system security was relatively stable over 2023 but remains vulnerable to shocks demonstrated in 2022. In 2022 markets were challenged to the extent that AEMO issued 7 'threat to system security' notifications for the Victorian gas market. This included directing that gas generators in the NEM sourcing gas from the Victorian market not generate in order to preserve sufficient capacity in the Iona gas storage facility. Markets did not experience comparable threats over 2023. Lower gas-powered generation in the NEM and milder weather resulted in lower gas demand generally over winter, easing pressure on gas markets. Nonetheless, the risks will remain and

4 AER, [Review of consumer protections for future energy services: Options for reform of the National Energy Customer Framework](#), Australian Energy Regulator, October 2022.

5 AEMC and AEMO, [Essential system services and inertia in the NEM](#), Australian Energy Market Commission and Australian Energy Market Operator, June 2022.

6 AEMO, [Engineering Framework](#), Australian Energy Market Operator.

7 AEMC, [Operational security mechanism](#), Australian Energy Market Commission, accessed 15 August 2023.

intensify if exit of coal generation in the NEM outpaces investment in renewable generation and enabling transmission investment. Besides the specific risks to security in east coast gas markets, this highlights the interacting challenges of closely interconnected electricity and gas markets.

The integration of consumer energy resources presents additional system security risks and opportunities. Increasing uptake of consumer energy resources reduces reliance on the grid when it is available. If well-coordinated, this has the potential to support system security. However, at present, AEMO has relatively little visibility of the real-time contribution of consumer energy resources to the NEM. Without improved coordination, this has the potential to make system forecasting and operation more difficult, increasing the challenges of maintaining system security.

1.3.2 Action on key challenges

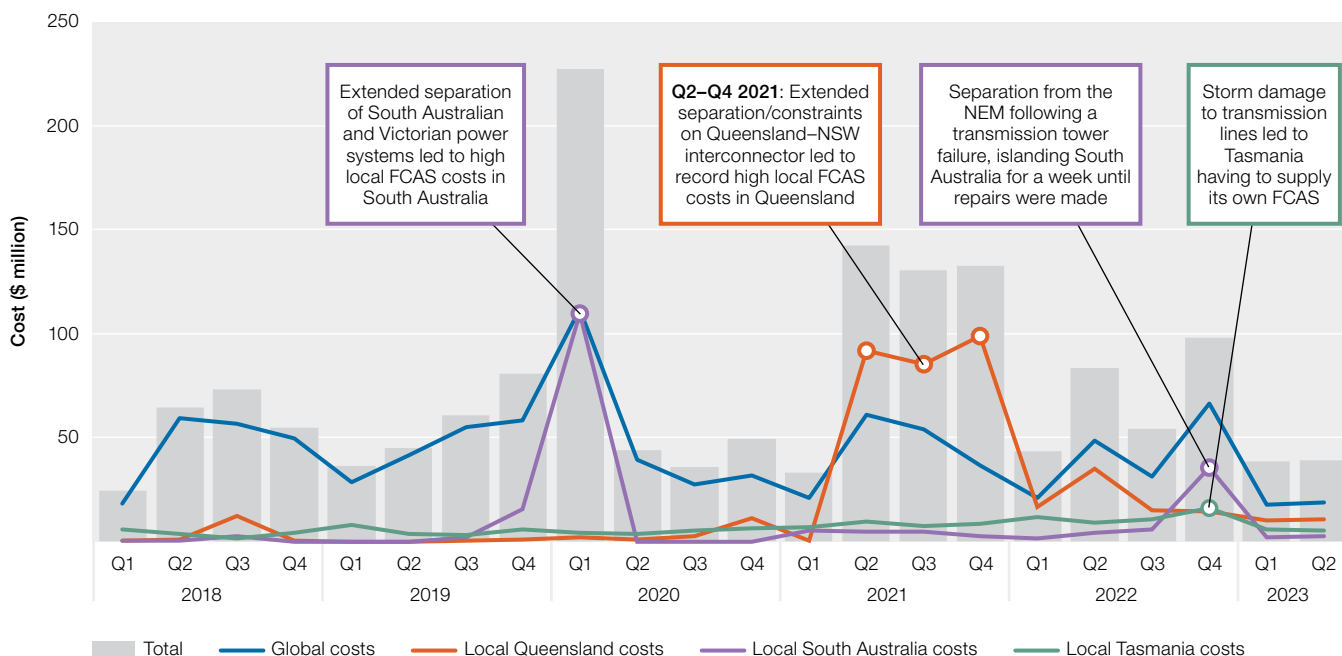
As the transition proceeds, there are longer-term risks of localised high FCAS costs

AEMO can procure frequency control ancillary services (FCAS) through the NEM to maintain grid frequency within technical operating limits.

Over the past few years, FCAS markets have attracted investments in grid-scale batteries, virtual power plants (VPPs) and demand response aggregators. This new entry has been successful in increasing competition in FCAS markets and providing new sources of FCAS as thermal plant exits.⁸ Mandatory primary frequency response requirements introduced in 2020 have increased the security of the power system by increasing its resilience to frequency excursions and have reduced the need for AEMO to procure additional frequency control services. The introduction of a very fast FCAS market will further support least-cost procurement of FCAS services.⁹

Despite these positive developments, there is an ongoing risk of FCAS shortages driving costs in the event of planned and unplanned network outages preventing access to FCAS services across regional boundaries. In the last quarter of 2022, South Australia experienced high local FCAS costs (\$34 million) and Tasmania experienced record local FCAS costs (\$14 million) in response to network outages resulting from weather events.¹⁰ These events, as well as the significant FCAS costs seen in Queensland in 2021 resulting from the Qld-NSW interconnector upgrade, highlight the vulnerabilities of local markets to transitory network and plant outages. In particular, local markets are highly concentrated and remain vulnerable to individual participants' commercial strategies.¹¹

Figure 1.3 Frequency control and ancillary service (FCAS) costs since 2018



Note: Global and local FCAS costs, by quarter.

Source: AER analysis using NEM data.

8 AER, *Wholesale electricity market performance report 2022*, Australian Energy Regulator, ch. 9.

9 AEMC, *Final determination: Fast frequency response market ancillary service rule*, Australian Energy Market Commission, July 2021.

10 AER, *Wholesale market quarterly report – Q4 2022*, Australian Energy Regulator, February 2023.

11 AER, *Wholesale electricity market performance report 2022*, Australian Energy Regulator, pp. 121–2.

Further augmentation of the network, including upgrades to interconnectors, may help improve system security in the longer term but in the meantime will likely continue to create long outages and extended periods of reliance on local FCAS services. Costs imposed on consumers should be factored early into planning network outages, so that local FCAS can be sourced relatively cheaply and efficiently.

Directions to support system security can be expensive

AEMO uses directions when commercial generation capacity is not available or able to address problems. The frequency with which AEMO has used directions to manage system security has increased markedly since 2016. Since Q2 2022, these directions have been used exclusively to manage system strength in South Australia.¹²

Despite the installation of synchronous condensers in 2021, South Australian security direction costs have risen sharply in both cost and the proportion of time they are required since Q4 2022.¹³ AEMO reports that this increase in costs has followed gas-fired generators opting to offer less into the NEM in response to higher renewable generation output.

Figure 1.4 Costs of directions since 2018 excluding RERT



Source: AEMO data; AER analysis.

Recent reforms will contribute to providing essential system services at least-cost to consumers

Essential system services reforms are focused on establishing new markets or other methods to procure system services in the long-term interests of consumers.

Implemented changes and ongoing rule proposals include:

- Creating fast frequency response markets and the introduction of a mandatory primary frequency response requirement. The implementation of mandatory primary frequency response has resulted in significantly improved and stable frequency performance. Since the commencement of this reform, the number of excursions outside of the normal operating frequency band has significantly dropped and the frequency has remained closer to the 50 hertz requirement.
- Requiring transmission businesses to proactively forecast and procure services (known as system strength), which facilitate the stable operation of the power system electronics that govern the operation of renewable generation. This reform is being implemented at a time when technological advances in the design of power system electronics may soon allow them to contribute to the provision of essential system services. It will be important to navigate this transition carefully to ensure investments are in the long-term interests of consumers.

¹² RERT directions relating to reliability increased significantly in June 2022 before the suspension of the NEM.

¹³ AEMO, [Quarterly energy dynamics: Q2 2023](#), Australian Energy Market Operator, July 2023, pp. 40–41.

- › Recommended improvements to existing inertia, network support and control ancillary services and non-market ancillary services frameworks to create proactive, forward-looking and enduring arrangements to help ensure system security and reduce the use of directions.¹⁴
- › A rule change proposal for an ancillary service spot market for inertia in the NEM to ensure the secure and efficient operation of the power system through the energy transition. A draft determination is expected to be published in February 2024.¹⁵
- › Clarifying mandatory primary frequency response obligations for batteries with capacity of 5 MW or greater.¹⁶

Work also continues to embed the rule changes into NEM systems, as well as exploring further reform mechanisms for other system services:

- › AEMO published the primary frequency response requirements in May 2023,¹⁷ and the Frequency Contribution Factors Procedure in June 2023.¹⁸
- › The AEMC published a revised frequency operating standard in April 2023, which will come into effect on 9 October 2023 to align with the commencement of the new market ancillary service arrangements.¹⁹

Low visibility to the market of consumer energy resources creates some risks

The growth of consumer energy resources provides significant opportunities for potential new sources of system services (for example, through flexible use of residential batteries). However, it may also pose some longer-term challenges to system security.

This is because of ‘minimum demand’ periods during the day and the lack of visibility and control over consumer energy resources by AEMO compared with centralised generation, all of which makes the system more difficult to operate. Figure 1.5 sets out AEMO’s projections of minimum operational demand.

¹⁴ AEMC, Improving security frameworks for the energy transition, Australian Energy Market Commission, August 2023.

¹⁵ AEMC, Rule Changes, Efficient provision of inertia, Australian Energy Market Commission, March 2023.

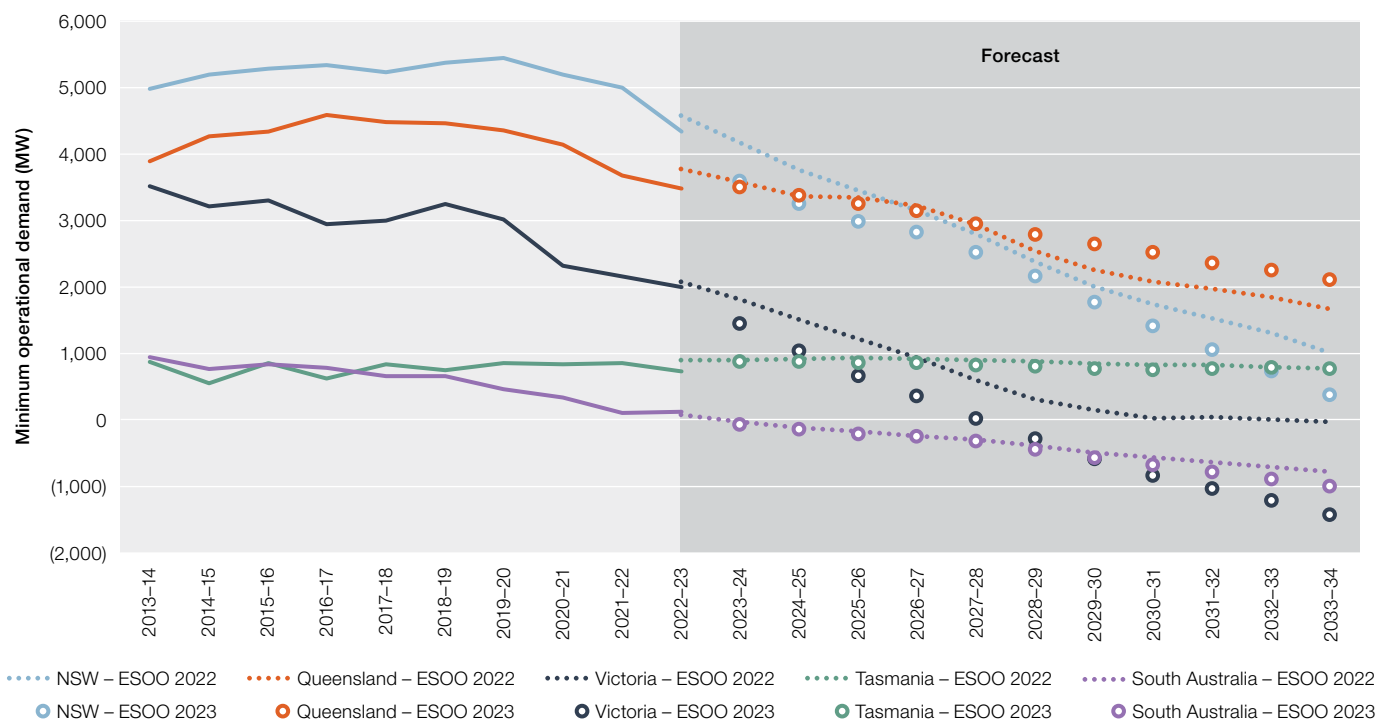
¹⁶ AEMC, [Clarifying mandatory primary frequency response obligations for bi-directional plant](#), Australian Energy Market Commission, August 2023.

¹⁷ AEMO, Primary Frequency Response Requirements, Australian Energy Market Operator, May 2023.

¹⁸ AEMO, Frequency Contribution Factors Procedure, Australian Energy Market Operator, June 2023.

¹⁹ AEMC, Frequency Operating Standard, Australian Energy Market Commission, April 2023.

Figure 1.5 Regional annual actual and forecast 50% probability of exceedance (POE) minimum operational demand (sent-out), 2022 ESOO central and 2023 ESOO central scenarios, 2022–23 to 2033–34



Note: The actuals displayed are not weather-corrected or adjusted for system events and exclude DSP. Also, the 2023 ESOO uses the step-change scenario as its central outlook.

Source: AEMO, Electricity Statement of Opportunities 2023.

Residential solar PV capacity has increased year on year, which is likely to accelerate declining minimum demand. By 2025, AEMO forecasts that there will be periods where distributed solar PV supplies up to 70–80% of underlying customer demand in mainland NEM regions. At present, there is no ability to actively manage these resources except in South Australia, where it is only an emergency measure and not one for general support of consumer energy resource utilisation.²⁰ If no action is taken, with the present operational tools it has available, AEMO will struggle to deliver minimum requirements for essential system requirements including system strength, inertia, voltage management and frequency control.

Some forms of consumer energy resources have also been found to disconnect simultaneously from the power system during power system disturbances, exacerbating system instability. Technical standards for consumer energy resources have been updated to address this, but AEMO has identified that only approximately 35% of new installations are being installed correctly in compliance with the new standard.²¹ The AEMC will be reviewing compliance with inverter standards as part of assessing the NEM’s progress adopting standards already introduced in the NER. This is part of its broader work on governance of technical standards for consumer energy resources.²²

1.4 Reliable and low-emissions energy

A reliable power system has enough generation, demand response and network capacity to supply customers with the energy that they demand with a very high degree of confidence.

The energy transition is changing the requirements and challenges necessary to support system reliability. To reduce emissions from electricity supply, traditional sources of electricity generation which use fossil fuels must be replaced with new, low-emissions sources. Solar and wind generation already account for a material proportion of generation in the NEM. This will continue to grow, and need to be supported with flexible capacity, such as batteries and hydro generation, that can be dispatched on demand to meet peaks. To maintain reliability while the transition takes place, the timing of this replacement expenditure will need to be coordinated in particular with the exit of coal generators.

²⁰ AEMO, [2021 Electricity Statement of Opportunities](#), Australian Energy Market Operator, August 2021, Section 6.1.

²¹ AEMO, [Power System Frequency Risk Review](#), Australian Energy Market Operator, July 2022, Section 3.3.1.

²² AEMC, [Rule Determination National Electricity Amendment \(Governance of Distributed Energy Resources Technical Standards\) Rule 2022: National Energy Retail Amendment \(Governance of Distributed Energy Resources Technical Standards\) Rule 2022](#), Australian Energy Market Commission, March 2022.

Gas generation will remain an important source of flexible capacity during the transition because, unlike coal generation, it is relatively well suited to shorter periods of operation in which it ramps up and down to meet peaks in demand. In the short term, this creates demand pressure impacting both domestic and industrial uses of gas, which in turn has implications for reliability in electricity markets. However, the longer-term domestic and industrial requirements for gas as a fuel are changing. Governments across Australia are establishing and implementing visions for the future role of gas in a low-emissions energy supply chain, and in some cases are actively progressing electrification of gas usage.

1.4.1 Reliability and progress towards low-emissions energy in 2023

The energy crisis in June 2022 highlighted significant challenges to reliability and system security. The same conditions have not arisen over 2023, following significant improved market conditions and temporary interventions in electricity and gas markets. However, the experience of 2022 showed that there are a range of vulnerabilities to the reliability of energy supply as coal generation ages and exits the market. In particular, it highlighted the sensitivity of the market to outages among those ageing plants, challenges accessing fuel, exposure to international fuel prices and interconnections between electricity and gas markets in which there are related reliability challenges.

An emissions objective will shortly be implemented within the national electricity, gas and retail objectives. When the objective is implemented, emission reductions will no longer be part of the external context for decision-making by the AER and other market bodies. They will become one of the central considerations in determining if decisions are in the long-term interest of consumers. The Australian Government will in close consultation with market bodies, states and territories lead work on developing a value for emissions, or method for determining one. A value, or method for determining one, is expected to be available by November 2023. Such a value will inform system planning, expenditure assessments for network investment, cost-benefit analyses and how consumer energy resources should be factored into investment business cases.

In September 2022, Australia updated its 2030 national target to 43% emissions reduction below 2005 levels. AEMO has now incorporated this target across all of its modelling scenarios.²³ The most recent emissions projects suggest that, with currently announced policies and ‘with additional measures’, Australia is projected to be 40% below 2005 levels by 2030 and 1% above the 2021–2030 emissions budget.²⁴ From 2020 to 2030 most of the decline in emissions in the baseline scenario is projected to come from the electricity sector due to strong uptake of renewables supported by policies of the Australian, state and territory governments.

Separate to this national target, individual states and territories have also implemented:²⁵

- › further emissions reductions commitments, targeting earlier reductions of emissions
- › specific renewable energy targets
- › storage targets to support sufficient dispatchable capacity.

The pipeline of investment to support this transformation is positive. As at July 2023, AEMO forecast that the committed and announced proposed new generation pipeline is roughly 30% of the NEM’s total current generation capacity.²⁶ Including proposed projects, the pipeline is roughly 4 times the existing capacity of the NEM. This is an over 60% increase on the proposed pipeline from July 2022. The majority of this pipeline comprises low-emissions solar, wind and hydro generation.

Nonetheless, most of the change to the extended generation pipeline is not yet committed. The NEM faces accelerated coal retirements and gas shortfalls affecting the most important current sources of flexible generation. With the NEM expected to experience 4 announced coal-fired generator retirements in the next decade, and needing resilience for potential future closures as well, the investment need is pressing and widespread across the NEM.

Illustrating this urgency, AEMO has forecast shortfalls in all NEM mainland regions as we approach 2030 (based on committed generation and transmission investment).²⁷ These forecast shortfalls have accelerated from the 2022 equivalent forecasts, reflecting factors including higher unplanned outage rates among generators, widespread delays in project delivery compared with forecasts, and fast growth in demand caused by electrification.

23 AEMO, [Inputs, assumptions and scenarios report](#), Australian Energy Market Operator, August 2023, p. 28.

24 DCCEE, [Australia’s emissions projections 2022](#), Department of Climate Change, Energy, the Environment and Water, December 2022.

25 AEMO includes in its 2023 Inputs, Assumptions and Scenarios report a detailed summary of Australian, state and territory government policies included in its modelling across all scenarios. AEMO, [Inputs, assumptions and scenarios report](#), Australian Energy Market Operator, August 2023, pp. 7–8.

26 AEMO, [Generation information: July 2023](#), Australian Energy Market Operator, accessed 15 August 2023.

27 AEMO, [2023 Electricity statement of opportunities](#), Australian Energy Market Operator, August 2023.

1.4.2 Action on key challenges

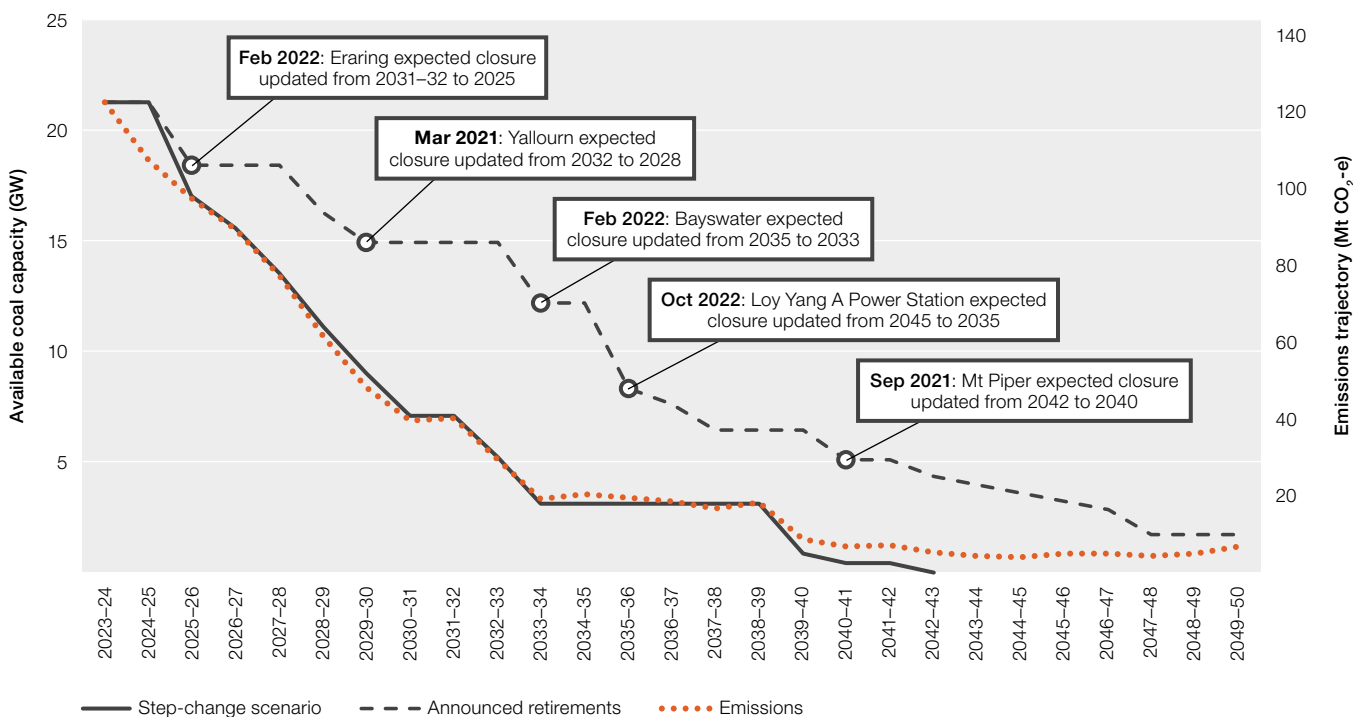
It is vital that coal exits the market in an orderly way

The remaining units of Liddell Power Station exited the NEM in April 2023, on schedule and in an orderly manner. Market impacts to date have been mitigated by the entry of new renewable generation alongside otherwise favourable market circumstances since closure (chapter 3).

The NEM now expects 4 coal-fired generator retirements in the next decade, including the remaining units of Eraring Power Station (NSW – August 2025), Callide B Power Station (Queensland – 2028), Yallourn W Power Station (Victoria – 2028) and Vales Point B (NSW – 2033).

Coal generation is the most impactful driver of the emissions from the NEM. To meet emissions reductions targets, coal generation must exit the NEM in a timely way.

Figure 1.6 Forecast coal retirements and links with emissions



Note: The 'emissions' line shows the forecast emissions trajectory from the 'step change' scenario.

Source: AER analysis, AEMO data.

The 'step-change' scenario, used as the central scenario in AEMO's planning, projects coal exiting the NEM more rapidly than has been currently announced (Figure 1.6). To maintain reliability as coal exits accelerate, new generation will need to enter the NEM at a faster rate than is currently taking place. However, there are barriers to this occurring. In its *Wholesale electricity market performance report*, the AER discussed these barriers in more detail.²⁸ Some key barriers include that:

- > Investment in long-lived generation relies on revenue certainty, and this is difficult to achieve in a complex and rapidly changing market
- > Transmission investments required to connect new sources of generation are progressing more slowly than planned.

Further, as coal generation approaches its anticipated exit, units are becoming less reliable without considerable maintenance expenditure. Aging thermal generators must have the appropriate incentives to maintain generation units until they can exit on an orderly timeline.

²⁸ AER, [Wholesale electricity market performance report 2022](#), Australian Energy Regulator, December 2022, pp. 100–109.

Certainty around timing of coal exit and fuel supply would help coal to withdraw at a rate consistent with the entry of new generation, smoothing the transition. Policymakers have a range of options to achieve this, including contracts between governments and coal generation or some form of economic regulation framework. Any response will have benefit if it enables revenue confidence, offers clearer time frames in which to plan maintenance, contract fuel, and facilitate future investment in lower emission technologies, while also meeting the broader reliability needs of the system and ensuring an orderly and timely exit to support the transition to net zero emissions.

As a further tool to mitigate the risks of coal generation exiting the market abruptly, the NSW Government is progressing the development of an opt-in orderly exit management framework.²⁹

Governments are prioritising support for dispatchable generation and storage

The Department of Climate Change, Energy, the Environment and Water has recently released a consultation paper seeking public feedback on the design of a capacity investment scheme to support investment in dispatchable renewable generation and storage, which will begin receiving public tenders in 2023. The first phase will include:³⁰

- › partnership with the NSW Electricity Infrastructure Roadmap – with the Australian Government to provide support for up to 550 MW of firm capacity, in addition to 380 MW already committed by NSW
- › a tender for investments in South Australia and Victoria, with tender arrangements to be announced by October 2023.

Projects selected through open tenders will be offered long-term Australian Government underwriting agreements for an agreed revenue ‘floor’ and ‘ceiling’.

If it attracts the desired level of investment, the scheme may mitigate some risks to reliability in the NEM. In its 2022 *Wholesale electricity market performance report*, the AER found that revenue uncertainty is an important barrier to entry in a rapidly changing and complex energy market. In consultation, participants told that the AER that investors are increasingly refraining from investment unless directly tied to government policy or funding.

As such, government interventions may be essential to support reliability alongside other environmental, economic and social objectives. Where possible it is important that, along with the models in which it operates, government interventions to support investment are made in a way that maximises diversity and competition of ownership wherever possible, especially among flexible generation.

Complementary measures to support reliability are also underway, including:

- › improvements to the quality and transparency of information that is collected and published about the future availability of generators as part of the medium-term projected assessment of system adequacy (MT PASA) process (published August 2022)
- › an AEMC review of the retailer reliability obligation, to be completed in 2024.³¹

Domestic gas shortfalls could affect reliability

New sources of flexible generation must replace coal to meet demand in daily peak periods and when renewable output is low. Without significant increases in non-thermal storage and demand response, gas will likely power flexible generation in the medium term. The step-change scenario forecasts a continued role for gas in the longer term, with up to 10 GW gas-powered generation capacity by 2050.

Over 2023 so far, gas supply has been sufficient and prices have been far lower than in 2022. At the end of winter, Iona storage is high. In total, the risk of supply shortfalls over 2023 appears to be decreasing. This suggests improvements in the balance of supply and demand in gas markets, supported by lower gas-powered generation requirements. To some extent it may have been supported by low international LNG prices and reduced incentives to export. Nonetheless, even in these circumstances there have been material spikes in price caused by transport or supply outages. The supply-demand balance in gas markets remains vulnerable to fluctuations in supply conditions or demand.

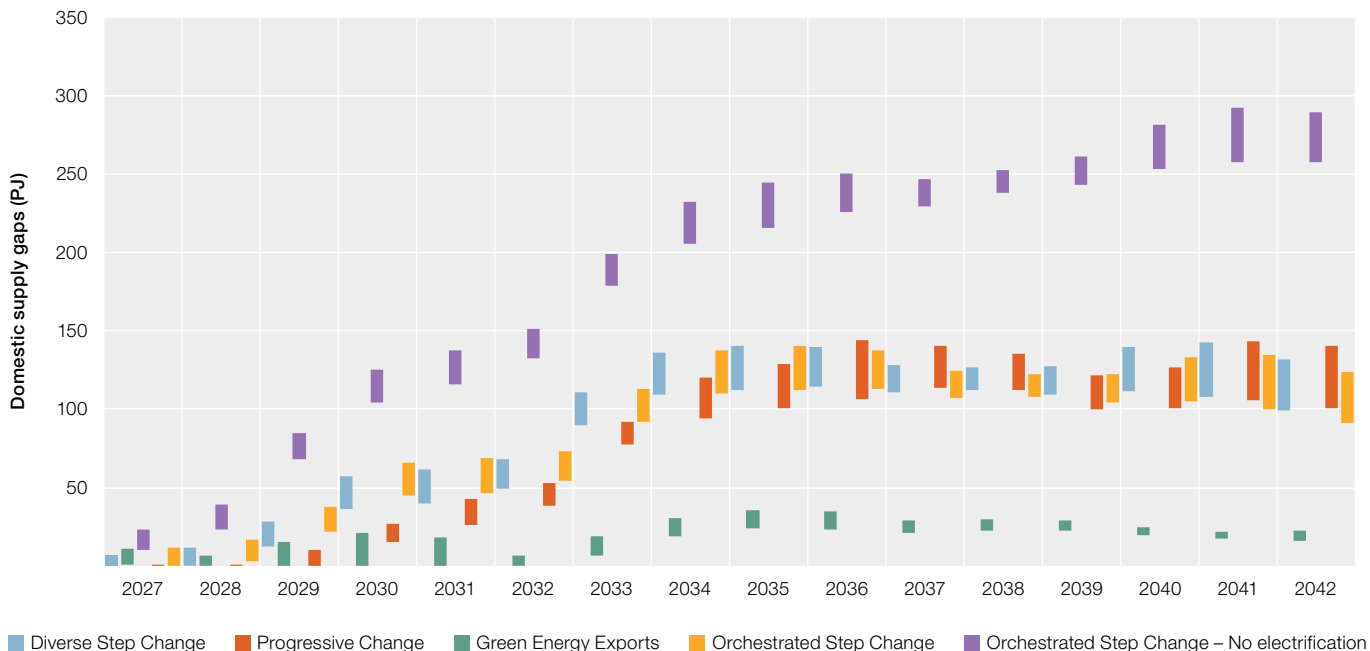
29 Energy and Climate Change Ministerial Council, [Meeting Communiqué](#), 7 July 2023.

30 DCCEEW, [Capacity investment scheme: Public consultation paper](#), Department of Climate Change, Energy, the Environment and Water, 4 August 2023.

31 AEMC, [Review of the retailer reliability obligation: Consultation paper](#), Australian Energy Market Commission, 23 March 2023.

Despite the more positive short-term outlook, AEMO anticipates medium-term gas shortfalls as southern gas reserves deplete. In its 2023 gas statement of opportunities, AEMO forecast annual southern supply shortfalls commencing from 2027 as capacity on north–south pipelines becomes constrained.³² The forecast timing and magnitude of these shortfalls, and therefore the optimal investments or interventions to address those shortfalls, depend to a large extent on rates of electrification.

Figure 1.7 Range of domestic annual supply gaps forecast under different scenarios, with existing, committed and anticipated developments, all scenarios, 2027–42 (PJ)



Source: AEMO, Gas statement of opportunities 2023.

Shortfalls could constrain the availability of gas generators and/or lead to higher prices. Reduced availability from gas generators would then restrict flexible generation available in the NEM, highlighting the challenges associated with closely interconnected markets.

Energy Ministers have committed to a further series of measures to support gas availability. These include:

- Extensions to AEMO’s powers, providing it with tools to manage supply shortfalls in the east coast market in winter 2023. This included a rule change that requires AEMO to act as a buyer and seller of last resort at the Dandenong gas storage facility. This is to reduce the likelihood of curtailment in Victoria, reduce the risks to the safety, security and reliability of gas supply in Victoria and support the efficient operation of the Declared Wholesale Gas Market over 2023 to 2025. Since implementation of this reform, storage at Dandenong has increased markedly.
- Instructions for AEMO to develop an annual winter readiness management plan for east coast energy markets and incorporate gas supply and system adequacy risks into its annual summer readiness plan.

1.5 Effective development of open and competitive markets

Open and competitive markets, and the competitive pressure they enable, are a vital part of managing these pressures and keeping costs at levels that are no more expensive than necessary or efficient. Competitive fuel and wholesale markets are essential to support the efficient dispatch of the lowest-cost sources of energy at any point in time. In retail markets, open and competitive markets are an important tool consumers can use to find retail offers best suited to their circumstances and usage. Competitive markets for financial hedge products are also critical to enabling retailers to manage the risks and volatility of the wholesale market on behalf of their customers. With major changes to the generation fleet, including the growing prevalence of consumer energy resources, the sources of and challenges to competition are also changing.

³² AEMO, [Gas statement of opportunities](#), Australian Energy Market Operator, March 2023, p. 82.

1.5.1 Market openness and competition in 2023

After several years of progress towards improved competition in energy markets, recent market shocks, most acute in winter 2022, posed some new challenges for retail and wholesale market participants.

In its December 2022 *Wholesale electricity market performance report*, the AER investigated the competitive structure of the NEM in more detail, finding risks to competitive pressure from factors including:

- › high concentration of generation ownership, particularly with respect to flexible generation
- › behaviour suggestive of the exercise of market power through economic withholding
- › structural and artificial barriers to entry and impediments to efficient price signalling
- › declining liquidity in contract markets and access to those contracts
- › lack of investment confidence arising from revenue uncertainty in a rapidly transforming market alongside uncertainty in the macroeconomic and policy environment.
- › In retail markets, consumers continue to move gradually from larger to smaller retailers, suggesting some improvement in retail competition. However, the spread of market offer prices has declined, indicating that consumers have at present lower scope to make material savings through changing offers.

Specific interventions have helped to stabilise the markets at critical junctures, mitigate price pressures and avoid load shedding. Nonetheless, they highlight continuing challenges. The energy system will likely face other market shocks as we transform our generation fleet and interact with global fuel pressures. A properly calibrated and predictable framework of interventions will play an important role in market resilience going forward.

1.5.2 Action on key challenges

Record high international fuel prices put pressure on domestic fuel availability and prices

Fuel costs are an important factor in generator behaviour. Where generators are exposed to high or volatile fuel costs, or limited fuel availability, this can impact the openness and competitiveness of wholesale markets.

Over 2022, international coal and gas prices reached record high levels, reflecting an overlapping set of domestic and international drivers. High international prices exert pressure on domestic fuel availability and price. Where international prices are high, domestic suppliers of coal or LNG face stronger incentives to sell into the export market. This increases price pressure on any fuel required through spot markets.

Many of these drivers reduced over the first half of 2023 and prices have stabilised. However, this outlook is sensitive to change. In the second half of 2023, a forecast El Niño weather event is expected to coincide with the Northern Hemisphere winter. This could contribute to increased demand from higher-than-expected summer temperatures in the Southern Hemisphere, translating to pressure on gas-powered generation to meet higher peak demand. If combined with the ordinary seasonal increase in demand as the Northern Hemisphere enters winter and increases exports, this could put significant pressure on domestic fuel availability.

Several temporary interventions have been implemented to shield domestic electricity and gas markets from international prices.

In December 2022 the NSW Premier declared a coal market price emergency. The NSW Minister for Energy was granted the power to give directions to respond to the emergency while the declaration is in place, with these issued the following day. The Queensland Government moved simultaneously to direct its coal generators.

As a result of directions given, the price of black coal sold to generators has been capped at \$125 per tonne in NSW. Although the directions to Queensland coal generators are not made public, the AER understands Queensland has a mechanism in place to achieve a similar effect. Additionally, coal generators in NSW are required to plan to maintain a stockpile that is sufficient to meet 30 days of projected demand. Coal mines in NSW are required to reserve a proportion of future coal production to supply NSW coal generators and are to prioritise delivery to generators with low stockpiles. The NSW Government has announced that this intervention will end in June 2024.

From December 2022 to July 2023, some trade in gas markets was covered by a \$12 per GJ price cap. In July 2023, this was replaced with a Gas Market Code of Conduct. The Code includes 4 key elements:

- › a price cap (initially set at \$12 per GJ)
- › an exemptions framework to incentivise the commitment of more gas to the east coast gas market and facilitate new investment
- › transparency obligations
- › conduct provisions to reduce bargaining power imbalances between suppliers and buyers.

High and volatile prices may reduce incentives for generators to offer hedging contracts

Spot markets and contract markets are important complements to support competition. Liquid contract markets allow generators and retailers to manage cost exposure and insulate consumers from transient high prices.

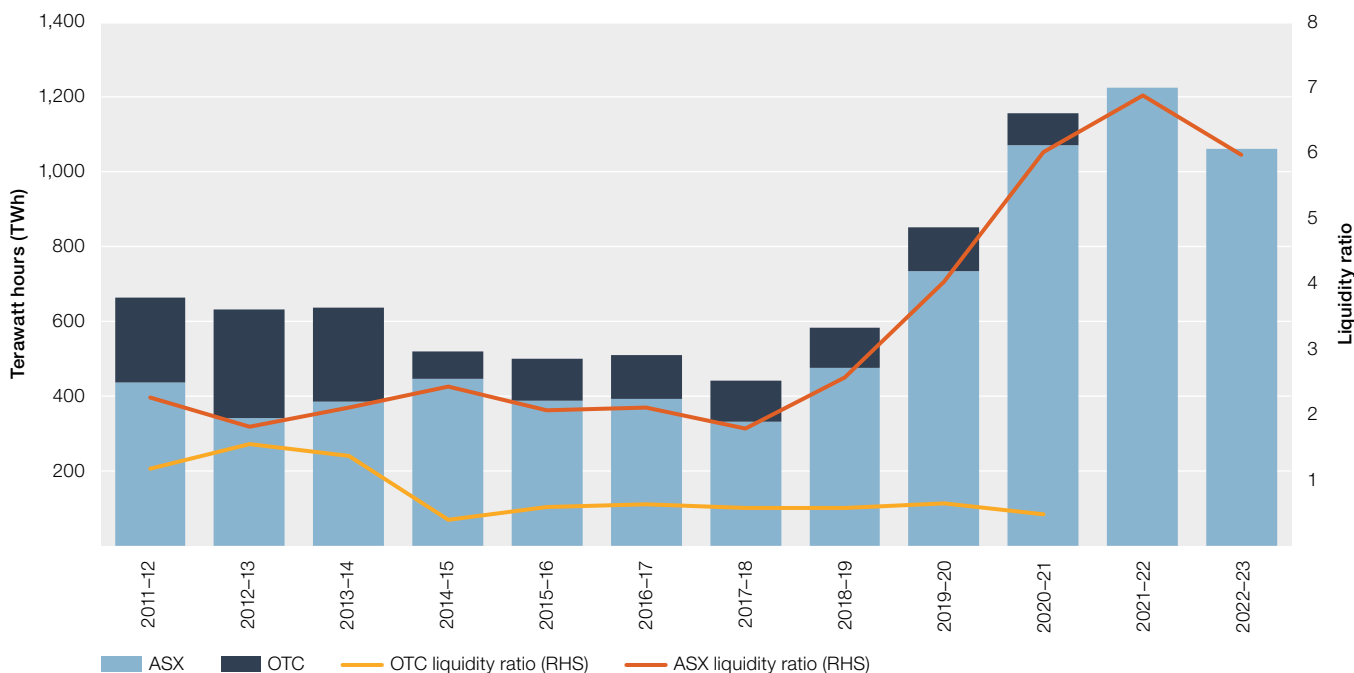
A lack of liquidity in the contract markets is a significant source of risk because it can impact the sustainability of existing participants and create barriers to entry and expansion.

During 2022–23, ASX traded volumes fell after 4 consecutive years of growth, declining 13% from the record set in 2021–22 (Figure 1.8). During the July to September quarter 2022 there was a marked decline in ASX traded volumes, down 40% compared with the previous quarter. The fall in traded volumes was likely a reaction to the significant spot and contract market volatility seen during the April to June and July to September quarters and the resulting cash-flow impacts on contract market participants. Several participants reported to the AER that, prompted by the increased volatility, they were reassessing their internal risk limits.

Traded volumes rebounded in the October to December quarter 2022, reaching the level seen in the October to December quarter the previous year. While cash flow and margining were likely still a concern, falling contract prices and less volatility in the spot market were reducing these risks.

January to March and April to June quarter 2023 traded volumes remain below those seen in 2020–21 and 2021–22 (down 25% compared with last year). Both retailers and generators have reported trimming their acceptable risk limits since last year’s market crisis, with the scale of prices in 2022 causing some to rethink their worst-case scenarios. It is also likely that some volume has moved to OTC markets, which are not captured by any currently available datasets.

Figure 1.8 Traded volumes in electricity futures contracts



Note: Exchange trades are publicly reported, while activity in over-the-counter (OTC) markets is confidential and disclosed publicly only via voluntary participant surveys in aggregated form. The OTC data are published on a financial year basis. To allow some comparability across OTC and exchange traded data, this section refers to financial years for both markets. Data for 2021–22 and 2022–23 trading of OTC contracts were not available at the time of publication. The OTC liquidity ratio forecast is the liquidity ratio comparing the total traded volumes to the native demand across the 4 combined regions.

Source: AER; AFMA; ASX Energy (data).

If hedging contracts are not available at profitable levels, retailers without generation assets may be unable to sustainably compete. Retailers integrated with generators can manage risk internally by balancing higher retail costs against higher generation earnings. Smaller retailers that do not own generation assets are particularly exposed.

If this contributes to retailer failure, it is vital that failure be as orderly as possible to minimise disruption for consumers, and to support the resilience of the retailers of last resort (ROLRs) that those consumers are transferred to. In support of this, the AEMC recently revisited the ROLR scheme in the context of supporting market resilience. It made a series of recommendations, which Energy Ministers have adopted and agreed to progress in legislation. In May 2023, the AEMC published a directions paper in its review into the arrangements for failed retailers' electricity and gas contracts.³³ This included a series of options for managing the costs of failed electricity and gas retailers, recognising the differences in how retailers access energy in the 2 markets.

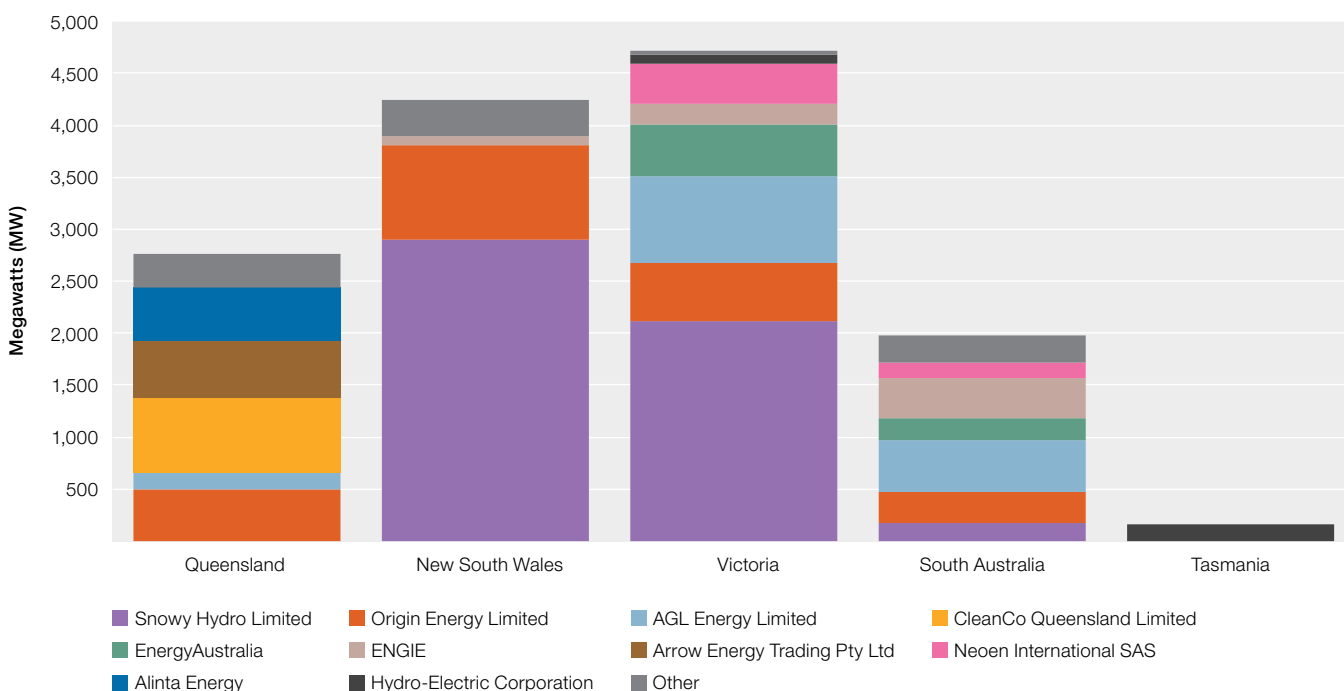
As spot prices decline and short-term pressures ease, it is possible that contract market liquidity returns to its medium-term path of improvement. This will be critical for the prospects of efficient and competitive retail markets.

Flexible generation capacity is concentrated among small number of owners

Material investment has been made in new renewable generation. However, when renewable generation is reduced due to weather constraints, the market must rely on dispatchable generation including flexible technologies such as hydro, battery and some gas generators. While transient high prices reflective of scarcity are features of an efficient and competitive market, recent experience highlights the risk of inefficiencies arising from market concentration in flexible capacity.

The AER highlighted the concentration of flexible capacity in its 2022 *Wholesale electricity market performance report*. This concentration has intensified further with the closure of Liddell Power Station in April 2023. As shown in Figure 1.9, this concentration is most acute in NSW and Victoria.

Figure 1.9 Market share by registered flexible capacity



Note: Flexible capacity in this chart captures all generation defined as 'fast' by start type.

Source: AER analysis.

Approximately 5 GW of new entry flexible generation has been committed over the next 10 years, including 1.6 GW of battery storage capacity, 2.3 GW of pumped hydro and 1.1 GW of gas capacity.³⁴ These committed projects are expected to increase the concentration of flexible generation ownership even further.

³³ AEMC, [Review into the arrangements for failed retailers' electricity and gas contracts: Directions paper](#), Australian Energy Market Commission, May 2023.

³⁴ Based on projects identified by AEMO as committed. See AEMO, NEM Generation Information July 2023, Australian Energy Market Operator, accessed 7 August 2023.

Greater concentration increases the potential for inefficient market outcomes, either through potential exercise of sustained market power or exposure to the supply, planning or strategies of individual participants. These inefficiencies can cause major market impacts if intermittent generation output is low over an extended period. The 2022 *Wholesale electricity market performance report* highlighted that competitive pressure is vital to spreading risk and encouraging innovation, and recommended that facilitating competition during and beyond the transition would enable the NEM to function efficiently.³⁵

Clearing services will play an important role in contract market effectiveness

The relatively small number of companies providing market clearing services has been limited further by restraints on clearing new contracts. As of March 2023, there were only 5 clearing service providers for electricity derivatives approved by the ASX.³⁶ It was reported on 14 October 2022 that Bell Potter had withdrawn its clearing services for ASX electricity derivatives and Macquarie had moved to restrict clearing services for electricity futures for would-be clients.³⁷

Clearing services play a vital role in facilitating ASX trading. They are also important for the viability of other trading platforms, such as FEX Global, which promote competition and greater diversity of standard contracting products. Participants without access to the ASX or FEX Global will be forced to hedge using OTC contracts, either through a broker or negotiated directly with a counterparty. An OTC trade negotiation can be time-consuming and small retailers may find the credit requirement imposed on them by counterparties to be onerous.

The exit of Bell Potter and restriction of Macquarie's services illustrates the risks of having such a small pool of clearing service providers. This is especially true at times of high electricity prices, when clearers are forced to take on more risk due to the volatile daily price fluctuations and risk that the client is unable to make the daily margin payment. The limited clearing pool is also a risk for new exchanges. FEX Global has confirmed to the AER that it considers the scarcity of available clearers as currently the most significant barrier that new customers face when seeking access to FEX Global products and services.

While the market appears to be functioning with the limited number of clearing services, they play an important role and this will remain a topic of interest.

Enhanced visibility of contract markets will improve risk analysis and response

Better insight into contract positions is a vital element of monitoring market dynamics. In March 2023 enhanced gas market transparency measures were introduced. These measures facilitate greater insights into east coast bilateral trades and materially improve the comprehensiveness of available gas trade data. Further, Energy Ministers are progressing reforms to expand the AER's wholesale market monitoring and reporting functions, including broader access to contract information. This will:

- › enable better monitoring of participant behaviour to support the AER's compliance and enforcement activities
- › equip the AER to form a more developed view about whether the capacity for market power exists and whether participant conduct suggests that participants are exercising market power
- › enable the AER to identify impediments to competition and efficiency and make recommendations about any further structural change that may be required.

The Department of Climate Change, Energy, the Environment and Water held 2 rounds of consultation with government and industry stakeholders on the proposed amendment to the National Energy Laws in August 2022 and April 2023. If the draft amendment is passed in the SA parliament, the AER will develop relevant guidelines.

³⁵ AER, [Wholesale electricity market performance report 2022](#), Australian Energy Regulator, December 2022, pp. 3, 125–6.

³⁶ ABN Amro, BNP Paribas, JP Morgan, Macquarie Bank and Societe Generale.

³⁷ Australian Financial Review, Energy retailers struggle for hedges as Bell Potter withdraws, 14 October 2022.

1.6 Efficient and timely investment in networks

Networks transport energy from large generators or gas fields, which are typically remote, to demand centres like major cities or gas hubs. As major new sources of electricity generation are developed in new locations, significant new investment in transmission investment is required to support it. The costs of this infrastructure will be shared widely, but the infrastructure itself will have direct impacts on the communities that host it, which is increasingly being reflected in planning and delivery of major projects.

As legacy gas fields deplete close to southern demand centres and the long-term role of gas is changing, it is likely the future role of gas pipelines will be materially different to what has traditionally been the case. The potential development of domestic LNG import terminals emphasises this changing dynamic.

In addition, as the energy transition progresses, the role and requirements of electricity networks is also evolving. With a higher proportion of energy generation now taking place through consumer energy resources, distribution networks increasingly play a role as providers of export services supporting the contribution of surplus domestic generation into the market. Over time, their roles will likely grow further as a platform to support new technologies, storage and trading. The potential implications of widespread electrification or uptake of electric vehicles may have major implications for the size and timing of network peaks, and require new and more sophisticated network price signals to encourage the most efficient use of the networks. This in turn must be shaped by consumers' ability to understand and respond to these more complex price signals.

1.6.1 Network investment in 2023

Network investment has continued at a relatively steady pace over recent years. Electricity networks and fully regulated gas networks are subject to a well-established incentive framework to minimise costs.

Networks have continued to generate profits under the regulatory framework, while costs to consumers have declined. There are likely to be some upward cost pressures over coming years as higher inflation and, if recent capital market trends continue, higher costs of capital feed into network revenue requirements.

The greatest challenge in relation to networks is the timely and least-cost delivery of major transmission projects that will support the changing generation mix. The projects are large and complex. They are important enablers of the energy transition but have specific impacts for communities that host the assets. Reflecting these complexities, they are and have been prone to delays and cost increases through planning and approval stages. These projects are taking place in an environment of emerging upward pressures on network costs – including domestic and global inflationary pressures and signs that the costs of raising capital are rising. Nonetheless, as the exit of coal generation accelerates, it is increasingly urgent that these projects progress.

This expenditure must also be supported by access reform to ensure generators get clear signals to connect into the right parts of the network. Reforming access has proven complex and contentious over several years, but it is vital to make the most efficient use of these transformative network investments.

In May 2023, the AEMC completed its transmission planning and investment review and made a series of recommendations to support timely and efficient investment in and delivery of Integrated System Plan projects.³⁸ It considers these can be implemented prior to more substantial change under consideration in its review of the Integrated System Plan.

1.6.2 Action on key challenges

Essential transmission investment has been slower and more costly than planned

Under the optimal development path in the 2022 Integrated System Plan (ISP), AEMO forecast approximately \$30 billion of transmission expenditure to 2050, of which:

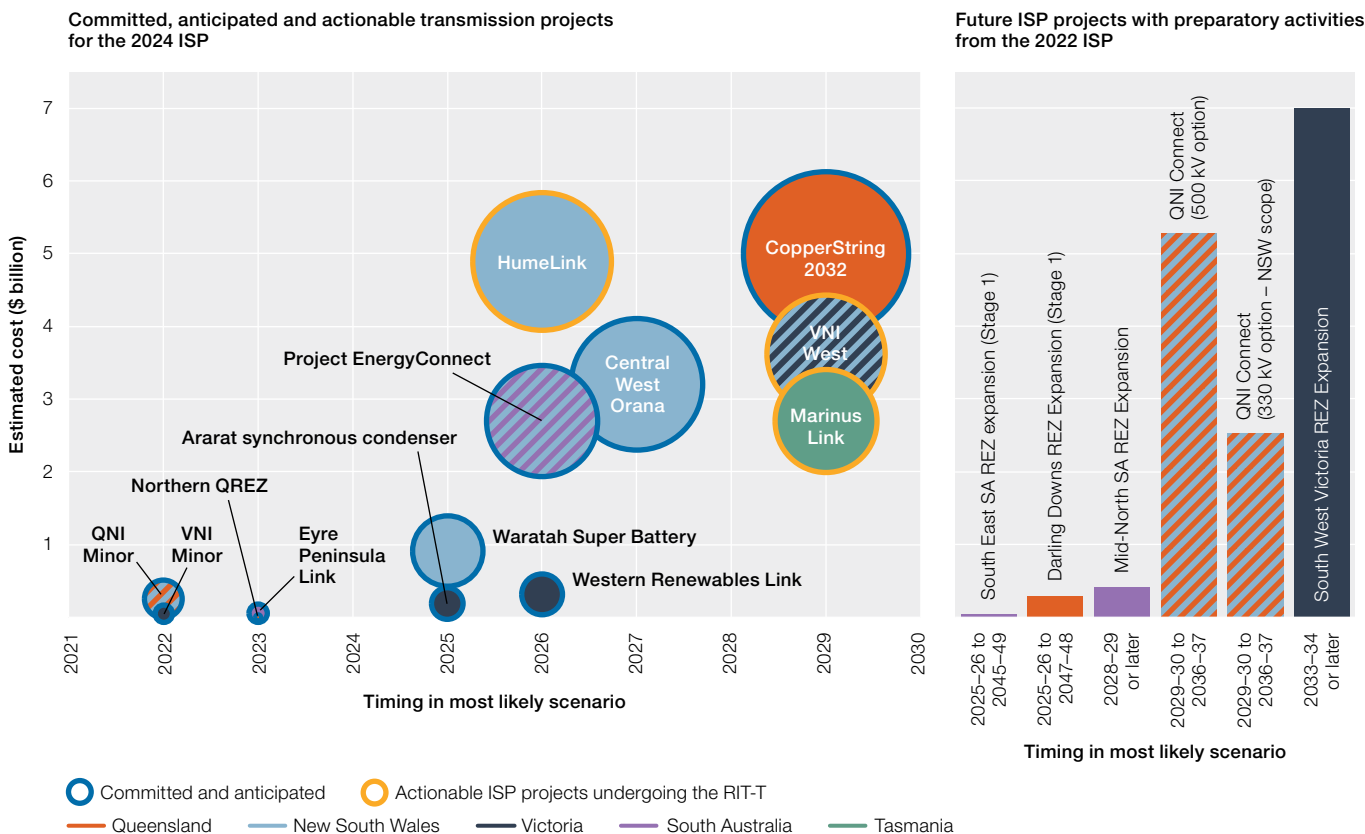
- › \$14 billion is already actionable – meaning the project should be delivered to its earliest schedule and triggering a regulatory investment test for transmission (RIT-T)
- › \$3.2 billion is committed and anticipated
- › \$13 billion has been identified for future ISP projects.

³⁸ AEMC, [Transmission planning and investment review: Stage 3 final report](#), Australian Energy Market Commission, May 2023.

These estimates will be updated again in development of the 2024 ISP and it is likely they will be materially higher. After accounting for inflation, cost estimates provided to AEMO for development of its recent *Transmission expansion options report* generally show increases of approximately 30% increase in real costs compared to equivalent cost estimates prepared for the 2022 ISP.³⁹ Further, AEMO expects project costs will continue to increase beyond the rate of inflation while the sector adapts to global market pressures.

The scope of required network investment could increase materially if Australia pursues significant development of hydrogen as a domestic fuel source or export commodity.

Figure 1.10 AEMO’s integrated systems plan



Note: Committed projects meet 5 criteria relating to planning consents, construction commencement, land acquisition, contracts for supply and construction of equipment and necessary financing arrangements. Anticipated projects are in the process of meeting at least 3 of the criteria. Data used to show the estimate costs of future ISP projects with preparatory activities was provided to AEMO by the transmission network service providers. Preparatory activities are intended to improve the conceptual design, lead time, location and cost estimates for transmission projects. The ISP may require preparatory activities for some future ISP projects. Future ISP projects are projects which address an identified need, form part of the optimal development path, and may be actionable ISP projects in the future.

Source: AER analysis, AEMO integrated system plan, June 2022, AEMO Transmission Expansion Options Report, September 2023.

Since then, some of these projects have been completed at close to forecast costs, including:

- › QNI minor interconnection upgrade
- › VNI minor interconnection
- › Eyre peninsula link.

Nonetheless, larger projects have been more difficult to progress for several reasons, including:

- › Cost pressures – These are major projects sensitive to a range of cost inputs and are taking place in an environment of rapidly escalating costs. AEMO identified in its *Transmission expansion options report* that cost estimates provided in this report generally show up to an approximately 30% increase in real costs compared with equivalent cost estimates prepared for the 2022 ISP.⁴⁰ These costs are all borne by consumers over the lives of the assets. Ongoing inflationary pressures and higher costs of capital may further exacerbate these impacts.

39 AEMO, [2023 Transmission Expansion Options Report](#), Australian Energy Market Operator, September 2023, pp. 3–4.

40 AEMO, [2023 Transmission Expansion Options Report](#), Australian Energy Market Operator, September 2023, pp. 3–4.

- › Complex decision processes – The process for developing the ISP and subsequent regulatory investment tests is rigorous so that only efficient investments will progress to delivery. However, they are also lengthy. Combined with other delays that projects of this scale are subject to, such as delays in engaging affected communities and achieving community support, this increases the risk that projects do not proceed on schedule.
- › Supply chain risks – Projects of this scale are sensitive to domestic and global supply chain risks. Due to the overlapping timelines for these projects, they will compete for plant, skills and resources. Challenges in accessing or coordinating these necessary inputs could increase both the costs and time required to complete projects.

Perhaps the greatest challenge in progressing these projects has been building and maintaining social licence. Hosting major transmission assets has social and environmental impacts on landholders and communities. It is vital that those key stakeholders can trust development processes and be involved in decisions affecting them. Failure to do so will impede the timeliness and cost-effectiveness of investments.

A wide-reaching work program is underway to encourage better engagement of communities and better implementation of those views in the transmission planning process:

- › In April 2023, the Minister of Industry and Science submitted a rule change proposal to the AEMC to support focus on social costs and benefits within the transmission planning process.⁴¹
- › In response, the AEMC published its draft determination in August 2023 designed to improve clarity and consistency of how local communities are included in the development and consideration of transmission planning.
- › The Australian Energy Infrastructure Commissioner is engaging with state governments to produce a best practice framework for community engagement and is due to produce a report by December 2023.
- › AEMO has established a Community Advisory Council with 11 members appointed to represent a diverse range of perspectives, including those of landholders, agriculture, rural and regional communities. This group has and will support development of inputs, scenarios and assumptions underlying the 2024 Integrated System Plan.⁴²

State governments in Queensland, NSW and Victoria also operate payment schemes to compensate landholders for hosting transmission infrastructure. This is in addition to the compensation provided through conventional land acquisition frameworks.

Key policy and reform work has been initiated

Ministers recognise the national significance of these projects and have engaged with the risks. The National Energy Transformation Partnership commits to:

- › identify and declare transmission of national significance (including the actionable projects in the Integrated System Plan – Marinus, VNI West (via Kerang) and Humelink) to accelerate the timely delivery of these critical projects and ensure better community consultation
- › start work on a co-designed First Nations Clean Energy Strategy with First Nations people to help drive the energy transformation
- › develop detailed integrated energy infrastructure and regional planning scenarios
- › assess the workforce, supply chain and community needs associated with the pipeline of transmission, renewable energy, storage and industry development opportunities, which will inform work on risks and opportunities and identify community engagement needs to support a national action plan on these issues
- › recognise the role electricity networks and demand-side participation will play in delivering the energy transformation.

To support this work, the AEMC completed stages 2 and 3 of its Transmission Planning and Investment Review in October 2022 and May 2023. Through this process, it has identified recommendations to assist the timely and efficient delivery of transmission investments. Regulatory changes are in the process of design and development to ensure the framework is fit for purpose to support the efficient and timely delivery of major projects.

A separate work program is underway to consider whether current mechanisms to build and support social licence remain fit for purpose.

⁴¹ The Hon. Chris Bowen MP, Minister for Climate Change and Energy, [Rule change request: Ensuring consistent stakeholder engagement for ISP projects](#), March 2023.

⁴² AEMO, [Community voice speaks volumes at inaugural advisory council meeting](#), Australian Energy Market Operator, accessed 29 August 2023.

The materiality of the anticipated transmission work presents challenges for the existing incentive framework due to the greater challenges in forecasting capital costs for specific, large and complex projects. The AER has recently commenced a review on expenditure incentive schemes to ensure they are fit for purpose in this context.

Access reform can support efficient transmission investment

Efficient transmission investment relies on efficient decisions for the location of generation, storage and demand-side resources connecting to the networks. Some congestion is a normal feature of an efficient network. The ISP is not designed to remove all congestion where the benefits exceed the costs. Nonetheless, excessive congestion creates needless costs and risks, specifically:

- › generation investment is riskier than is necessary
- › storage and demand-side resources are not paid to alleviate congestion
- › consumers face high costs for inefficient or avoidable investment in transmission infrastructure.

It is important that generators, storage and demand-side resources face appropriate signals regarding the costs and impacts of congestion.

Energy Ministers tasked the Energy Security Board, now the Energy Advisory Committee, to investigate potential access reform models. This complements the work underway by jurisdictions to establish Renewable Energy Zones (REZs) and coordinate transmission and generation investments. A hybrid model, comprising a congestion relief market alongside priority access, is being designed and tested with stakeholders including through public consultation and technical working groups. The Energy Advisory Committee's recommendations on this model are expected to be presented to Energy Ministers in November 2023. Access reform for the NEM has been under consideration for many years but proven complex to implement.

Smart meters are important to support efficient investment in and use of networks

Traditionally, most households and small businesses have been charged the same network tariff component for using the distribution network regardless of how and when they use energy (that is, flat/single rate or non-cost-reflective network tariffs). Because flat tariffs are independent of when and how electricity is used, they don't reflect the relatively higher costs of a network built to supply electricity during peak periods.

Tariff reform can encourage more efficient use of networks, delay the need for network augmentation and investment, and spread network costs more equitably. Initially, reform focused on signalling costs during peak demand periods (which historically drove network investment). Recent reform has involved sending price signals to efficiently integrate consumer energy resources – such as rooftop solar, batteries and electric vehicles – into distribution networks. This includes sending price signals to encourage the use of solar energy in the middle of the day to avoid excess solar (minimum demand) on the network.

The availability of smart meters fundamentally shapes networks' ability to increase the cost-reflectiveness of network cost structures, which are passed to retailers and in turn retailers can reflect in their offers to consumers. They can also support faster identification of network outages, both improving the consumer experience and improving the efficiency of networks' operational expenditure. For this tariff reform to reach a critical mass, when it shapes the options retailers offer to consumers, legacy meters will need to be replaced with smart meters at scale.

In August 2023, the AEMC published its final report setting out several recommendations and options to accelerate the deployment of smart meters in the National Electricity Market (NEM).⁴³

The AEMC's proposed reforms target all consumers having access to smart meters by 2030.

As one of a broader suite of innovations in network and communication technology – including interactive household devices and energy management and trading platforms – smart meters support change in energy markets. These innovations allow consumers to access real-time information about, and make informed decisions in managing, their energy use. If consumers choose to voluntarily reduce their energy use from the grid in peak periods (by shifting energy use or relying on battery storage), it can delay the need for costly network investment. Moreover, since demand for energy imports is increasingly at its minimum when solar generation is high, shifting consumption from peak periods can help reduce the costs of supply, manage minimum demand constraints (such as voltage issues) and draw more energy from a low-emissions fuel source.

⁴³ AEMC, [Final report – Review of the regulatory framework for metering services](#), Australian Energy Market Commission, 30 August 2023.

Work is underway to clarify the long-term use of gas pipelines

Decarbonisation and electrification will impact gas distribution and transmission pipelines in different ways. In many cases, those same pipelines are undergoing material programs of replacing aging assets. There is a potential risk of incurring significant investment costs with a falling customer and demand base.

In 2021, the AER released a paper on ‘Regulating gas pipelines under uncertainty’ to canvas some of these issues as it relates to the fully regulated pipelines, which are predominantly distribution pipelines serving significantly residential and small business customer bases. Many of the same uncertainties are relevant to the use of gas as an input for industrial users, though the scope for industrial users to substitute other fuels varies from user to user. The implications for network investment also depend on whether industrial substitution takes place through electrification, which would reduce pipeline requirements, or by replacement of natural gas with hydrogen, hydrogen blends or biomethane which might make use of existing pipelines.

As well as impacting investment decisions, uncertainty about the future use of gas pipelines has implications for how costs of the transition are shared. For example, in its recent review of Victorian gas access arrangements, the AER’s final decisions included changes to the pricing structures of permanent disconnections from gas pipelines.⁴⁴ Some consumers choosing to move away from gas have been opting for temporary disconnection to avoid higher direct costs associated with permanent disconnection from the pipeline, but this has safety implications. The model adopted in the decisions retains for permanent disconnections some direct costs to the disconnecting customer, but shares some of the costs amongst the customer base at large. This is a short-term measure to address current incentives. Energy Safe Victoria has committed to working with pipelines to understand whether other methods may be more appropriate than permanent abolishment in the context of the large number of disconnections that have been forecast as a result of the Victorian Government’s policy to support electrification, or whether there are any new technologies that may reduce the safety risk.

The Australian Government has recently commenced developing a future gas strategy.⁴⁵ When complete, this should help to guide decision-making on investment in long-lived gas assets. In parallel, states and territories such as the ACT and Victoria have set out pathways towards electrification, which will shape the long-term role of gas in those jurisdictions.

Many of the same complex investment and pricing questions also apply to other vital pipelines not currently covered within the full regulatory framework and where pipeline owners have relatively more scope to exercise market power.

In March 2023, a package of changes to the National Gas Law and Rules commenced that, when fully implemented, are likely to simplify the framework of pipeline regulation, improve transparency for users of those pipelines and provide a more effective constraint to the exercise of market power. In combination, these changes should contribute to more efficient regulation of the pipelines and ultimately more efficient investment outcomes.

As part of this initiative, the AEMC recommended changes to rules that will support the development of a decarbonised gas sector by allowing hydrogen blends and renewable gases to be safely supplied through the existing distribution systems.⁴⁶ Energy Ministers agreed to these amendments in October 2022 and they are expected to become law by the end of 2023.⁴⁷ AEMO is leading work to amend the instruments required for settlement and metering in the facilitated and regulated retail gas markets.⁴⁸

The reforms aim to provide regulatory certainty to support investment in innovative projects that will reduce emissions in gas networks. The reforms will also ensure existing regulatory provisions and consumer protections will work as intended when hydrogen and renewable gases are incorporated into the gas network.

44 See for example: AER, [Final decision overview: Multinet gas networks gas distribution access arrangements 1 July 2023 to 30 June 2028](#), June 2023, p. 7.

45 Department of Industry, Science and Resources, [Planning for gas to 2050](#), accessed 15 August 2023.

46 AEMC, [Final rules report: Review into extending the regulatory framework into hydrogen and renewable gases](#), Australian Energy Market Commission, November 2022.

47 DCCEEW, [Extending the national gas regulatory framework to hydrogen and renewable gases](#), Department of Climate Change, the Environment, Energy and Water, 14 July 2023.

48 AEMO, [Final report: Hydrogen blends and renewable gases procedures review](#), Australian Energy Market Operator, September 2022.