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NSW Electricity Supply and Reliability Check Up

Prepared for NSW Treasury – Office of Energy & Climate Change (OECC)

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A Marsden Jacob Report

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Acronyms and abbreviations

ACCC	Australian Competition and Consumer Commission
ACT	Australian Competition Tribunal
AEIC	Australian Energy Infrastructure Commissioner
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AMPR	Annual Market Performance Review
APC	Administered Price Cap
ARENA	Australian Renewable Energy Agency
ASX	Australian Stock Exchange
CEC	Clean Energy Council
CEFC	Clean Energy Finance Corporation
CEIG	Clean Energy Investor Group
CER	Consumer Energy Resource
CfD	contract for difference
CIS	Capacity Investment Scheme
COAG	Council of Australian Governments
CPT	Cumulative Price Threshold
CSSI	Critical State Significance Infrastructure
CT	Consumer Trustee
CWO	Central-West Orana
CWO REZ	Central-West Orana Renewable Energy Zone
DGSM	Domestic Gas Security Mechanism
DPE	Department of Planning & Environment (NSW)
DMO	Default Market Offer
EAAP	Energy Adequacy Assessment Projection
EAC	Energy Co Advisory Committee
EEC	Energy Efficiency Council
EII Act	Electricity Infrastructure Investment Act 2020 (NSW)
ESA	Energy Supply Agreements
ESB	Energy Security Board
ESC	Energy Security Corporation
ESOO	Electricity Statement of Opportunities
ESS	Energy Savings Scheme
EST	Energy Security Target
ESTC	Energy Security Target Commissioner
ESTM	Energy Security Target Monitor
EV	electric vehicle
FNCEN	First Nations Clean Energy Network
FT	Financial Trustee
GPG	gas-powered generation
GW	gigawatt
GWh	gigawatt hour
HTP	Hunter Transmission Project

IEA	International Energy Agency
IIO	Infrastructure Investment Objectives
INSW	Infrastructure New South Wales
IPART	Independent Pricing & Regulatory Tribunal (NSW)
IRM	Interim Reliability Measure
ISP	Integrated System Plan
LDS	long-duration storage
LNG	liquefied natural gas
LOR	Lack of Reserve
LRC	low reserve condition
LRET	Large-scale Renewable Energy Target
LTESA	Long-term Energy Service Agreement
MFP	Market Floor Price
MPC	Market Price Cap
MW	megawatt
MWh	megawatt hour
NE	New England
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
NE REZ	New England Renewable Energy Zone
NIS	Network Infrastructure Strategy
NRF	National Reconstruction Fund
NSW	New South Wales
NZC	Net Zero Commission
NZECEB	Net Zero Emissions & Clean Economy Board
OECC	Office of Energy and Climate Change
OEM	Orderly Exit Mechanism
PASA	Projected Assessments of System Adequacy
PDRS	Peak Demand Reduction Scheme
PHRG	Pumped Hydro Refundable Grants
PIAC	Public Interest Advocacy Centre
PTIP	Priority Transmission Infrastructure Project
PV	photovoltaic
RAB	regulated asset base
RERT	Reliability and Emergency Reserve Trader
RESB	Renewable Energy Sector Board
REZ	Renewable Energy Zone
RISC	Roadmap Intergovernmental Steering Committee
RMF	Renewable Manufacturing Fund
RRO	Retailer Reliability Obligations
RSSR	Reliability Standard and Settings Review

SECV	State Electricity Commission of Victoria
SFV	Scheme Financial Vehicle
SLIH	Solar for Low Income Households
SBPS	Strategic Benefit Payments Scheme
STTM	Short Term Trading Markets
SRA	Smelter Reduction Amount
SRES	Small Scale Renewable Scheme
SW REZ	South-West Renewable Energy Zone
TAF	Transmission Acceleration Facility
TAPR	Transmission Annual Planning Report
TASCO	The Australian Steel Company
TET	transmission efficiency test
TFNSW	Transport for New South Wales
TIS	Transmission Infrastructure Strategy
TNSP	Transmission Network Service Provider
TOR	Terms of Reference
USE	unserved energy
Vic DWGM	Victorian Declared Wholesale Gas Market
VPP	virtual power plants
VRET	Victorian Renewable Energy Target
WDRM	Wholesale Demand Response Mechanism
WEM	Western Electricity Market
WSB	Waratah Super Battery

Terms of Reference (TOR) Summary

The NSW Government will continue to implement the Roadmap and facilitate the transition and decarbonisation of the electricity sector as part of our commitment to achieve Net Zero by 2050. In this context, the Electricity Supply and Reliability Check Up (the Check Up) will:

- review the existing information, resources, known developments and structures rather than commission any new work or analysis
- consider the current overall policy and program approach to delivering a timely and cost-effective electricity sector transition, given the main developments that have occurred since the *Electricity Infrastructure Investment Act 2020* was passed
- comment on any residual risks for NSW (for reliability and price) should the Eraring Power Station close in 2025 and the potential additional controls available to mitigate them

  in undertaking the above, have regard to opportunities for the NSW Government to enhance local community support, workforce readiness and supply chain improvements.

SENSITIVE – NSW CABINET

Executive Summary

Net Zero objectives driving energy transition

This report covers a very broad range of topics related to the supply and reliability of electricity supply in New South Wales (NSW) at a time of energy transition. The transition is driven by the need to decarbonise the state's electricity supply in line with the commitment to Net Zero emissions by 2050.

The federal and state governments are united in pursuit of Net Zero objectives. However, each state government faces different implementation challenges. The speed of transition in NSW electricity supply is greater than any other jurisdiction. Our challenges are immediate and daunting.

Today, around 70% of NSW's delivered electricity comes from four coal generation plants scheduled to retire in the next 10 to 15 years. The largest of those plants, Eraring, has announced an intention to retire in 2025. Under any circumstances, replacing a plant like Eraring that provides around 20% of NSW's delivered electricity would have been extremely challenging. With just three-and-a-half years' notice, it is almost impossible without reliability and affordability impacts.

The Roadmap is in place and achieving outcomes

A state transition plan, known as the Electricity Infrastructure Roadmap (Roadmap), is in place.

In 2020, the NSW parliament provided bipartisan legislative backing to the Roadmap through the Electricity Infrastructure Investment Act 2020 (EII Act). That legislation put in place a comprehensive state-based framework to support the development of new transmission, low emissions generation and energy storage.

The bipartisan support for the Roadmap is not in question. It provides confidence and certainty to the private investors who are critical to the transition.

Most NSW electricity assets are privately owned. The Roadmap's success depends on new private investment. That makes the transition qualitatively different to those states where public ownership predominates.

The Roadmap also operates alongside the reforms and legislative framework of the National Electricity Market (NEM), of which NSW is the largest region. As the NEM is also decarbonising, the state and national frameworks are broadly aligned.

When the Roadmap was legislated nearly three years ago, the state did not have an implementation capability. A range of new and existing bodies and skilled personnel have since been appointed to achieve the Roadmap targets of 12 gigawatts (GW) of new renewable generation, and 2 GW of long-duration storage (LDS) by 2030. The Roadmap also contains provisions for the construction of firming infrastructure that is necessary to meet the Energy Security Target (EST) and the reliability standard. That new generation, storage and firming infrastructure is expected to largely be in five declared Renewable Energy Zones (REZs) identified in the EII Act.

The implementation framework of the Roadmap took time to establish. During the period in which it was set up, market developments such as the earlier closure of Eraring and the delays to the Snowy 2.0 pumped hydro project have made its task more challenging. Workforce, supply chain and community acceptance problems have arisen in the regions where new infrastructure is planned.

Scope of the Check Up

The issues detailed above have been the focus of this 8-week Check Up. Multiple stakeholders including the Roadmap bodies, national regulators, NSW government agencies, industry peak bodies and private companies directly relevant to the TOR have been spoken to.

Several stakeholders made short written submissions. An Expert Panel supported the Check Up, as did an internal government Secretariat. The Check Up would like to thank the Secretariat, the Expert Panel and all stakeholders who participated.

The report seeks to provide background, identify the issues, summarise stakeholder views, make findings and recommend actions. In summarising stakeholder views, it may be guilty of generalisations.

Recommendations cover energy markets, governance and wider whole-of-government policies needed to support the Roadmap.

With the short timeframe, broad TOR and reliance on existing material, the Check Up has been cautious about making definitive findings and recommendations. In many cases it has made recommendations on further work related to complex problems identified in the Check Up. All recommendations are aimed at keeping up the momentum of energy transition to meet Net Zero.

Key findings of the Check Up

In energy market terms, 2030 is not far away. The Roadmap's approach of supporting large generation projects, long-duration storage projects such as pumped hydro, and major new transmission projects is subject to significant engineering and cost risks.

The risk of later delivery is real. Alone, it may not be able to deliver in a timeframe aligned to the exit of existing generation.

New generation target – 12 GW

The pipeline of new generation proposals gives confidence that the Roadmap's 12 GW renewable generation target can be met, but the timeframe is less certain.

Long-duration storage target – 2 GW

In the case of long-duration storage (LDS), the 2 GW target by 2030 is very unlikely to be met if it is based on pumped hydro. Without a change of approach, it is questionable whether the target will ever be met due to the costs of pumped hydro projects and the risk appetite of private investors. No new pumped hydro project aside from Snowy 2.0 is committed in NSW. The 2 GW LDS target was

additional to Snowy 2.0. Additional long-duration storage is still needed and thus it may need to be supplied by projects with a range of technology types and sources.

Firming infrastructure

A tender for firming LTESAs is currently underway. Project proponents representing more than 3.3 GW total capacity submitted a tender response, with the tender outcome to be announced in September. In July, AEMO Services increased the target to 930 MW from the initially announced minimum tender size of 380 MW. This increase has incorporated the support for 550 MW firming infrastructure from the Federal Government's new Capacity Investment Scheme (CIS).

Renewable Energy Zones (REZs)

The Network Infrastructure Strategy (NIS) released by NSW REZ planning body Energy Co forecasts that initial energisation of the first REZ in the Central-West Orana region (CWO REZ) will occur in 2027/8. The first stage of the largest proposed REZ in New England (NE REZ), is expected to be completed by the end of the decade.

A credible consortium has been chosen to build the CWO REZ and contestability in transmission achieved. It will still be 12 months before construction is likely to start.

Closure of Eraring Power Station

Some have argued that the potential 2025 closure of Eraring requires the state to speed up the infrastructure build. Given the multiple headwinds, the likelihood of success is low. The cost to consumers could be high. Long-term social license in the REZs could be jeopardised.

In other sectors, building infrastructure in 3.5 years to replace a critical asset would not be possible. If there was a projected water shortage, a new desalination plant could not be commissioned in such a timeframe. With the amount of notice given on Eraring's closure, it is reasonable to seek more time.

Even with an extension to Eraring, a more multi-faceted approach to managing NSW's electricity supply and reliability in the current decade is required. It will involve a minor pivot, while remaining committed to the Roadmap ambition and targets.

The key to the successful management of electricity supply and reliability is a better alignment of capacity exit and entry. This is also critical to achieving affordability and reliability objectives. Electricity policy is a balance between emissions reduction, affordability and reliability. A trilemma.

Summary of recommendations

A summary of the key steps recommended by the Check Up are as follows:

- The government engage with Origin Energy on a temporary extension of the Eraring coal plant, while developing a managed exit policy for future coal closures.
- A NSW-based Energy Security Target Monitor (ESTM) to oversee ongoing management of supply reliability and the exit and entry of new capacity.

- A concerted attempt to look for low-cost enhancements to the existing transmission and distribution grid to enable the entry of more low emissions generation.
- A more flexible approach to achieving the state's storage needs, coupled with a recognition of the firming role played by gas generation.
- A prioritised Consumer Energy Resource (CER) strategy that recognises the importance of harnessing continued growth in rooftop solar, batteries and electric vehicles (EVs).
- An Infrastructure NSW review of the REZ planner, Energy Co, to ensure it is set up for the delivery phase of the REZ program.
- A whole-of-government approach to supporting the Roadmap, led by the Roadmap Intergovernmental Steering Committee (RISC).
- A better resourced, consistent, community-focused approach to planning that is aligned to Roadmap objectives.
- A comprehensive community-benefits approach to the REZ construction and operational phases that draws in all relevant state government agencies.
- A coordinated approach to social license in REZs led by Energy Co.
- An efficient pathway to establishing the Energy Security Corporation (ESC) and allocating its funds to meeting Roadmap objectives.

Other areas critical to the Roadmap success such as transmission planning, Roadmap cost recovery processes, gas infrastructure requirements and landholder approaches are recommended for further review.

The full list of recommendations arising from the three key Terms of Reference follow.

One overarching recommendation is for the Roadmap to be better understood by the people it was designed to benefit – NSW consumers. Much more than this short Check Up will be required to achieve that objective.

Full list of recommendations

Timely and cost- effective electricity sector transition (Section 7)

Recommendations

1. That successful implementation of the Roadmap be added to the list of Premier's priorities for the state of NSW.
2. The current Roadmap Intergovernmental Steering Committee (RISC) be confirmed as having responsibility for coordinating whole-of-government implementation responsibility for the Roadmap. The RISC should include representatives of critical agencies such as Planning, Education, Transport, Treasury, Housing and Regional Development, as well as the Roadmap entities. The RISC should provide

quarterly status reports to the NSW Secretaries Board to further support whole-of-government focus on the Roadmap.

3. The Energy Security Target Monitor (ESTM) should be transferred to a NSW agency with a target date of 1 July 2024.
4. The new ESTM should be led by an independent Energy Security Target Commissioner (ESTC) who oversees the Energy Security Target (EST) and reports to the Minister.
5. The ESTM should continue to engage the current monitor, AEMO, for modelling of the Energy Security Target (EST).
6. Consideration should be given to amending the EST methodology to align with the National Electricity Market (NEM) once the current review of the NEM reliability standard by the Australian Energy Markets Commission (AEMC) is complete.
7. The Minister should direct Energy Co under section 8(5) of the Energy and Utilities Administration Act 1987 to focus on financial closing of the Central-West Orana REZ, and, if deemed time critical, Priority Transmission Infrastructure Projects like the Waratah Super Battery (WSB) and Hunter Transmission Project (HTP).
8. Representatives of the Office of Energy and Climate Change (OECC), Treasury and Infrastructure NSW (INSW) should immediately be appointed as full members of the Energy Co Advisory Committee (EAC).
9. Before any procurement processes occur for future REZs, INSW should conduct an Assurance Review of the REZ program and assess procurement approaches and delivery focused structures for Energy Co.
10. Consideration should be given to engaging INSW's Projects NSW division to oversee the construction of the Central-West Orana (CWO) REZ by the first ranked ACE Consortium.
11. Once the Upper House inquiry into underground transmission is complete, should Transgrid not proceed with a final decision on the HumeLink project then consideration should be given to directing Transgrid to carry out the project as a Priority Transmission Infrastructure Project under s.34 of the Electricity Infrastructure Investment Act 2020.
12. To ensure an alignment of generation and network objectives in the Roadmap, information sharing arrangements between Energy Co and AEMO Services Ltd (Consumer Trustee) should be enhanced with a Joint Coordination Committee (JCC) of both organisations put in place.
13. Once the Central-West Orana REZ (CWO REZ) reaches financial close, a review of the approval process should be conducted to see if there are opportunities to make decisions faster.
14. The NSW Government together with NSW distribution networks should work with the Australian Energy Regulator (AER) on a common methodology to recover Roadmap costs. The government should closely monitor forward projections on estimated Roadmap recovery costs to ensure that affordability objectives are maintained.
15. The exemptions framework for Roadmap costs should be reviewed and also consideration given to including transmission-connected businesses to reduce the burden on small customers.

16. The Electricity Infrastructure Jobs Advocate should immediately brief the energy minister on skills and training requirements and construction and logistic challenges in the Central-West Orana REZ (CWO REZ).

17. Consideration should be given to establishing the proposed Energy Security Corporation (ESC) as a subsidiary of the Clean Energy Finance Corporation (CEFC) with a NSW-appointed board and mandate focused on market needs rather than specific technologies.

18. Under s.21(2)(b) of the Energy and Utilities Administration Act 1987, the Minister should commission an expert review of current Transmission Planning arrangements in NSW to reduce duplication and advise on the best approach to ensuring coordination between the Roadmap bodies (Energy Co, Transgrid, AEMO, AEMO Services).

19. Consideration should be given to ensuring a new REZ requirement for final design and interface with the shared network to be reviewed by Transgrid.

Residual Risks of Eraring Closure (Section 8)

Recommendations

20. That given the proposed closure of the Eraring generator is now less than two years away, the NSW Government should consider new modelling on the affordability impacts of the proposed closure of Eraring in August 2025 on NSW and NEM customers.

21. That engagement begin with Origin Energy on an extension of the Eraring coal plant beyond 2025.

22. That the government seek clarity from Origin Energy on Eraring to provide certainty for workers and suppliers.

23. That Origin Energy be required to demonstrate any claims about the extension of Eraring to the Energy Security Target Monitor (ESTM) and provide all information required to verify those claims to the ESTM.

24. That an Orderly Exit Mechanism (OEM) for future generation exits continue to be progressed through National Electricity Market (NEM) forums by NSW.

25. That NSW simultaneously progress a 'NSW Responsible Exit Policy' under which any market participant in NSW proposing to retire existing generation capacity, or part thereof, above a firm generation capacity of 600 MW be required to submit their plans to the ESTM at least three years prior to the proposed retirement.

26. That compliance with the Responsible Exit Policy be a requirement for participation in Consumer Trustee LTESA auctions.

27. That the NSW Government immediately review the regulations supporting the Energy Security Target Monitor (ESTM) to address recommendations in the Energy Security Target Monitor (ESTM) 2022 report to consider risks associated with interconnectors and short-duration storage.

28. That considering the slow development of long-duration storage (LDS), the Government commission a review by the Consumer Trustee (CT) into the storage requirements of the NSW market and consider amendments to the definition of LDS in the Roadmap legislation.

29. That the Government engage a technical expert to advise on whether additional renewable generation projects can be developed on the existing transmission and distribution grid through small network enhancements.

30. If the technical expert confirms hosting capacity on the transmission and distribution grid is available, some funding from the Transmission Acceleration Facility (TAF) be repurposed to allow for a contestable bid for enhancements run by the Consumer Trustee (CT) in consultation with Energy Co. NSW transmission and distribution companies should also be required to publish generation hosting capacity.

31. That a NSW Consumer Energy Resources (CER) strategy be prioritised by the Department to better integrate CER into the supply mix by 2030. The strategy should ensure common technical standards for CER and set targets for uptake of technologies such as smart meters and distributed batteries.

32. That eligibility for the Peak Demand Reduction Scheme (PDRS) be expanded to include use of batteries, virtual power plants (VPPs) and other measures that help reduce peak demand.

33. That the investment mandate of the proposed Energy Security Corporation (ESC) include CER optimisation projects on the distribution grid.

34. That given NSW will have seven gas plants by the end of 2024, AEMO be commissioned to undertake a NSW gas infrastructure review to advise whether additional storage will be required for those generators given an impending supply gap in east coast gas markets.

35. That consideration be given to NSW Government participation in the Wholesale Demand Response Mechanism (WDRM) as a leadership example to other large users.

Enhancing local community support, workforce readiness and supply chains (Section 9)

Recommendations

36. That Energy Co establish a REZ network infrastructure Consumer Consultation Council (RCCC) that includes the Australian Energy Regulator (AER), the Office of Energy and Climate Change (OECC) and small and large consumer groups to discuss Roadmap cost pass-through forecasts arising from Roadmap projects. This would be modelled on network company consumer consultative councils.

37. To complement the on the ground presence of Energy Co in the REZs, consideration be given to a broader public information campaign to explain the Roadmap and promote its benefits and opportunities.

38. That an expansion of Essential Energy's apprenticeship program in regional NSW be supported to help build the skills required for the energy transition.

39. That more consistency in the development assessment process for renewable energy in NSW be established through clear guidelines for wind, utility solar, transmission and storage projects. That standard guidelines also be issued for community benefit sharing.

40. That a regular forum for engagement on those guidelines be established by Department of Planning and Environment (DPE) involving Office of Energy and Climate Change (OECC), Energy Co and the clean energy industry.
41. That decommissioning plans be a part of all future renewable project approvals and that these be supported by remediation bonds at an agreed point in the project life.
42. That standard landholder agreement templates be available from the Department of Planning and Environment's (DPE) website.
43. That the Roadmap Intergovernmental Steering Committee (RISC) develop a whole-of-government plan for addressing community and workforce infrastructure needs and investments in the construction phase of the Central-West Orana (CWO) Zone. That a transport and logistics plan also be developed by RISC for CWO.
44. That selected REZ generation projects be considered for Critical State Significance Infrastructure (CSSI) where they provide system security services and enjoy community support.
45. That Energy Co establish high-profile offices in the REZs and look to increase local recruitment.
46. That the funding agreement between DPE and Energy Co for faster planning approvals in REZs be expanded, and a coordinated approach taken to cumulative impacts and biodiversity assessments.
47. That funding and resourcing of the Energy and Resources team in the Department of Planning and Environment (DPE) be increased.
48. That Energy Co, DPE and REZ generators establish coordinated approaches to benefit sharing funds, complaints and community engagement in the REZs.
49. That an updated local content policy for REZ infrastructure be developed by the RESB together with the Roadmap Steering Committee and be subject to a cost-benefit assessment.
50. That the Renewable Energy Sector Board (RESB) be supplemented by a sub-committee of the Roadmap Steering Committee (RISC) focused on local content opportunities identified by the RESB
51. That a future-looking study on the electricity infrastructure required to support a hydrogen industry in NSW be undertaken, which addresses options for funding the infrastructure outside the Roadmap.
52. That consideration be given to complementing the Strategic Benefit Payments Scheme (SBPS) with a NSW framework for neighbours and visual impacts.
53. That NSW consider the recommendations of the Australian Energy Infrastructure Commissioner's (AEIF) Community Engagement Review to be released later this year.
54. That the First Nations Clean Energy Network (FNCEN) or other appropriate representative bodies, be included in the Roadmap Steering Committee and Local Content Sub-committee.

1. Purpose

1.1 Background

In November 2020, the NSW Government released the NSW Electricity Infrastructure Roadmap (the Roadmap) that is legislated under the *Electricity Infrastructure Investment Act 2020 (EII Act)*. The Roadmap sets out an investment framework to coordinate the replacement of coal-fired power stations and transition the electricity sector to a clean, affordable, and reliable system. The Roadmap and EII Act include mechanisms to deliver:

- 12GW of new renewable generation and 2GW of long-duration storage by 2030,
- Long-term Energy Service Agreements (LTESAs) for generation, storage, and firming,
- Five REZs coordinating generation, storage and network infrastructure,
- Priority Transmission Infrastructure Projects (PTIP) in response to forecast breaches of the Energy Security Target (EST).

The outlook for NSW's electricity sector has evolved and changed since November 2020. Key developments include:

- announcements of earlier planned coal plant retirements,
- delays to major projects including Snowy Hydro's Kurri Kurri and Snowy 2.0 generators and new transmission projects,
- national and global skills shortages and supply chain issues following the impacts of COVID-19 and international acceleration of decarbonisation ambitions,
- ongoing land use conflict and social licence challenges for infrastructure projects,
- latest projections indicating NSW requires around 2640MW of firmed generation capacity by 2029-30 to continue to meet security and reliability standards.

The Australian Energy Market Operator's (AEMO) ongoing analyses provides clear and regular advice on whether NSW has sufficient projects to ensure electricity reliability and security. Nevertheless, the NSW Government considered there was an opportunity to assess the effects of recent market and policy developments and how capably the NSW Government's policies, programs and initiatives are responding.

1.2 The terms of reference for the NSW Electricity Supply and Reliability Check Up

The NSW Government will continue to implement the Roadmap and facilitate the transition and decarbonisation of the electricity sector as part of its commitment to achieve Net Zero by 2050.

The purpose of the Electricity Supply and Reliability Check Up (the Check Up) is to

- consider the current overall policy and program approach to delivering a timely and cost-effective electricity sector transition, given the main developments that have occurred since the Electricity Infrastructure Investment Act 2020 was passed,
- comment on any residual risks for NSW (for reliability and price) should the Eraring Power Station close in 2025 and the potential additional controls available to mitigate them,
- in undertaking the above, have regard to opportunities for the NSW Government to enhance local community support, workforce readiness, and supply chain improvements.

The detailed TOR is available in the Appendix 4.

1.3 Information and resources

Rather than to conduct new work and analysis, the Check Up was based on existing information, resources, known developments and structures, including:

- targeted interviews with NSW Government agencies, National Electricity Market bodies and industry associations representing electricity generators, networks, and consumers in NSW,
- the latest reports and data available from NSW Government agencies and market bodies, including:
  - the NSW Electricity Infrastructure Roadmap and the Electricity Infrastructure Investment Act 2020 and ancillary instruments
  - AEMO Electricity Statement of Opportunities (ESOO) and the Energy Security Target Monitor Report (ESTM Report)
  - existing market testing reports produced for the Roadmap and the outcome of the recent tender for LTESAs
  - documents relating to current governance frameworks.

All tenders under the Roadmap were out of scope and were not reviewed nor will be affected by the Check Up.

The Check Up was conducted by Marsden Jacob Associates (Marsden Jacob) as an independent consulting service provider.

1.4 Acknowledgements

Several stakeholders made short written submissions. An Expert Panel supported the Check Up as did an internal government Secretariat consisting of members from the Office of Energy and Climate Change (OECC), Energy Co and The Cabinet Office. The Check Up would like to thank all the stakeholders who participated and the Expert Panel. A special thanks to the Secretariat whose support was invaluable.

2. Introduction

The New South Wales and Federal Governments' policy commitments to reach Net Zero by 2050, means the power system must transition. That transition must be managed well; meaning that it must be planned and implemented in a way that does not compromise on energy reliability and affordability.

It may be stating the obvious but is worth restating anyway – electricity is an essential service. For that reason, transitioning an electricity system is a complicated task. You are changing a system that can never cease to operate 24 hours a day, 7 days a week.

To not manage the transition well, is to jeopardise support for the transition itself.
The starting point for the transition differs between individual states and countries. The state of New South Wales begins with a high bar.

In the year to August 2023, around 70% of NSW' delivered electricity came from coal generation.[1] The source of that generation is expected to be fully retired by 2040.

Decisions on when those plants retire are not made by the state government. The current national rules only require 42 months' notice of closure.

As with the Eraring generator, that notice in NSW is issued by a private company to the market operator, AEMO. The state government is notified as a courtesy.

In no other industry would such consequential decisions relating to critical infrastructure be subject to light-handed regulation. This is the situation that applies in electricity today.

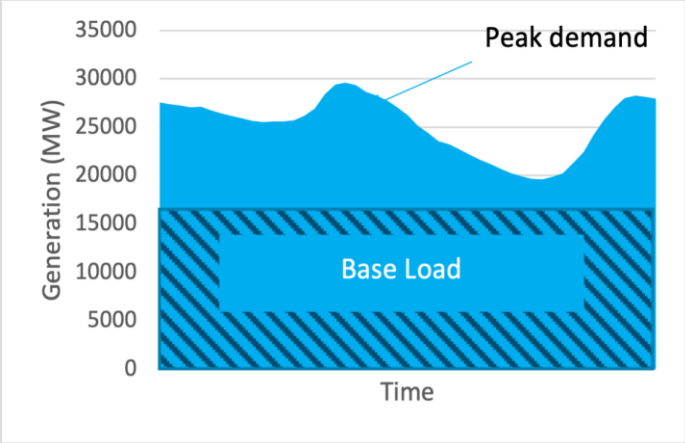
The world is very different to when the existing coal generation plants were commissioned under the government of Neville Wran in the 1980's.

The age of those coal plants and characteristic as baseload generators makes them increasingly unsuited to a market with increasing amounts of variable wind and solar, both utility scale and on rooftops.

[1] https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/data-nem/data-dashboard-nem

What is baseload power?

It is easily explained in terms of electricity demand. Over a period of time, say a day, demand can be characterised by its maximum level, its average level, and level that is there all the time. Over the days in a year the level that is always there, referred to a "base" demand, does not greatly vary. On the other hand, over the days in a year the maximum level, referred to a peak or maximum demand, can vary significantly. This is due to the nature of seasons and the extreme weather events that can occur. Extreme peak demands may not happen every year, and when they do occur may only be for a few hours.



Source:
https://www.csiro.au/en/news/All/Articles/2018/February/baseload-power

When the demand for electricity is high in NSW, particularly on hot summer days and cold winter days, the large generation capacity of the coal plants is still required to ensure reliability. As the plants age, their own reliability is declining. Higher forced outages mean that each time one coal plant exits, there is less redundancy in the electricity system. Exits of generation must therefore be offset by new capacity.

When the NSW parliament legislated the Electricity Infrastructure Investment Act 2020 (EII Act), colloquially known as the "Roadmap", with bipartisan support it put in place a comprehensive state-based framework to support the entry of new transmission, wind and solar generation, storage, and firming.

The bipartisan support for the Roadmap has been welcomed by investors. The Terms of Reference (TOR) for this Check Up make clear bipartisanship is not in question. Investor certainty is assured.

What cannot presently be guaranteed, is an alignment between exiting generation capacity and new generation brought forward by the Roadmap and the individual decisions of private investors. Already it is clear new generation capacity, whether incentivised under the Roadmap or otherwise, is taking longer than anticipated due to a range of factors.

Any potential misalignment of exit and entry time frames presents supply risks to NSW consumers. Current advice from AEMO indicates those risks are at a heightened level. The question is what

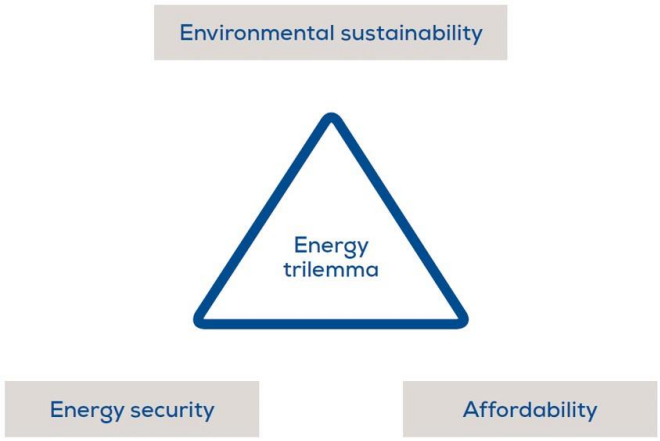
options there are to mitigate those risks. How do we manage the exits and entry of generation, meet our decarbonisation policy commitments, without compromising on electricity system reliability, security, and affordability? This is the focus of much of this report.

2.1 The Energy Trilemma

In considering how NSW manages its approach to electricity transition, applying an assessment and decision-making framework to actions related to the electricity system is a good starting point.

Across the world a generally accepted concept is the Energy Trilemma. The essence of the trilemma is that decisions relating to energy must balance affordability, reliability/security, and sustainability outcomes.[2]

Figure 1: The Energy Trilemma



Object 1 (a) of the Electricity Infrastructure Investment Act (EII Act) is consistent with the concept of the trilemma. It states that the object of the Act is to "improve the affordability, reliability, security and sustainability of electricity supply".

The Roadmap is focused on a utility level (large-scale) transition. A separate transition has and continues to occur at a consumer level with the uptake of rooftop solar, batteries and electric vehicles (EV). NSW and Australia lead the world in rooftop solar penetration. As prices paid for grid electricity increase, the incentive for consumers to install solar grows.

Managing the energy trilemma must consider both the large and small-scale transition occurring. It is not a case of either/or, given the scale of generation retiring. There is a question of relative shares.

If consumers' own investments in generation and storage can be harnessed for the benefit of the electricity system, the requirements for large scale investment may be correspondingly reduced. Even a small reduction in large scale infrastructure amounts to a large dollar saving given the investment required.

[2] For example, the International Energy Agency (IEA), a global organisation of member countries, including Australia, established in 1974 to share energy data and analysis, states that its objective is to recommend policies that enhance the reliability, affordability, and sustainability of energy. https://www.iea.org/about/mission

Net Zero is premised on increased "electrification" of processes such as transport, heating, and cooking. For the first time in decades AEMO is projecting a growth in electricity demand.[3] Were hydrogen production ever to be commercialised in NSW, that growth would be significantly higher.[4]

Electrification will also mean that our lives become more, not less, dependent on electricity. This means the transition of the system must not be allowed to compromise the affordability or reliability of this increasingly critical essential service.

2.2 Context – Electricity prices

At the time of undertaking this Check Up the affordability of electricity is a significant concern to NSW households and businesses. Default Market Offer (DMO) prices for NSW household consumers increased from 1 July by between 14 and 21% depending on network area.[5]

Most consumers are on market offers rather than the DMO. In many cases these market offers have increased by a larger amount than the DMO.

Electricity price rises have occurred at a time of wider cost of living concerns driven by inflation and increasing interest rates.

An electricity retail price is principally influenced by the costs of generation and networks (transmission and distribution). Over time the shares of these two components can vary, but they are the main causes of price variations.

Other price components such as retail costs and margins are relatively stable but vary between consumers, with margins often higher for customers who never switch supplier.

Costs associated with government polices such as the Large-Scale Renewable Energy Target (LRET), Small-Scale Renewable Scheme (SRES) and NSW schemes such as the Energy Savings Scheme (ESS) are minor but also have varied between years.

[3] https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/nem-electricity-demand-forecasts/2017-electricity-forecasting-insights/summary-forecasts/annual-consumption-overview#:~:text=Overall%2C%20consumption%20is%20projected%20to%20grow%20from%2010%2C442,an%20expected%20increase%20of%204.8%25%20over%20the%20period.

[4] https://www.climateworkscentre.org/news/climateworks-and-csiro-multi-sector-energy-modelling-informs-aemos-most-ambitious-release-to-date/

[5] https://www.aer.gov.au/news-release/aer-releases-final-determination-for-2023%E2%80%9324-default-market-offer

Figure 2: Composition of an Electricity Price – AER

Note: Cost components for the average residential customer in 2021–22, excluding GST Calculated using tends in supply chain components for each jurisdiction and national trends.

Source: AEMC, *Residential electricity price trends 2021*, 25 November 2021 (using data from Energy Made Easy and Victorian Energy Compare on 17 September 2021).

For many consumers with their own rooftop solar, the impact of higher bills can be managed to an extent by using lower volumes from the grid and/or receiving feed in tariffs (FIT) paid for exporting electricity to the grid. Higher grid prices increase this incentive. It is not an option open to all consumers, especially those who do not own their own home.

In recent times it has been the generation component that has caused rising retail prices, principally the impact of higher international coal and gas prices caused by the conflict in Ukraine. Measures have been taken to reduce these fuel cost pressures, but these have not prevented significant real electricity price increases.

The Australian Energy Regulator (AER) and major energy retailers are reporting an increase in customers experiencing payment difficulties and accessing hardship schemes.[6]

NSW has also seen an increase in average wholesale prices since April 2023 when the Liddell coal power plant closed.[7] This may be partly attributable to the higher demand arising in winter. Liddell's closure had been widely anticipated by the market and its owner AGL had provided 7 years notice of closure.

The scheduled closure of the larger Eraring generator in 2025, for which the minimum notice of 42 months was provided, presents a potential risk of ongoing affordability pressures in NSW.

Earlier closures of major coal generators such as Hazelwood in Victoria have been associated with significant and sustained generation price increases in the NEM in the past.[8] While it must be noted

[6] https://www.afr.com/companies/energy/households-trapped-with-energy-debt-soar-39pc-20221130-p5c2fs
[7] https://www.abc.net.au/news/2023-07-20/nsw-energy-liddell-closure-report/102624382
[8] https://www.aer.gov.au/news-release/wholesale-electricity-prices-higher-since-hazelwood-exit

that Hazelwood's owner provided only 5 months' notice of closure in 2017, there was more alternative capacity at the time that this occurred.

The most recent advice from the market operator AEMO, indicates that there will be a shortfall in available generation in NSW during peak demand after the closure of Eraring in 2025. Any market where demand is potentially higher than available supply usually results in higher prices.

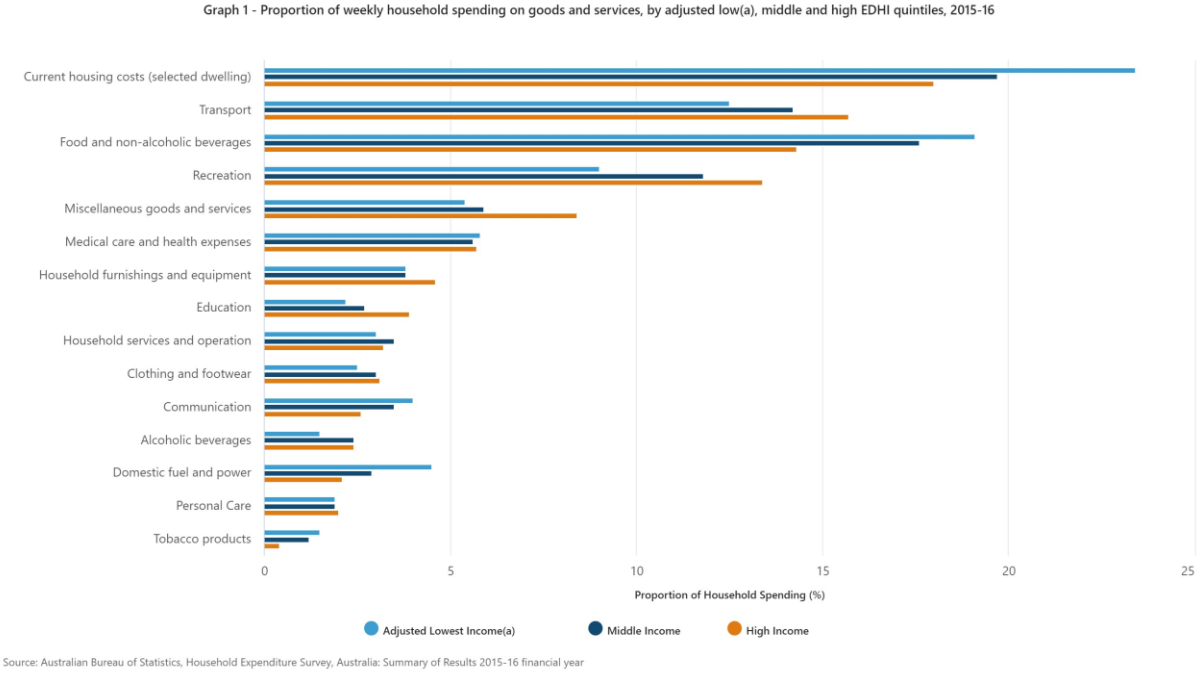
Were affordability issues to arise in NSW at this time, it will have implications for consumer tolerance of the costs of key Roadmap and Integrated System Plan (ISP) investments to enable the transition. While modelling for the NSW Government projected that consumers would be better off from the Roadmap, costs from the Roadmap and all investments to enable the transition precede benefits.

In other words, current affordability challenges can potentially threaten the sustainability objectives in the Roadmap.

2.3 Hardship

Aside from being an essential service, electricity costs are a higher proportion of the expenditure of low-income consumers. Absent government intervention, electricity price rises are therefore regressive.

Figure 3: Household expenditure by income grouping – Source: Australian Bureau of Statistics



Source: Australian Bureau of Statistics, Household Expenditure Survey, Australia: Summary of Results 2015-16 financial year

This reality is recognised by governments and appropriately addressed through targeted rebates and concessions. The NSW rebates are outside the Terms of Reference (TOR) of this Check Up. The extent to which those rebates achieve their objective is influenced by how well we manage the energy transition.

What the electricity transition is also creating is an inequality of access to Consumer Energy Resources (CER) such as rooftop solar that enable greater self-management of electricity costs. A similar problem exists with investments that may be required to enable electrification of heating, cooking and hot water.

Aside from their inability to pay for up-front investments like rooftop solar, the "split incentive"[9] problem denies consumers who rent access to CER. The owner of the property has no incentive to invest in CER when the tenant pays energy bills.

The costs of the transition are recovered through grid electricity costs. If lower income and hardship customers cannot access alternatives to grid-based electricity, they will pay a disproportionate share of those costs.

The transition envisaged by the Roadmap is an investment in the future. Avoiding disruptive events such as premature generation exits that exacerbate affordability problems while ensuring that integration and access to CER is maximised, are important elements in achieving a managed transition that delivers on the energy trilemma.

[9] https://www.energy.gov.au/publications/hvac-factsheet-overcoming-split-incentives

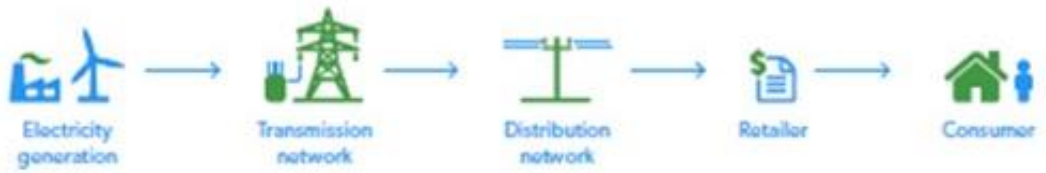
3. Electricity industry in NSW

The NSW electricity industry was mostly privatised over the past 10-15 years. Most generation and network assets are in private ownership. Successfully managing the transition requires a partnership between government and the private sector.

3.1 Electricity industry structure

Historically electricity in NSW, as in other states, was delivered by monopoly state owned utilities. All parts of the electricity value chain from generation to point of consumption were controlled by one organisation. The state electricity grids were largely separated from each other. The individual state electricity grids were controlled by the respective State commissions. Power flows between NSW[10] and Victoria were undertaken on an agreed and more limited basis through the Interconnection Operating Agreement primarily associated with Snowy Hydro generation. This was the case in the 1970's and 80's when much of the generation and transmission base of NSW was commissioned and built by the Electricity Commission of NSW.

Figure 4: Traditional structure of an electricity system



3.2 Generation-Transmission-Distribution-Retailing

As a result of the Competition Policy Agreements of 1995 and the establishment of the National Electricity Market (NEM) in 1998, the industry was structurally separated, and electricity began to be freely traded across state borders. What were seen as natural monopoly functions such as distribution and transmission ("poles and wires"), were separated from contestable functions such as generation and retailing. Cross ownership of the monopoly services and contestable services was prevented by regulation.

The networks were seen as requiring economic (price) regulation while competition and non-economic regulation were considered a more effective way to discipline generation and retail markets.

[10] Queensland was connected with NSW in 2001.

The establishment of the NEM meant that events in one state could impact another. Furthermore, because of privatisation, companies could operate in more than one state. This has been most apparent in generation and retailing.

3.3 Privatisation in NSW

In 2010 the NSW industry began to be privatised, starting with the retailing arms of state-owned companies in 2010.[11] A partial sale of the trading rights of major coal generators followed under the then Kenneally government. This was known as the "Gentrader"[12] model. The trading rights were largely acquired by the same companies that had bought the retailers.[13]

After the election of the O'Farrell Government in 2011 a full sale of the major coal generators such as Bayswater, Eraring, Mt Piper, and Vales Point occurred between 2013-2015. This mostly involved a sale to the party that already had the trading rights, except for Vales Point which was sold in 2015.[14]

After the 2015 election the Baird Government proceeded with a plan to sell a 99-year lease of a 49% share of the state's network assets.[15] The 49% share applied to total network assets, and in practice involved selling 100% of the state's transmission company Transgrid in 2015 and a 50.4% share of the Ausgrid distribution network in 2016 and the Endeavour distribution network in 2017. The vast Essential distribution network remained 100% government owned. This remains the case today.

NSW therefore has an electricity sector that is almost totally controlled by the private sector, aside from the distribution network in regional areas.

This history is not meant as a commentary or judgement about privatisation. It is the reality within which the electricity transition in NSW must be managed.

The Roadmap itself is predicated on private investment in new generation and network assets. Any potential return of government ownership or direct intervention could have implications for private sector confidence, and therefore Roadmap outcomes. It would be desirable if it could be avoided.

3.4 Implications of privatisation

Privatisation of generation and transmission means a managed transition in NSW is more complex to achieve than, for example, in Queensland, where the state government owns most of the generation, and all network assets.

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[11] https://www.smh.com.au/national/nsw-energy-privatisation-deal-finalised-20101214-18vr7.html

[12] Gentrader referred to an arrangement where the physical generation assets and staff remained in government ownership but control of the operational decisions of the generation plant, especially bidding in the market, was controlled by the private sector.

[13] https://www.smh.com.au/business/nsw-to-start-talks-on-gentrader-asset-sales-20121114-29cfd.html

[14] https://www.theguardian.com/australia-news/2022/sep/19/private-owners-net-millions-in-sale-of-ageing-coal-fired-power-station-in-nsw#:~:text=Delta%20Electricity%20said%20it%20sold,the%20state%20government%20in%202015.

[15] https://www.dailytelegraph.com.au/news/nsw/coalition-backs-premier-mike-baird-on-the-20-billion-sale-of-nsws-poles-and-wires/news-story/28aa9375ddb746edeb5813da07ffa7c0

The Queensland Energy and Jobs Plan[16] commits the government to closing all their state-owned coal plants by 2035, to creating an extended SuperGrid, and to building two mega pumped hydro projects for the transition to renewables.

A state government of NSW has less control over events. It is not the decision maker on generation exits, and while it has established mechanisms in the Roadmap to support and coordinate new generation, storage and transmission, it relies on the private sector to invest in, and build the new assets.

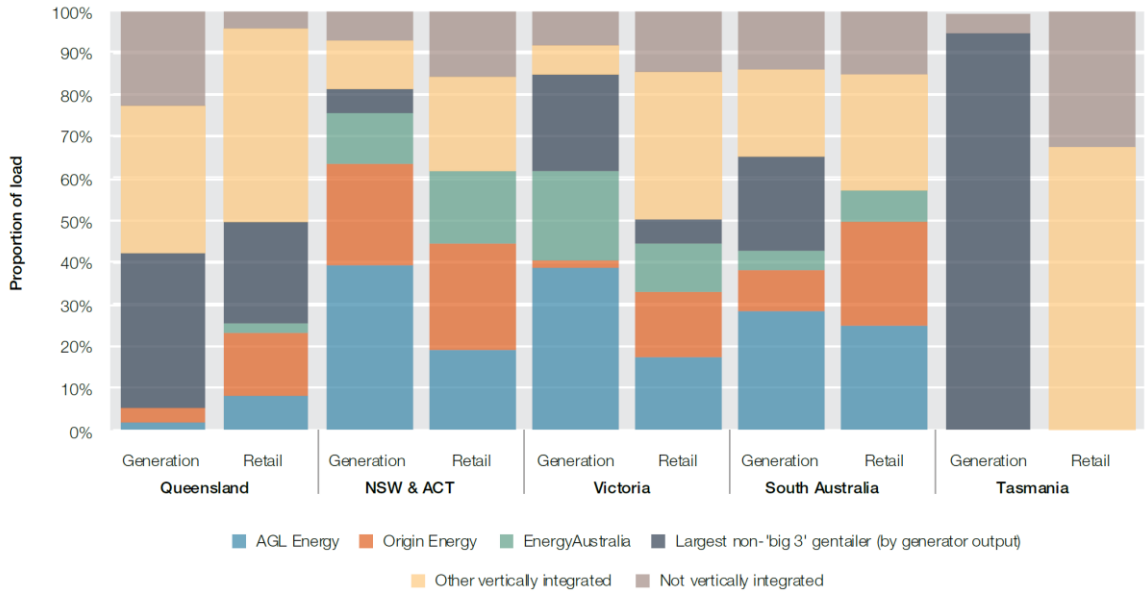
3.5 Vertical integration

One consequence of the state's approach to privatisation is that there is a high level of "vertical integration". By that is meant the companies which own most of the generation also have the highest number of retail customers. These companies are often called "gentailers".

For these companies it has meant that the risks of the volatile NEM, which can vary in price from minus $1000 a megawatt hour to $16,600 a megawatt hour, can be more easily managed through purchasing wholesale electricity from their own generators.

The level of vertical integration in NSW is the highest of any state in the NEM.

Figure 5: Vertical integration – AER



Note: Electricity generation market shares are based on generation output in 2021–2022. Retail market shares are based on market load in 2021–2022.

Source: AER, AEMO.

The Australian Competition and Consumer Commission (ACCC) had concerns about the impact of this level of vertical integration on consumers, and in 2014 tried to intervene to block the sale of

[16] https://www.epw.qld.gov.au/energyandjobsplan

Macquarie Generation (Bayswater and Liddell) to AGL Energy.[17] That intervention was ultimately unsuccessful as the ACCC's decision was overturned by the Australian Competition Tribunal (ACT).[18]

Vertical integration has delivered significant advantages to the companies in question in managing the risk of the NEM, and in warding off competition in the retail market.

The main players, Origin Energy, AGL Energy and Energy Australia have more than a 60% share of the contestable retail market.

Increasing amounts of lower cost renewable energy of utility scale, and on rooftops, have challenged the economics of the coal plants owned by the three major retailers. Their need to replace these assets, along with the investment framework provided through the Roadmap, will help to drive new generation investment in the state.

It does however mean that the generation closure decisions of the major retailers can have implications for the state's ability to achieve a managed transition. Coal generator closures before the market can replace the capacity are likely to increase affordability and reliability problems.

3.6 Transmission

The NSW transmission company, Transgrid, and its assets were sold on a 99-year lease to a private consortium for $10.258 billion in November 2015.[19]

This transaction occurred before the first Integrated System Plan (ISP) published by AEMO in 2018 which recommended a very large transmission infrastructure build in NSW, and before the Roadmap was announced and legislated in 2020.

A privatised Transgrid must comply with a license issued by the state and to reliability standards set by the state's regulator, the Independent Pricing & Regulatory Tribunal NSW (IPART). As with other transmission and distribution companies, economic regulation, including the approval of new transmission investments above $6 million sits with the national regulator, the Australian Energy Regulator (AER).

The NSW Transmission Infrastructure Strategy (TIS) released in late 2018[20] sought to prioritise four projects in the first ISP released by AEMO earlier that year, and also identified the REZs in New England, Central-West and South-West that were later included in the Roadmap.

Recognising that privatisation and national regulation reduced its ability to force Transgrid to undertake the projects, underwriting support for early works on the four priority projects was provided by the state government under the TIS.

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[17] https://www.accc.gov.au/media-release/accc-opposes-agls-proposed-acquisition-of-macquarie-generation
[18] https://www.accc.gov.au/media-release/accc-disappointed-by-tribunal-decision-authorising-agl-to-acquire-macquarie-generation
[19] https://www.afr.com/companies/energy/hastings-wins-transgrid-in-103b-deal-20151125-gl77hk
[20] https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/nsw-transmission-infrastructure#:~:text=The%20NSW%20Transmission%20Infrastructure%20Strategy,customers%20to%202040%20and%20beyond.

Further underwriting support was offered by the state and federal governments to Transgrid to begin early procurement of equipment required for the highest priority project in the ISP, the upgrade to the Queensland-NSW interconnector.[21]

Three of the four TIS projects are either complete, or committed, with the final one, HumeLink, still to be moved to a final decision.[22]

When the Roadmap was legislated in 2020 and committed the state to developing five REZs on top of the range of ISP projects in NSW, it appointed an existing statutory authority, Energy Corporation of NSW (Energy Co) as the transmission planner for the REZs. In doing so, it broke Transgrid's monopoly on transmission planning and gave Energy Co the ability to use a contestable process to appoint alternative network operators in NSW.

Energy Co recently announced that the Central West Orana (CWO) REZ would be developed by a private consortium rather than Transgrid.[23]

The state has therefore been able to reduce its single entity dependence on Transgrid for transmission delivery at a time of unprecedented new construction.

There is a separate question whether a private company like Transgrid could have financed all the NSW ISP projects and the REZs. In 2021 Transgrid unsuccessfully sought a rule change from the Australian Energy Markets Commission (AEMC) to bring forward cash flows from ISP projects to help manage the impact of coincident projects on its credit rating.[24]

Whether or not Transgrid had been privatised, NSW did not have any recent history of delivering major new transmission projects at the time the ISP and Roadmap were implemented. To date, only upgrades to existing interconnectors to Queensland and Victoria have been delivered successfully by Transgrid.

Transmission in NSW now has separate national and state specific planning, approval, cost recovery and delivery processes. It is an open question whether the new arrangements are optimal.

It is too early to draw any firm conclusions on this but there may be opportunities for clarification of roles in what is a very complicated transmission sector in NSW.

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[21] https://www.transgrid.com.au/projects-innovation/queensland-nsw-interconnector
[22] https://www.transgrid.com.au/projects-innovation/humelink
[23] https://www.energyco.nsw.gov.au/update-first-ranked-central-west-orana-rez-network-operator
[24] https://www.aemc.gov.au/rule-changes/participant-derogation-financeability-isp-projects-transgrid

4. Energy Transformation in NSW

The NSW electricity industry must operate within the National Electricity Market (NEM). The NEM and NSW are going through an historic transition in their generation sector. This transition is both large and small scale. Consumer uptake of rooftop solar is impacting the economics of larger generators.

4.1 The National Electricity Market

New South Wales (NSW) has the largest population and electricity demand in Australia's interconnected east coast National Electricity Market (NEM) which was established in 1998. The NEM is one of the longest electricity markets in the world and stretches some 5,000 kilometres from north to south. It links five Australian states – Queensland, NSW, Victoria, Tasmania, and South Australia.[25] The NEM's coverage includes nearly 90% of Australian electricity consumers.

Figure 6: The National Electricity Market – Yurika[26]

[25] Australian Energy Market Operator (AEMO) – NEM fact sheet.
[26] https://www.yurika.com.au/service/nem-metering/

4.2 Generators

The NEM has installed generation of around 60,000 megawatts, of which the technology with the largest share is coal generation.[27] The next largest source of generation is wind, followed by hydro, solar, and gas. Another growing form of generation are batteries, which are also called bi-directional units.[28] This recognises that batteries are both a source of generation and demand (charging).

The share of electricity delivered to consumers by a technology can differ from its share of total installed generation. Coal generators generally operate most of the year while wind and solar generators are intermittent and hydro and gas tend to be sources of peaking generation. Hence the share of delivered electricity in the NEM from coal is higher than its share of installed generation.

Figure 7: NEM installed and committed generation – AEMO

Summary Table: NEM Scheduled, Semi-scheduled & Non-scheduled Generation (MW) - Existing and New Developments by Fuel-Technology Category

	Fuel - Technology Category										
Summary Status	Coal	CCGT	OCGT	Gas other	Solar*	Wind	Water	Biomass	Battery Storage	Other	Total
Existing	22,755	2,985	6,873	1,894	6,429	9,947	7,992	577	746	283	60,480
Announced Withdrawal	4,380	-	-	800	-	-	-	-	-	-	5,180
Existing less Announced Withdrawal	18,375	2,985	6,873	1,094	6,429	9,947	7,992	577	746	283	55,300
Upgrade / Expansion	15	-	165	-	-	-	-	-	-	-	180
Committed	-	-	1,193	-	2,971	2,655	2,290	-	468	6	9,582
Anticipated	-	-	-	-	1,324	1,574	-	-	3,009	-	5,907
Proposed	990	207	4,622	1,957	39,041	90,569	18,762	341	35,982	1,092	193,562
Withdrawn	500	-	173	153	-	-	-	-	-	-	826

Notes:

"Existing" summary status includes "Announced Withdrawal".

"Committed" summary status includes "Committed*".

"Solar*" Fuel-Technology category excludes Rooftop PV installations.

Projects with "TBA" Dispatch Type are not included in the Summary Table.

Projects with "Confidential" FuelBucketSummary are not included in the Summary Table.

Source: AEMO

4.3 Demand

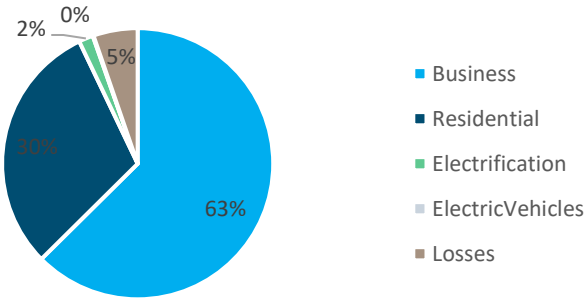
The major sources of electricity demand in the NEM are businesses, about 63%, while households account for about 30% of the total demand. Nevertheless, it is households that drive the daily and seasonal variations in consumption and therefore have the biggest impact on peak demand.[29]

[27] https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information

[28] https://www.aemc.gov.au/rule-changes/integrating-energy-storage-systems-nem

[29] The maximum peak demand achieved in the NEM has on three occasions exceeded 35,000 megawatts. Those instances were in the summers of 2008-9, 2010-11 and 2019-20 https://www.aer.gov.au/wholesale-markets/wholesale-statistics/seasonal-peak-demand-nem

Figure 8: Electricity Annual Consumption 2022 ESOO forecast – AEMO



Source: AEMO

As with other states, demand for electricity in NSW is variable across seasons and days. The biggest cause of variation is household use, with heating or cooling in extreme weather being the major factor.

The summer season will generally be when peak demand reaches its highest levels owing to the use of air conditioners. NSW peak demand on hot summer days can exceed 13,000 megawatts.[30] The highest level of demand in NSW was 14,744 megawatts in February 2011.[31]

While summer peaks are the highest, winter is likely to become the season with the highest overall demand owing to lower solar output.

The major demand centres in the state are the Sydney, Newcastle, and Wollongong regions. The biggest single electricity user is the Tomago aluminium smelter in Newcastle, whose demand of around 950 megawatts can at times be 10-15% of state-wide load.[32] Consequently, Tomago is possibly a source of demand response when the state has a supply-demand imbalance.

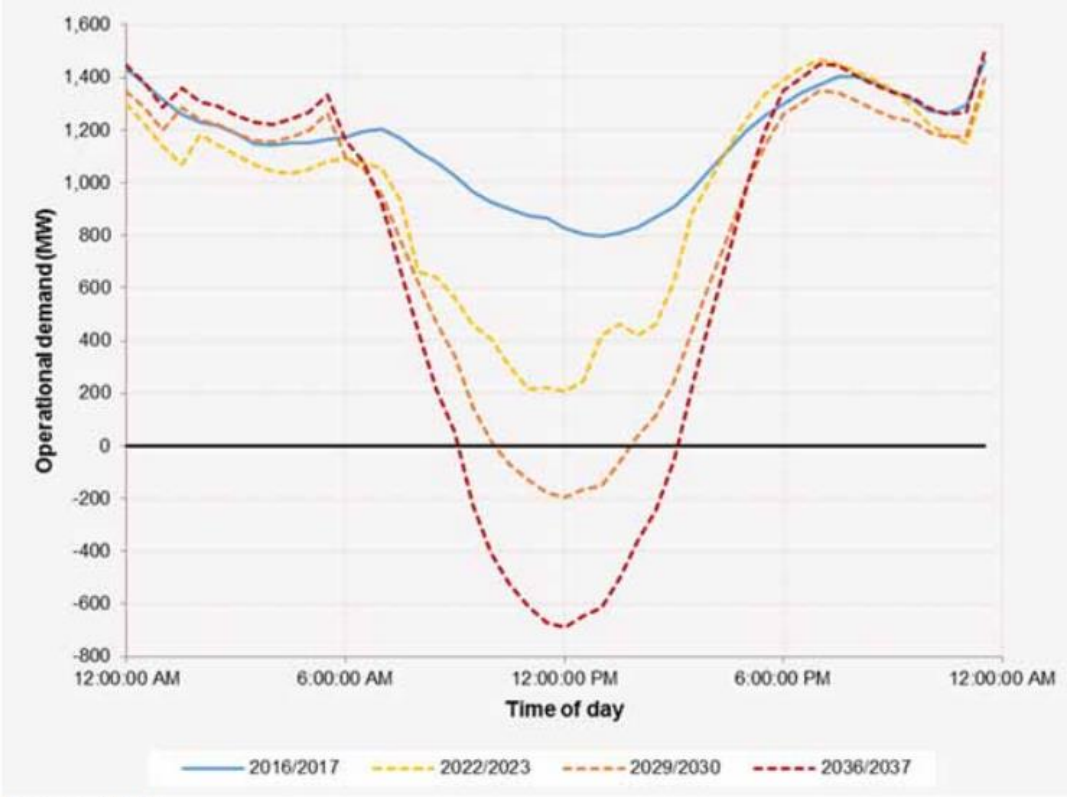
4.4 Rooftop solar PV impacts

The penetration of rooftop solar photovoltaic (PV) panels in Australia is the highest in the world with more than one in four households estimated to have solar PV.[33] The generation capacity of the aggregated solar PV is estimated to be around 5,000 MW.[34] It is forecast that aggregated rooftop solar will soon surpass coal as the biggest generator in the NEM.[35] Furthermore, the rate of installation does not appear to be slowing even though initial subsidies provided under the SRES and earlier generous state feed in tariffs have been reduced.

[30] The 13,000-megawatt level was exceeded this year on 3 March. This was the highest demand figure ever reached by the state in the month of March. Australian Energy Market Operator (AEMO).
[31] https://www.theguardian.com/australia-news/2023/mar/07/nsw-heatwave-drives-highest-demand-for-power-in-three-years
[32] https://www.tomago.com.au/tomago-keeps-the-lights-on-across-the-state/#:~:text=Tomago%20Aluminium%20is%20the%20country's,the%20state%20grid%20within%20minutes.
[33] https://www.energy.gov.au/news-media/news/australia-leads-world-rooftop-solar-share-renewables-jumps-35
[34] https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/shift-renewables/solar-energy#:~:text=6%2C070%20MW%20for%20residential%20(less%20than%2010%20kW%20capacity)
[35] https://www.perthnow.com.au/business/energy/rooftop-solar-to-be-nations-largest-energy-generator-c-9900225

A key impact of rooftop solar PV is on the NEM 'operational demand' profile. The use of electricity from rooftop solar PVs by households is not included in the NEM operational demand.[36] As a result, the operational demand during the day decreases when solar PVs generate. With the increased penetration of solar PVs the reduction in demand combined with high generation by utility solar is resulting in negative wholesale prices in the middle of the day. Afternoon peak demand (around 6-7pm), however, has remained relatively high and stable over time. This is the so-called "duck curve" illustrated below.

Figure 9: Impact of rooftop solar PV on NEM operational demand profiles – current and projected – AEMO



Source: AEMO.

Source: AEMO

The negative daytime prices and the subsequent sharp increase in electricity operational demand creates significant challenges for the viability of coal generators. Coal generators were designed to be "baseload" generators and to operate at the same generation output most of the time.

Uncontrolled and variable levels of solar PV also create significant challenges for the management of system security at a local and NEM level.

[36] Operational demand is demand met by the grid. Rooftop solar reduces operational demand as consumers use their own generation rather than the grid.

4.4.1 Consumer Energy Resources (CER)

While off a small base, the number of combined solar PV and battery installations in NSW in 2023 was 15,800.[37] This category of customers is expected to grow over time.

The three NSW networks are projecting ongoing significant growth in CER, meaning rooftop solar PV, batteries, and electric vehicles in their next five-year regulatory period from 2024-29. Ausgrid has forecast 620,000 installations by 2029, Endeavour 402,000 and Essential Energy 124,000.[38]

This is consistent with AEMO forecasts in the ISP of substantial ongoing growth in CER. It reinforces the reality of a dual energy transition at both the distributed and utility level. The difference is that the distributed level transition is happening now and is not waiting for new network infrastructure.

4.5 Transition in Generation

The NEM is going through an unprecedented transition in its generation base. The mix of that generation is reflecting the decarbonisation of the generation system through new large solar and wind generation and supporting storage plant (driven by federal and state schemes and the improving economics of renewables), and the increasing purchase of Consumer Energy Resources (CER) by households and businesses. The planned closure of the coal power stations is reflecting the age of the power stations, their decreasing economics as renewables enter, and consumer preference. Australia's nationally legislated emissions reduction target of 43% below 2005 emissions by 2030 is premised on an 82% share of renewables in the NEM by 2030.

The transition picture in the NEM varies significantly on a state-by-state basis. Some states like South Australia are already dominated by renewables, while Tasmania is almost completely supplied by hydro and wind. The main transition will occur in the largest states of NSW, Victoria, and Queensland where coal is still the main source of delivered electricity.

The share of delivered electricity in the NEM in the twelve months to July 2023 that came from coal generation was 63%. For the three largest states, the corresponding figure was NSW 71%, Queensland 76%, and Victoria 66%.[39] These figures are trending down and will continue to do so as planned coal retirements occur and as the large pipeline of renewables across the NEM enters the market.

[37] https://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations#Installation-numbers-for-smallscale-systems-by-stateterritory
[38] AEMC Technical Standards submission. NSW DNSPs.
[39] NEM data dashboard. Fuel Mix last 12 months.

Table 1: Generation shares by state (electricity delivered) – AEMO

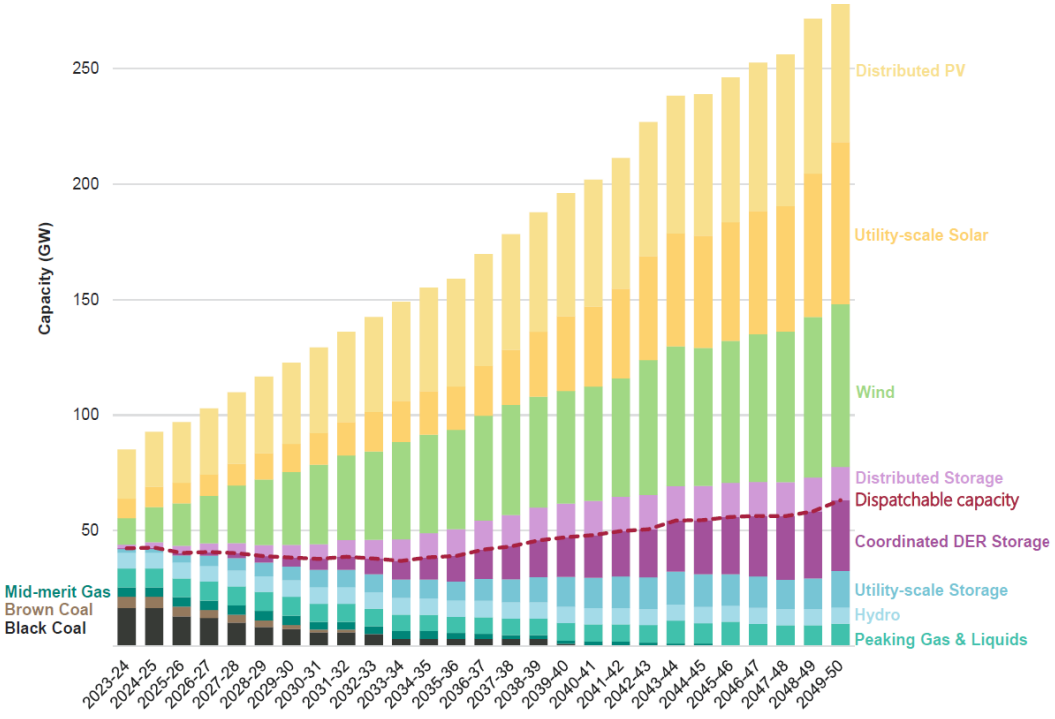
	NSW	QLD	SA	TAS	VIC	NEM
Battery	0%	0%	1%	0%	0%	0%
Biomass	0%	0%	0%	0%	0%	0%
Black coal	71%	76%	0%	0%	0%	46%
Brown coal	0%	0%	0%	0%	66%	17%
Gas	3%	9%	31%	1%	2%	6%
Hydro	6%	2%	0%	82%	6%	9%
Liquid Fuel	0%	0%	0%	0%	0%	0%
Solar	10%	9%	7%	0%	3%	7%
Wind	11%	4%	60%	17%	22%	15%

Source: AEMO

The electricity transition in Australia is guided by a bi-annual grid planning process called the Integrated System Plan (ISP), which commenced in 2018. The ISP is developed by AEMO and projects the NEM forward to 2050. It identifies priority transmission projects within and between states that need to occur to support the transition away from coal and towards a mix of wind, solar (utility and distributed), storage and firming generation, which is mainly gas.

The ISP's projection on the NEM's changing generation mix from today to 2050 is shown in Figure 10.

Figure 10: NEM generation sources to 2050. Integrated System Plan (2022) – AEMO



Source: AEMO

The generation transformation in the NEM outlined in the ISP is reinforced by State based policies to support the transition such as the Queensland Energy and Jobs Plan, the Victorian Renewable Energy Target (VRET), the Tasmanian Renewable Energy Target (TRET) and supporting Battery of the Nation, and in NSW, the Electricity Infrastructure Roadmap.

4.6 Current NSW Generation

Since the retirement of the Liddell coal plant in the Hunter Valley in April 2023, NSW now has four coal plants that still provide close to 70% of NSW electricity.

The Liddell closure was anticipated, reviewed by the Federal-State Liddell Taskforce, and occurred when the plant had reached the end of its operating life of 50 years. The owner of the plant, AGL Energy, provided 7 years notice of closure, well beyond what it was required to do under the NEM rules. Replacement capacity has entered the system and the closure occurred without any forecast breach of the NEM reliability standard or Energy Security Target (EST).

Of the remaining four coal plants some have announced closure dates, while in other cases the date is unclear. In current market circumstances, operational life is not a reliable indicator of closure dates.

Table 2: NSW Coal Generators remaining from April 2023 – Source: Published statements of owners

Plant	Owner	Capacity (mw)	Retirement date
Eraring	Origin Energy	2880	2025
Vales Point	Sev.Energy	1320	2033
Bayswater	AGL Energy	2640	2033
Mt Piper	Energy Australia	1400	2035[40]

Based on current information, it seems likely the remaining NSW coal capacity of around 8,000 megawatts (MW), will need to be replaced within 10-15 years. The scale of this challenge in such a timeframe cannot be underestimated.

Market interest in replacing the coal is very strong. The pipeline of wind and solar projects in NSW is estimated to be as high as 32,000 MW, with 2,700 MW committed.[41] Operating renewable energy in NSW has a generation capacity of 7,600 MW.

However, the amount of renewable energy entering the market is significantly less than required to meet emissions reduction targets.[42] Further progress will depend on completion of the REZs, major ISP transmission projects and selected projects who can find capacity outside the REZs.

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[40] Mt Piper in Lithgow near Sydney has no announced retirement date unlike the others. It is the newest plant and can theoretically run until 2040.

[41] AEMO Generation Information Page

[42] https://www.abc.net.au/news/2023-01-31/australia-adding-renewable-energy-less-than-half-speed-needed/101907914

There are two new gas fired generators under construction in the state to add to five existing ones, and the Snowy 2.0 pumped hydro project. While Snowy 2.0 is committed, its forecast completion date has now been pushed back to December 2029.[43]

Aside from Snowy 2.0, there are no other long-duration storage projects committed but there is a strong pipeline of battery projects including the Eraring battery and the Waratah Super Battery. While a battery provides firm capacity, it is duration limited and requires charging when depleted. This is why they were included in a new NEM category of Integrated Resource Providers (IRPs), rather than as generation.

4.7 Interconnection with the NEM

Being in the centre of the NEM and with the highest load, NSW has often relied on interconnectors from Queensland and Victoria and Snowy Hydro[44] to meet its peak demand.

In 2017 it was estimated that the interconnectors between NSW and Qld and NSW and Victoria could bring an estimated 2,500 MW into NSW.[45] One study estimated that around 20% of NSW supply came from interstate.[46]

The ISP has given particular attention to NSW and most of its priority transmission projects are in NSW or between other jurisdictions and NSW.

The first ISP in 2018 recommended boosting the capacity of the NSW-Queensland and NSW-Victoria interconnectors through priority upgrades that combined could add an additional 360 MW into NSW.

These projects, known as QN1[47] and VN1[48] were undertaken by the NSW transmission company, Transgrid, and are some of the first ISP projects to be completed. As they were upgrades, they did not require any new land acquisition.

A new interconnector linking NSW and South Australia was also recommended in the ISP and was approved by the transmission regulator the AER in 2021. It is now under construction.

It is estimated the NSW-SA interconnector, known as EnergyConnect, could help supplement NSW supply by another 600-800 megawatts when complete in 2026. This will depend on the related HumeLink project.[49] EnergyConnect is the first “greenfields” interconnector to be built in the NEM for over a decade and is a key test of the market’s ability to deliver new transmission.

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[43] https://www.snowyhydro.com.au/news/snowy-2-0-project-update/

[44] The transmission line actually connects Victoria to Snowy Hydro to NSW (where Snowy Hydro is in NSW). Murray was moved to the Victorian region on 1 July 2008 when the Snowy region of the NEM was abolished. See https://www.aemc.gov.au/rule-changes/abolition-of-snowy-region

[45] AEMO. Interconnector capabilities for the NEM. Published November 2017.

[46] https://reneweconomy.com.au/australias-biggest-coal-state-nsw-also-biggest-electricity-importer-77443/

[47] https://www.transgrid.com.au/projects-innovation/queensland-nsw-interconnector

[48] https://www.transgrid.com.au/projects-innovation/victoria-to-nsw-interconnector

[49] https://www.transgrid.com.au/projects-innovation/energyconnect

4.8 Outlook for NSW

Each year AEMO prepares an ESOO report that projects forward ten years and identifies any potential breaches of the NEM reliability standard in each state. Breaches of the reliability standard reflect an increased probability of having insufficient supply to meet peak demand, where this can be in the range from a one in two-year to a one in ten-year peak demand.

The NEM reliability standard is currently expressed as a "maximum expected unserved energy (USE) in a region of 0.002% of the total energy demanded in that region for a given financial year".[50]

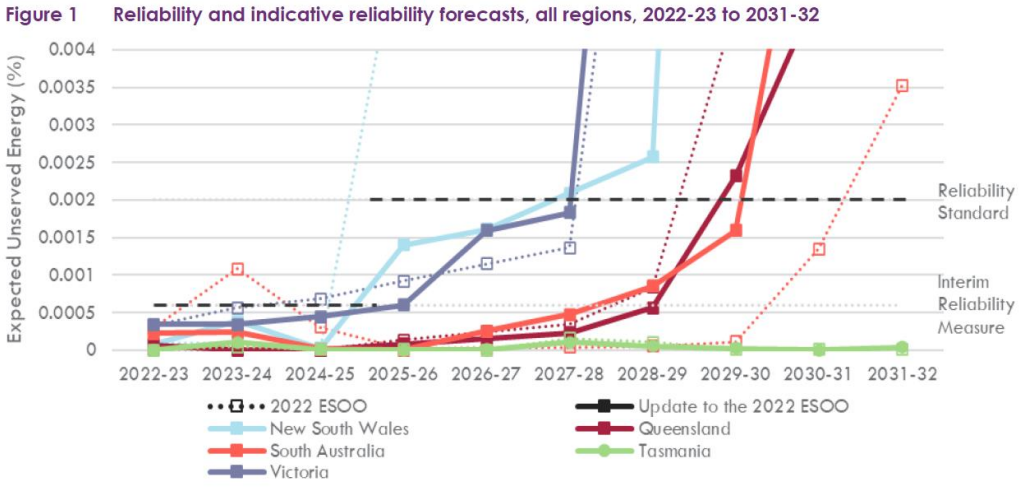
In recognition of the increased reliability risks in the NEM from exiting plant, Australia's Energy Ministers in 2020 implemented an Interim Reliability Measure (IRM) that set an even higher expectation of 0.0006% USE in a financial year.[51]

As part of the NSW Roadmap, a NSW EST was established and legislated in the Electricity Infrastructure Investment Act 2020. The EST differs from the NEM standard and is overseen by an ESTM.

The EST is based upon what will be required to meet a one in ten-year demand peak in NSW with a reserve of two units of the state's largest generator. Any projected breach of the EST requires the NSW Minister to consider what if any action to take to reduce the reliability risks.

The latest version of the ESOO, in the form of an early 2023 update to the 2022 report, projects clear breaches of the IRM in NSW from 2025 after the closure of Eraring, and breaches of the NEM reliability standard from the late 2020's after the scheduled closure of Vales Point. This can be seen in Figure 11.

Figure 11: Updated 2022 ESOO – Projected Breaches of the Reliability Standard and the Interim Reliability Measure –AEMO



Source: AEMO

[50] Australian Energy Markets Commission. Reliability Panel. Fact Sheet. The Reliability Standard.

[51] https://www.energy.gov.au/government-priorities/energy-and-climate-change-ministerial-council/priorities/national-electricity-market-reforms/post-2025-market-design/interim-reliability-measures#:~:text=Acting%20on%20the%20advice%20of,any%20region%20in%20any%20year

In some previous ESOO's there have been projected breaches of the reliability standard, and this was accepted as an appropriate signal to the market that new capacity was needed. That is in part the purpose of the ESOO.

The ESOO accounts for committed new projects in a state at the time it is done. In NSW the ESOO has allowed for new wind and solar, batteries and the two new gas plants under construction in NSW, that collectively will provide around over 1,000 megawatts of new capacity by 2025.[52]

The NSW Energy Security Target Monitor (ESTM) produces an annual assessment of the state's ability to meet the EST. The ESTM report is usually produced about two months after the ESOO. The most recent version is the October 2022 report, which is before the 2023 update to the ESOO.

The 2022 ESTM report also estimated a breach of the EST after the closure of the Eraring plant in 2025. The projected breach in 2025-26 was 262 megawatts.

AEMO noted however that in response to the forecast breach the NSW Consumer Trustee, AEMO Services, had commenced a firming tender round for a 380 MW project.[53] In July AEMO Services announced that it would increase the tender size to 930 MW (nameplate capacity) in order to reflect the Federal Government's decision to support 550 MW firming capacity in NSW as part of the Capacity Investment Scheme (CIS). This may deliver almost 1 GW of dispatchable capacity to eliminate the forecast shortfall in 2028/29 flagged by the AEMO. Only zero-emissions technology projects will receive Federal support through the expanded firming tender.

The ESOO 2022 update is therefore the most recent public assessment of the NSW reliability outlook. It clearly demonstrates that NSW has the most immediate and largest reliability challenges in the NEM. Those challenges are projected to increase towards the end of the decade. This is a situation that has not occurred in the history of the NEM.

[52] https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/generation-information

[53] Energy Security Target Monitor Report. AEMO. 28 October 2022

5. National energy market and the reliability framework

As part of the National Electricity Market (NEM) NSW electricity industry is heavily influenced by reforms and regulations at the national level. The NEM reliability framework provides a basis to achieve national reliability objectives which the Roadmap strengthens.

5.1 Outages and supply interruptions in the NEM

Reliability in the electricity sector means that the power system has enough generation, demand response, and network capacity to produce and transport electricity to meet consumer demand. The source of supply interruptions in the NEM can be classified according to parts of the power system where the interruption originated from. The sources and the historical percentages of cases are:

- transmission and distribution network events – approx. 96%
- system security events – approx. 3%
- generation and bulk supply events – less than 1%

While customers' experience of power supply interruptions may be similar[54] irrespective of the cause, the above classification is useful because different parts of the power system have differing regulatory frameworks, and so requiring different solutions to ensure the reliability standard is met.

Transmission and distribution network events

To date, almost all supply interruptions have been due to technical problems in the grid, for example when a pole is knocked down in a storm or power lines are damaged in bushfires.

Network reliability standards guide how much investment in transmission and distribution network assets (poles and wires) is needed to deliver a specified level of supply to consumers. These standards are set by state and territory governments. Investments in transmission and distribution reliability involve balancing a trade-off between the cost of building and maintaining networks, which is ultimately paid for by consumers through their bills, and the value customers place on the reliability of supply.[55]

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[54] Power supply interruptions due to distribution events are local and often of short duration. Power supply interruptions due to generation and bulk supply can be wide spread and of a longer duration. Issues can involve traffic congestion, hospitals without power, and in extreme cases looting.

[55] The network reliability standard primarily is informed by the value customers place on a reliable supply of power, known as the value of customer reliability (VCR). The VCR is estimated by AEMO with guidance on the methodology provided by the AER.

System security events

System security events are mostly caused by sudden equipment failure that results in the system operating outside its technical operating limits, such as voltage and frequency. With more wind and solar connecting to the grid, the technical characteristics of the system are changing. In particular, it is becoming harder for the system to withstand disturbances such as a sudden change in demand or supply.

Work to strengthen system security in the NEM is ongoing to reduce the risk of widespread outages. This includes new requirements for networks to provide minimum levels of inertia and system strength, and enhanced technical performance standards for new generators.

Generation and bulk supply events

Wholesale related reliability events that occur when generation and demand response capacity is not enough to meet demand, have only been responsible for less than 1% of the total interruptions.

The section below further detail the NEM reliability framework as it relates to generation and bulk supply related reliability events, i.e. when there is a risk that generation and demand response made available in the NEM may not be enough to meet demand.

5.2 NEM Reliability framework

5.2.1 Reliability Standard

Historically, the NEM has provided a very high level of reliability. The reliability standard is currently set at 0.002% USE. This figure represents the maximum amount of unmet (unserved) energy demand as a proportion of the total consumer demand in a given region in a given financial year. For example, the 0.002% USE means that out of 100,000MWh of demand, no more than 2MWh of outage would be allowed.

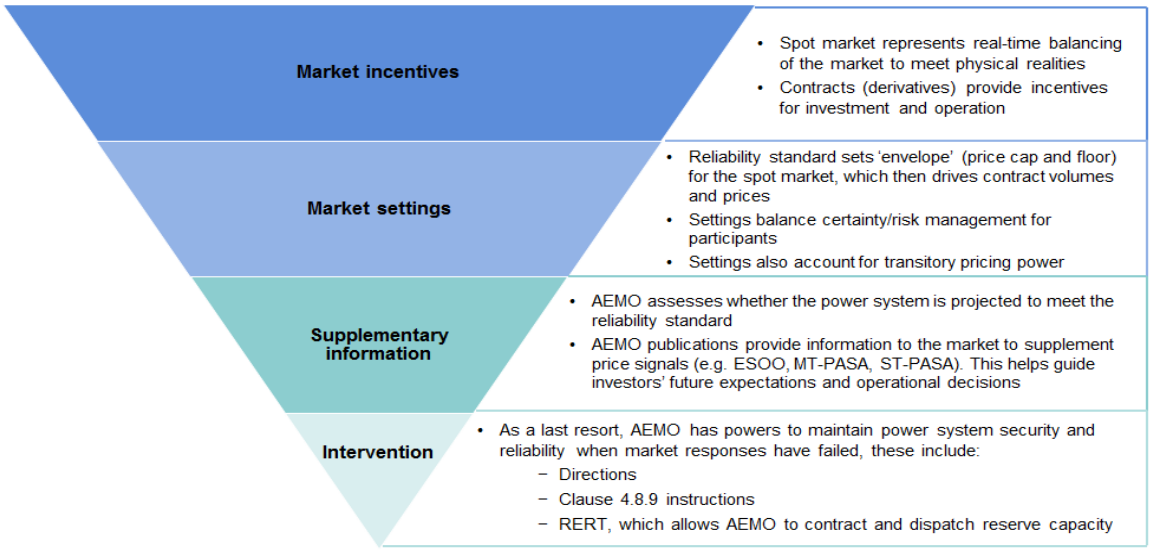
5.2.2 Overview of NEM reliability framework

In the NEM, the regulatory framework for reliability can be described as predominantly market based with an escalating series of interventions made available to AEMO to account for market limitations. The Figure below provides an overview of the elements of the current NEM reliability framework, including:

- the market incentives
- the price settings that underpin the market settings
- the supplementary information that AEMO must make available to the market participants, and
- the intervention mechanisms available to AEMO if the above measures fail to achieve the desired reliability outcomes.

Each of these elements is discussed in detail below. A detailed description of each of the elements is provided in Appendix 5.

Figure 12: The NEM reliability framework – AEMC



5.3 NEM Reliability framework governance arrangements

The reliability framework governance arrangements relate to how the framework is managed and the how the settings may be changed over time.

A principal guardian body of reliability in the NEM governance arrangement is the Reliability Panel. The Reliability Panel is comprised of members representing a range of participants in the NEM, including consumer groups, generators, network businesses, retailers and the AEMO.

The key responsibilities of the Reliability Panel includes monitoring, reviewing, and reporting on the safety, security and reliability of the national electricity system and advising the AEMC on these matters.

The Reliability Panel publishes a range of market reviews such as:

- Annual Market Performance Review (AMPR) which examines the performance of the NEM in terms of reliability, security and safety of the power system. In doing so, the AMPR considers a range of factors such as current and historic NEM reliability performance, forward-looking reliability risks, NEM reserve levels and constraints, AEMO's interventions, market price signals, and investment incentives.
- Reliability Standard and Settings Review (RSSR) which examines whether the reliability standards and market settings remain suitable for current market arrangements, and they continue to meet the requirements of the market participants and consumers.

The Reliability Panel also produces guidelines to assist AEMO to perform its power system security and reliability functions. These include, for example, guidelines in relation the operation of the RERT and the procurement of emergency reserves, principles to be applied when AEMO exercises its

powers to issue directions to generators and large users and instructions to network operators to carry out controlled load shedding.[56]

5.4 NEM reliability measure and regulatory reform developments

In addition to the core NEM reliability framework described above and detailed in Appendix 5, additional reliability reform measures have been implemented in recent years to further support reliability outcomes in the NEM. These include the:

- Retailer Reliability Obligations (RRO)
- Interim Reliability Measure (IRM)
- Capacity Investment Scheme (CIS)

5.4.1 Retailer reliability obligation (RRO)

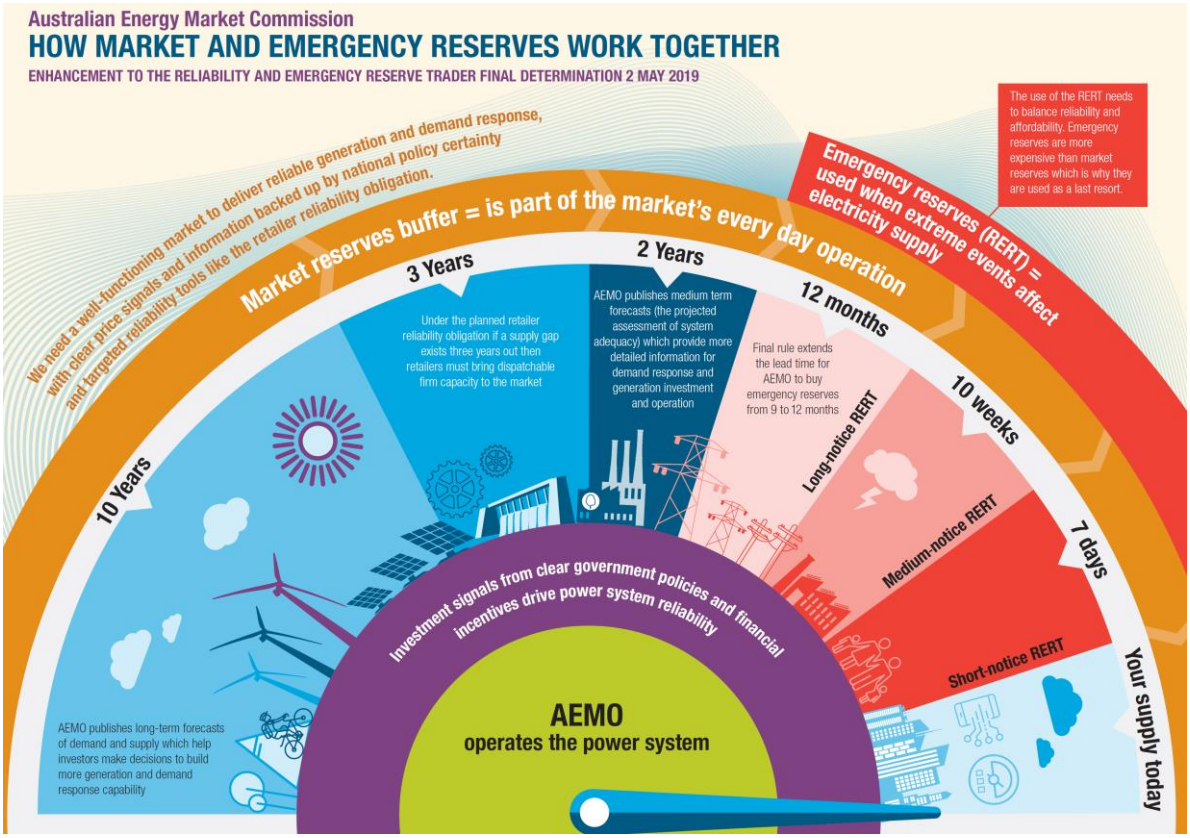
The RRO was designed and implemented by the Energy Security Board (ESB) and it commenced on 1 July 2019. The key objective of the RRO is to strengthen incentives for market participants to invest to support reliability outcomes in the NEM. If AEMO identifies a material reliability gap within a three-year period, the RRO is triggered requiring retailers and large energy users to enter into sufficient qualifying contracts to cover their share of a one-in-two year peak demand event.[57]

The Figure below, prepared by the AEMC, provides a summary of the elements of the existing reliability framework and how the RRO fits into this framework at the '3 years' mark.

[56] The latest version of the RERT guidelines were made in August 2020 to reflect the implementation of a temporary out of market capacity reserve, called the Interim Reliability Reserves, the rules for which were recommended and approved by Energy Ministers in August 2020. See here.

[57] The South Australian Minister for Energy and Mining also has the ability to trigger the RRO within South Australia and it did so for first quarter of 2024 and 2025 respectively.

Figure 13: Reliability framework – time-based interventions –AEMC



5.4.2 Interim reliability measure (IRM)

The IRM was put in place the former Council of Australian Governments (COAG) Energy Council to improve the reliability (resource adequacy) of the electricity system in the short term.

The IRM sets an interim reliability standard of 0.0006% of maximum expected unserved energy in a region for a given financial year. The interim reliability standard replaces the general reliability standard of 0.002% under certain circumstances, for example when inter-regional transmission elements are being assessed. This increases the likelihood of the RERT and/or the RRO being triggered.

In May 2023 the AEMC published its review of the IRM and recommended to continue the application of higher standard to the RRO to 30 June 2028. The AEMC also considered that with the increase penetration of variable renewable energy (VRE), reliability risks, particularly those arising from low-probability high impact events, must be characterised differently.

5.4.3 Capacity Investment Scheme

In 2022, Federal, state and territory ministers agreed in principle to establish the Capacity Investment Scheme (CIS). The CIS will provide a national framework to encourage new investment in clean dispatchable capacity to support reliability and reduce the risk of price shocks in the energy market. It is expected that the CIS will support at least 6 GW of dispatchable power.

Whilst the details of the CIS have not been published, it will involve competitive tenders seeking bids for clean renewable generation and storage projects to fill expected reliability gaps. Projects selected through open tenders will be offered long-term Federal underwriting agreements for an agreed revenue 'floor' and 'ceiling'. These underwritings decrease financial risks for investors and encourage more investment in capacity when and where it is needed.

Stage 1 of the CIS will be rolled out in the second half of 2023 and will involve a Federal/New South Wales tender in partnership with the Roadmap.[58] As part of Round 2 of the Roadmap Tender, the CIS will expand the Roadmap's firming tender up to an additional 550 MW, more than doubling the 380 MW of firming capacity already committed by NSW. This may deliver almost 1 GW of dispatchable capacity to eliminate the forecast shortfall in 2028/29 flagged by the AEMO. Only zero-emissions technology projects will receive Federal support through the expanded firming tender.

Further detail and consultation on future delivery of the scheme will be released in the coming months.

[58] Another CIS work program includes a joint tender in South Australia and Victoria, to be delivered by the Australian Energy Market Operator (AEMO).

6. The NSW Roadmap

6.1 Objectives of the Roadmap

NSW not only has the largest population and demand of any state in the NEM, but it is also where the largest percentage of generation will retire in the next 10-15 years. The energy transition is therefore most urgent in NSW.

In November 2020, the NSW Government released the NSW Electricity Infrastructure Roadmap (the Roadmap) that is legislated under the Electricity Infrastructure Investment Act 2020 (EII Act).[59] The aim is to achieve investment in 12GW of new renewable generation capacity and 2GW of long-duration storage by 2030. Additional important elements include:

- Long-Term Energy Service Agreements (LTESAs) that support the investment in generation, long-duration storage and firming infrastructure
- Renewable Energy Zones (REZs) that help coordinate investment in generation, storage and network infrastructure, including through building new network infrastructure, establishing a network access schemes and delivering community benefits[60]
- Priority Transmission Infrastructure Projects (PTIPs) which are investment in appropriate infrastructure in response to forecast breaches of the Energy Security Target.

The Roadmap was legislated with support of both sides of NSW politics and is the most comprehensive state policy to support the development of new generation, storage, and transmission. The bipartisan support is important to investor confidence given it is premised on long-life generation and transmission assets to be owned and built by the private sector.

The Roadmap is focused on utility scale transition and involves substantial new investments in generation, storage and transmission. These investments are prone to engineering, construction, planning and community acceptance risks that make timely implementation challenging.

6.2 The Electricity Infrastructure Investment Safeguard

The Electricity Infrastructure Investment Safeguard (the Infrastructure Safeguard) is the Roadmap's primary mechanism to support private investment in:

- renewable generation that is at least 30 MW capacity
- long-duration storage infrastructure that is scheduled in the central dispatch and can store and discharge electrical energy at its registered capacity for at least eight hours (e.g. pumped hydro, compressed air or battery energy storage)

[59] The Roadmap is not only established through the EII Act but through a number of related regulations, policies and implementation guides.

[60] The EII Act includes five REZs and these are Central West Orana, New England, South-West, Hunter Central Coast and Illawarra.

- firming infrastructure that is scheduled in central dispatch (e.g. gas, battery energy storage and some forms of demand response).

The EII Act sets out overall objectives for the amount of each of these types of infrastructure and sets minimum objectives for the construction of generation and long-duration storage infrastructure by 2030.

6.2.1 Infrastructure Investment Objectives Report

The Consumer Trustee is required to prepare an Infrastructure Investment Objectives (IIO) Report every two years. The IIO Report includes two components:

- the 20-Year Development Pathway that sets out a plan to construct generation, long-duration storage and firming infrastructure over a 20-year period to meet the infrastructure investment objectives and
- the 10-Year Tender Plan that sets out the tender schedule for when LTESAs may be tendered to give effect to the 20-Year Development Pathway.

6.2.2 The Energy Security Target Monitor Report

The Energy Security Target Monitor (ESTM) is required to prepare an annual Energy Security Target Monitor Report (ESTM Report) to advise the Minister on whether it considers firm capacity is sufficient to meet the NSW energy security target (EST) over the next 10 years. The ESTM Reports are an input into the 20-Year Development Pathway and assist the Consumer Trustee to identify the need for or timing of long-duration storage infrastructure and firming infrastructure.

6.3 Long-term Energy Service Agreements

Long-term Energy Service Agreements (LTESAs) are a central element of the Roadmap and they offer an option to access price guarantees for generation, long-duration storage and firming projects that successfully secured LTESAs in a tender.

LTESAs are option contracts. The LTESAs require the successful tenderer to build a physical infrastructure asset and, if successful has an option to exercise a derivative arrangement to support its minimum revenue.

The LTESAs are intended to achieve the following objectives:

- incentivise investment in generation, storage, and firming assets by providing an insurance mechanism for projects against low wholesale electricity prices
- protect the financial interests of NSW electricity consumers by supporting sufficient (but not excessive) investments
- encourage participation in the NEM wholesale, ancillary, derivatives, and other contracts markets such as power purchase agreements
- achieve an efficient risk allocation between projects and NSW electricity consumers.

- be highly coordinated with the rollout of REZs and access rights for them.

Each type of infrastructure (i.e. generation, long-duration storage, firming) has different kinds of LTESAs. The Consumer Trustee sets the terms and conditions of the LTESAs, with a dedicated Scheme Financial Vehicle as the counterparty. Periodic LTESA tenders

The Consumer Trustee (CT) is responsible for recommending generation, storage and firming projects to be eligible for the LTESAs. To select suitable projects from across NSW, the CT runs periodic tenders. The CT has discretion over the timing and scale of competitive tenders, it publishes tender rules and detail requirements (including eligibility and merit criteria) and conducts the tenders to identify the best projects to offer LTESAs. The Consumer Trustee must consider the financial value to NSW consumers and how tenders contribute to the EII Act objectives.

In terms of firming infrastructure, AEMO Services has developed a methodology to assess the EST contribution factor for each firming project. The EST contribution factor is a number between 0 and 1 and it reflect the ration of a unit of MWh output that can be considered 'firm' and contributory to achieving the EST. The project-specific EST contribution factors are calculated during the LTESA tender process and applied in the merit assessment process. The lower the EST contribution factors of a project, the lower its merit.

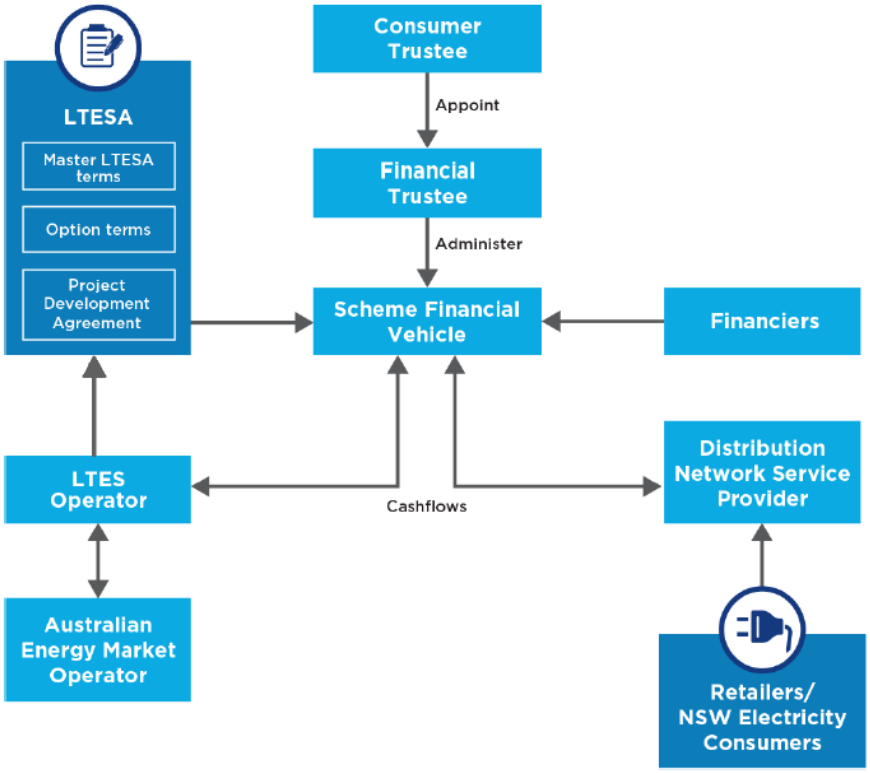
Tenders are conducted multiple times a year and this allows proponents to choose when to bid based on the maturity of their projects.

6.4 Financial risk management framework of the Roadmap

The Consumer Trustee is required to develop a risk management framework to protect the financial interests of consumers from risks arising from the financial liabilities associated with LTESAs. This risk management framework may assign functions to the Consumer Trustee, Financial Trustee, the Scheme Financial Vehicle and Regulator.

The figure below depicts the key components of the Infrastructure Safeguard.

Figure 14: Diagram showing key components of the Infrastructure Safeguard – DPIE[61]



6.5 Roadmap agencies and their roles

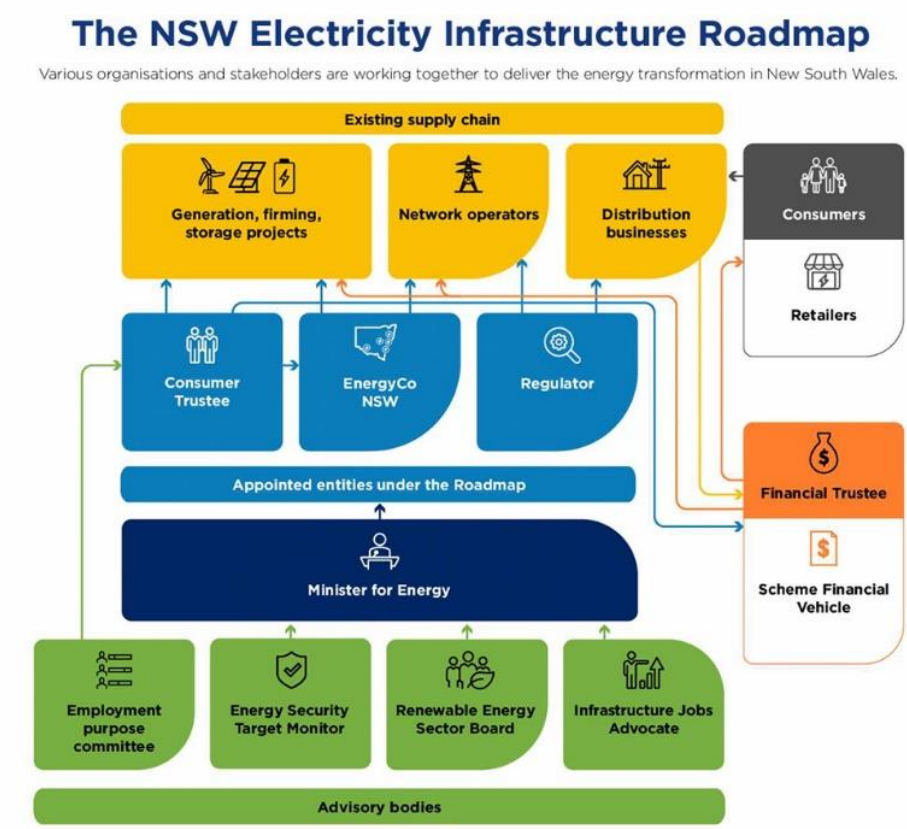
At the time the Roadmap was legislated, NSW did not have the capability to implement the objectives of the EII Act. This is not a criticism, but a statement of fact. The establishment of the NEM in the 1990s, its related institutions, and the privatisation of the NSW generation and transmission assets over two decades meant that if the state government was to take on an active role in energy infrastructure, it required a rebuilding of capability.

The Roadmap established a range of agencies to deliver the infrastructure investment objectives of the EII Act. Since 2020 a range of new and existing entities have been appointed to key roles in the implementation of the Roadmap.

The following figure depicts how the Roadmap bodies are intended to work together to deliver the EII Act objectives.

[61] https://www.energy.nsw.gov.au/sites/default/files/2021-08/long-term-energy-services-agreement-design-consultation-paper-210316.pdf.

Figure 15: Overview of the key agencies of the Roadmap – DPIE [62]



The following sections provide an overview of the key Roadmap agencies.

6.5.1 Infrastructure Planner – Energy Corporation of NSW ('Energy Co')

The role of the Infrastructure Planner is to plan and recommend infrastructure projects such as the five REZs and the PTIPs as well as contracting and overseeing the suppliers delivering the transmission network infrastructure.

6.5.2 Consumer Trustee – AEMO Services Ltd

The Consumer Trustee conducts competitive auctions for generation and storage agreements as well as transmission access rights in the REZs. It also authorises REZ network infrastructure.

6.5.3 The Scheme Financial Vehicle – Equity Trustees Limited

The Scheme Financial Vehicle (SFV) administers a fund under the Roadmap, from which obligations relating to LTESAs entered into by the Consumer Trustee are drawn.

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[62] https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap/entities-delivering

6.5.4 Independent Pricing and Regulatory Tribunal NSW (IPART) as a Regulator under the EII Act

IPART is an independent regulator that determines the maximum prices that can be charged for certain retail energy, water, and transport services in NSW. In addition to its existing regulatory role, IPART was appointed as a regulator under the EII Act. Its role under the Roadmap includes undertaking performance audits on the entities delivering the Roadmap (e.g. the CT, the Infrastructure Planner), as well as recommending the Renewable Energy Sector Board's (RESB) plan to the Minister, to ensure it protects the financial interests of NSW electricity consumers and is consistent with Australia's international trade obligations.

6.5.5 Australian Energy Regulator (AER) as a Regulator under the EII Act

Besides IPART, under the EII Act, the AER has a number of statutory functions (in addition to its functions under the national regulatory framework), including:

- applying a transmission efficiency test (TET) to authorised REZ network infrastructure projects
- approving a risk management framework developed by the CT
- reviewing LTESA tender rules.

6.5.6 NSW Environment Protection Authority (NSW EPA) as a Regulator under EII Regulation

The Electricity Infrastructure Investment Regulation 2021 requires that firming infrastructure facilities that hold LTESAs must meet emission intensity requirements and thus may need to offset their greenhouse gas emissions when they generate electricity.[63] The firming facilities' compliance with the emission intensity obligations are overseen by the NSW EPA. To this end, the NSW EPA monitors the greenhouse gas intensity of the NSW generators and firming infrastructure facilities. It also calculates and monitors the carbon credits surrendered by the facility operators.

6.5.7 Energy Security Target Monitor (ESTM) – AEMO

The ESTM under the EII Act monitors the NSW EST and makes recommendations to address any potential breaches of the EST.

6.5.8 Renewable Energy Sector Board (RESB)

The RESB is a group appointed to achieve procurement objectives (e.g. local content) related to the construction of transmission, generation and storage.

[63] Before 2036, firming facility operators' annual emissions intensity must be lower than the emissions intensity of all NSW generators supplying to the grid each year. From 1 January 2036, each firming infrastructure facility must achieve net zero for their scope 1 emissions annually. See https://www.epa.nsw.gov.au/your-environment/climate-change/firming-infrastructure

6.5.9 Electricity Infrastructure Jobs Advocate

The Electricity Infrastructure Jobs Advocate is a Ministerially appointed individual tasked with advising on issues such as employment, training, logistics and export opportunities in the regions arising from the Roadmap.

6.5.10 Other agencies relevant to the Roadmap

Other critical energy agencies to the Roadmap include the main policy maker, the Office of Energy and Climate Change (OECC) the state's jurisdictional transmission planner and operator, Transgrid, the electricity market operator, AEMO, Infrastructure NSW, and the Australian Energy Infrastructure Commissioner (AEIC).

Infrastructure NSW

The role of Infrastructure NSW is to provide independent advice to the NSW Government on the identification and prioritisation of critical public infrastructure. It delivers a 20-year Infrastructure Strategy every five years, and provide independent advice on infrastructure policies and priorities.

It also provides advice on the delivery of high priority projects, monitors the infrastructure pipeline to ensure projects are delivered on time and on budget, and reviews the performance of NSW's infrastructure sectors.

Australian Energy Infrastructure Commissioner

The Australian Energy Infrastructure Commissioner (AEIC)64 is an independent role reporting to the Federal Minister for Climate Change and Energy. The AIEC's role is to consider the complaints made by community residents about wind farms, large-scale solar farms, energy storage facilities and new major transmission projects. In performing its role, the AEIC is expected to work collaboratively with all levels of government, scientists, experts, industry and the community to resolve complaints.

[64] Prior to 2021 the title was called National Wind Farm Commissioner

7. Delivering a timely and cost-effective electricity sector transition

The Check Up required a review of the overall policy and program approach to delivering a timely and cost-effective electricity sector transition and the provision of relevant advice. It involved consideration of the current decision-making and governance arrangements under the Roadmap; a review of the latest information available regarding the anticipated costs, benefits and timeframes of the Roadmap; and consideration of whether particular financing, planning and regulatory changes are required to accelerate projects.

7.1 Introduction

At the time the Electricity Infrastructure Investment Act 2020 (NSW) (EII Act) was passed in November 2020, the institutional framework to deliver the ambitious targets of 12 GW of renewable generation and 2 GW of long-duration storage by 2030 was not in place. Since that time, all the relevant agencies have been established, are up and running, and are achieving some noteworthy outcomes. An implementation capability has been established and will be an ongoing asset to the state.

The following sections provide a:

- brief background of the Roadmap agencies, including their roles and achievements to date
- stakeholders' views on how the Roadmap arrangements are working
- the key findings arising from the assessment of the timely and cost-effective electricity sector transition, and when potential room for improvements have been identified, and
- recommendations that should be considered further by government.

7.2 Governance and processes of the Infrastructure Planner

7.2.1 Background

The role of Energy Co as the Infrastructure Planner

Energy Corporation of NSW (Energy Co) was appointed as the Infrastructure Planner under the EII Act. At the time the Roadmap was legislated, Energy Co was a dormant state-owned corporation with land acquisition powers that existed within the Energy and Utilities Administration Act 1987 (NSW). Under the EII Act, it was repurposed as a statutory authority and designated as the Infrastructure Planner. It operates under the directions of the NSW Minister for Energy.

Energy Co has built a core management team headed by a chief executive and has engaged a range of consultants to help deliver on its ambitious agenda. It is still within the general government sector, so its full-time employees are engaged under public service conditions. It has no fiduciary board but has an Energy Co Advisory Committee (EAC).

Energy Co's role as the Infrastructure Planner is to recommend network infrastructure projects, such as Renewable Energy Zones (REZs) and Priority Transmission Infrastructure Projects (PTIPs), and to work closely with communities, investors, and industry when coordinating investment in electricity network, generation and storage infrastructure in REZs for the long-term benefit of energy consumers, local communities and industry in NSW.

Infrastructure outcomes: Renewable Energy Zones (REZs)

Under the EII Act, Energy Co has been legislated as the Infrastructure Planner of the five REZs. Energy Co has already developed an identified route for the first major REZ in the Central-West Orana region (CWO REZ) and run a contestable procurement process to deliver the project under a public private partnership (PPP) model. That process has chosen a first ranked developer and network operator for the CWO REZ called the ACE Consortium, consisting of Acciona Energy, Cobra and Endeavour Energy.[65]

The capabilities, financial strength and experience of the consortium members indicate a credible delivery partner has been chosen. It will nevertheless be the first REZ project to be completed in Australia for both the ACE Consortium and Energy Co. There is still a range of processes to navigate under the Roadmap before the final CWO REZ project approval is secured and construction can commence. It is estimated the final project commitment deed will be entered into around mid-2024.

While this is a significant milestone in introducing contestability to transmission in NSW under a new regulatory investment test model, the CWO REZ will be an important test of a REZ network infrastructure project approval process. It will require a significant focus by the management of all relevant Roadmap agencies for the project to reach financial close.

The CWO REZ will be seen as a test case for all REZs in NSW, and even the National Electricity Market (NEM). The 2019 NSW Electricity Strategy, the precursor to the Roadmap, described it as a pilot REZ.[66] It is now far more than that, with a potential capacity of 6 GW. [67]

Simultaneously, Energy Co has been planning an even bigger REZ project in the New England region (NE REZ). In the Roadmap legislation, the CWO REZ was estimated to be 3 GW, whereas the NE REZ was designated as being up to 8 GW of the proposed 12 GW generation target.

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[65] https://www.energyco.nsw.gov.au/cwo

[66] https://dev.energy.nsw.gov.au/sites/default/files/2022-08/2019_11_NSW_ElectricityStrategyOverview.pdf

[67] In 2021 the CWO REZ was initially declared as having 3 GW network capacity. The NSW Network Infrastructure Strategy released by Energy Co in May 2023 identified a need to increase network capacity of the CWO REZ from 3 GW up to 4.5 GW under Stage 1, and around 6 GW by 2038 under Stage 2. To align with this, the NSW Government is currently proposing to amend the CWO REZ declaration to increase the intended network capacity to 6 GW. The proposed declaration amendment would only change the network capacity and does not impact the geographical size of the REZ. For further details see: https://www.energyco.nsw.gov.au/cwo-rez

The model of having a government entity such as Energy Co as the face of the REZ infrastructure plan has led to some favourable social license outcomes when compared to projects fronted by transmission companies. The real test of this approach will be after financial close when construction activity begins to take place.

Infrastructure outcomes: Priority Transmission Infrastructure Project (PTIP)

Energy Co has also been designated as the Infrastructure Planner for PTIPs – investment projects that are needed in response to a projected breach of the Energy Security Target (EST).

To date, Energy Co has awarded one PTIP known as the Waratah Super Battery (WSB) in response to the projected breach of the EST after the closure of Eraring.[68] The WSB is a 'virtual transmission' project, for which Transgrid will be the network operator, that unlocks additional capacity in the existing grid in the Sydney-Newcastle-Wollongong region.[69] It is being developed by Akaysha Energy and is under construction on the old Munmorah coal generator site.

Besides the WSB, the Hunter Transmission Project[70] (HTP) is another PTIP for which Energy Co was designated as the Infrastructure Planner. The HTP, which is proposed to be in the Hunter-Central Coast region, is one of the most significant upgrades to the state's core electricity infrastructure.[71] Consultation on a route for the HTP is underway with a decision to be made on a network operator. The project will help strengthen the capacity of the grid in the Hunter region and provide a better backbone to carry the energy from the CWO REZ and the NE REZ.

7.2.2 Stakeholders' views

Most stakeholders recognised the significant progress made in establishing the Roadmap agencies.

In relation to Energy Co there were a range of views on its contestable procurement for CWO REZ, with some stakeholders recognising the strategic importance of establishing an alternative network operator. Negative comments were, however, made about the costs and complexity of that procurement.

Energy Co has a range of interactions across government, but this was not always seen as coordinated and resourced by other agencies. The view of some was that Energy Co was doing too much, while the view of others was that they had to. Energy Co's extensive reliance on consultants was commented upon.

Energy Co and Transgrid were seen as inevitably in competition, but there was evidence of collaboration on projects such as the Waratah Super Battery (WSB).

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[68] https://www.energyco.nsw.gov.au/akaysha-energy-appointed-develop-waratah-super-battery
[69] https://www.energyco.nsw.gov.au/projects/waratah-super-battery
[70] https://www.energyco.nsw.gov.au/projects/hunter-transmission-project
[71] The HTP involves up to 2 x 500 kV double circuit transmission lines between Bayswater and Eraring power stations and upgrades to existing substations at these power stations. For further details see: https://www.energyco.nsw.gov.au/projects/hunter-transmission-project

7.2.3 Findings

In terms of progressing the plan envisaged in the Roadmap, Energy Co has made significant progress in identifying and planning infrastructure needs. In terms of its ability to deliver on all these projects, there are real questions as to whether the current structure is appropriate, subject to appropriate oversight, and overly reliant on outside consultants.

Energy Co's Network Infrastructure Strategy (NIS) released in May 2023[72] would see it be the network planner and procurer of $9.7 billion of REZ infrastructure it categorises as "deliver now".[73]

While it can be argued that the imperative of closing coal power stations and achieving Net Zero objectives demand urgency in implementation, it is doubtful Energy Co, as currently structured, can deliver on such a program in a cost-effective manner.

The Energy Co management have come up with a credible network infrastructure strategy for which they should be commended. To successfully implement that strategy in the uncertain investment environment facing all new transmission projects across the country, will be an enormous challenge.

At the time the Roadmap was implemented in 2020, the state's transmission company, Transgrid, had no recent history of planning and building new transmission lines. It has taken time to build that capability and now the company is progressing the EnergyConnect project linking New South Wales to South Australia.[74]

One of the reasons for considering contestability in transmission was a belief that to have Transgrid doing all the NSW Integrated System Plan (ISP) projects, REZs and PTIPs was too much single entity risk. It would have been just too many projects for one entity to commission, finance and oversee at the one time. Even allowing for the fact that different contractors ultimately build the projects, the project proponent must manage the contractors successfully.

The argument is just as valid, if not more, in relation to Energy Co. For that reason, its current structure and the REZ program itself should be subject to external review by infrastructure delivery experts before commencing any new projects. The objective should be to establish the best model for project delivery.

Energy Co, since it commenced operating as the Infrastructure Planner under the EII Act, has made significant progress in planning the REZ program. Effectively it is a start-up, that does not have a model suited to the delivery of the REZs. It is overly dependent on consultants meaning the capture of knowledge by the state for future REZs is not protected. Many staff have a policy function that would be more suited to departmental roles. The Department needs to increase its own Roadmap policy resourcing as Energy Co moves into delivery mode

To continue with the current model with such a large infrastructure program presents a significant risk. While Energy Co has recognised the need to change its model, government bodies should not be making their own reform decisions.

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[72] https://www.energyco.nsw.gov.au/industry/network-infrastructure-strategy-nsw#network-infrastructure-strategy-for-nsw
[73] https://www.energyco.nsw.gov.au/industry/network-infrastructure-strategy-nsw#network-infrastructure-strategy-for-nsw P 9
[74] https://www.projectenergyconnect.com.au/

Energy Co's management and resources should be directed to focus on progressing the CWO REZ approval and regulatory processes and reaching financial closure with the ACE Consortium.

Beyond that, aside from ongoing planning and consultation, it would be preferable if no further project procurements are commenced until Energy Co's structure and REZ program have been independently reviewed. An exception could be made for a Priority Transmission Infrastructure Project (PTIP) such as Hunter Transmission Project (HTP) if it is deemed time critical.

To immediately increase understanding across government of the CWO project and REZ program, representatives of the Office of Energy and Climate Change (OECC), Treasury and Infrastructure NSW should be appointed to the Energy Co Advisory Committee (EAC).

Infrastructure NSW's (INSW) Project Assurance division should, while the CWO project is progressing, conduct an Assurance Review on the REZ program that looks at the best structure for Energy Co going forward and future procurement options for the REZs.

Then to ensure effective delivery of the CWO REZ, consideration should be given to using the services of INSW's Projects NSW division to manage the completion of the CWO REZ.

While there will be criticism that this will delay the REZ program, the aim is to ensure that the first project is done in a manner that provides a case study for future REZs. It will also ensure capability to undertake future REZs is retained within the NSW Government.

The affordability impacts of passing through the costs of too many multibillion-dollar REZ projects at once must also be a consideration.

Transgrid priorities

While this prioritisation of Energy Co's program takes place, Transgrid should similarly be pressured to move ahead with the HumeLink project once the findings of the Legislative Council inquiry into undergrounding transmission lines are handed down.[75]

Advice from AEMO and Transgrid is that completion of HumeLink and Project EnergyConnect will enable the development of the South-West Renewable Energy Zone (SW REZ) and provide an immediate boost to the capacity to deliver energy into the Sydney-Newcastle-Wollongong region. This would be the case even if there were further delays to Snowy 2.0.

The objective of these proposed actions is to encourage competition between the two organisations in demonstrating project delivery. At the same time, transmission delivery capability will be geographically and organisationally diversified to provide optionality for future project delivery. A badly managed REZ and transmission program would have major affordability and reliability risks and jeopardise support for the Roadmap itself.

[75] https://www.nsw.gov.au/media-releases/feasibility-underground-transmission-infrastructure

7.3 Governance and processes of broader NSW transmission planning

7.3.1 Background

The Roadmap has created a range of parties involved in transmission planning decisions in NSW. These include the jurisdictional planner Transgrid, the REZ planner Energy Co, the ISP planner AEMO and, through the REZ network project approval process, AEMO Services.

A range of publications are issued on NSW transmission, all of which cover many of the same projects. AEMO provides the biennial ISP (with potential annual updates), Transgrid as the jurisdictional planner issues a Transmission Annual Planning Report (TAPR), while Energy Co recently issued a Network Infrastructure Strategy (NIS).

Separately under the Roadmap legislation, AEMO Services as the Consumer Trustee (CT) issues a 10-year tender plan and 20-year development pathway in its Infrastructure Investment Objectives (IIO) Report, which provides a guide on how Roadmap targets for generation and long duration storage will be realised. The CT considers the timing of network infrastructure projects in developing the IIO Report.[76]

7.3.2 Stakeholders' views

Clarity was seen as lacking in relation to the multiple agencies involved in transmission infrastructure planning in NSW. Separate releases of transmission plans were noted. While Energy Co and Transgrid had cooperated on projects such as the Waratah Super Battery (WSB), awareness of tension was high. While in some ways this was seen as inevitable and many welcomed contestability, there were perceived risks in the current situation.

7.3.3 Findings

It is a complicated picture in relation to NSW transmission infrastructure planning and one where there appears to be tension between the roles of the respective parties, most notably between Energy Co and Transgrid.

It may be argued that such tension was inevitable given the Roadmap broke Transgrid's monopoly on transmission planning, and the CWO REZ process involved a contestable procurement for which Transgrid was not shortlisted. The Check Up makes no judgement on who is responsible for this tension but believes it needs to be better managed in the interests of NSW consumers.

Transmission infrastructure planning skills are in scarce supply and need to be concentrated as much as possible in the one organisation, even if the planner is not always the deliverer of the project.

[76] https://aemoservices.com.au/en/publications-and-resources/infrastructure-investment-objectives-report

Risks arising from REZ transmission infrastructure interfaces

Where a project is done contestably and transmission assets are added to the NSW grid, they must interface so the grid operates in a secure and reliable manner. Any future problems with REZ interface could create risks for the state if generators or consumers are impacted.

As a minimum, all REZs planned and delivered by Energy Co should involve extensive consultation with Transgrid on how they interface with the shared network. That does not mean Transgrid can limit Energy Co's ability to continue with contestable procurements. Procurement approaches should be considered as part of the proposed expert review of the REZ program.

Governance arrangements and supporting processes to achieve the best future approach to transmission infrastructure planning in NSW requires technical specialists with a background in the sector. This review should be commissioned by the NSW Office of Energy and Climate Change.

7.4 Governance and processes supporting generation and storage investments

7.4.1 Background

The role of the Consumer Trustee (CT)

AEMO Services was established as a subsidiary company of the national market operator, AEMO, and was appointed as the CT under the EII Act. AEMO Services has a corporate structure and is subject to oversight by a board. As it has not faced some of the hiring constraints of the general government sector, it has recruited over 60 staff, many with commercial backgrounds.

In its role as the CT, AEMO Services must act independently and in the long-term financial interests of NSW electricity customers. Its key roles include:

- long-term planning in generation, storage, firming and network infrastructure
- authorising network infrastructure projects
- administering tenders to identify the best generation, firming and storage projects to offer Long-Term Energy Service Agreements (LTESAs)
- appointing a Financial Trustee to establish, own and administer the Scheme Financial Vehicle and execute Long-Term Energy Service Agreements.

Procurement outcomes: LTESAs for generation

AEMO Services successfully ran its first tender for generation and long-duration storage LTESAs in 2022, and gave support to four projects in May 2023.[77] It will soon award a second round of LTESAs, and a firming round triggered by a projected breach of the EST following the closure of Eraring. The

[77] The first tender round for generation and long-duration storage received strong interest from the market. Sixteen projects representing more than 4.3GW of generation and long-duration storage were shortlisted to proceed to the financial value assessment. OF the 16 projects, 4 projects (3 generation and 1 storage prokects) were selected and offered LTESAs.

third round of generation and long-duration LTESA auction is also currently underway. The fourth tender round that will allocate generation and CWO REZ access rights is scheduled to commence in October 2023.

The auction processes run by AEMO Services have been highly competitive and ensure the organisation has a strong lens on commercial opportunities in the NSW market. The Federal Government has shown its confidence in AEMO Services by engaging it for its Capacity Investment Scheme (CIS) NSW auction.

The LTESA model established under the Infrastructure Safeguard is described as an insurance product that is more appropriate for market approaches than some of the other government underwritten contract for difference (CfD) arrangements.

LTESAs have provided an avenue for supporting generation that does not rely on the government balance sheet at a time of fiscal challenges.

Procurement outcomes: LTESAs for long-duration storage

In relation to long-duration storage, AEMO Services offers LTESAs that were designed for a high capital risk profile investment such as pumped hydro.

Authorising network infrastructure projects and managing the Scheme Financial Vehicle (SFV)

For network infrastructure projects, the Consumer Trustee (CT) sets a maximum project budget for a REZ and shares this with the Australian Energy Regulator (acting as the Roadmap regulator under the EII Act), but this information is not shared with Energy Co. This regulatory design and process is enshrined in the EII Act and is about to be tested with the CWO REZ authorisation.[78]

The CT also appoints the Financial Trustee (FT) who manages the SFV under the Roadmap.

7.4.2 Stakeholders' views

There was some view that cooperation and alignment of objectives was not always apparent between the CT and Energy Co. The CT was seen by some as overly focused on lowest cost outcomes rather than support for the REZs. The CT claimed in turn that this view reflected a misunderstanding of its role.

The long-duration storage LTESAs were seen as unlikely to achieve the Roadmap targets without a change of criteria. Specific comments were made about the design of LTESAs and whether it is appropriate for supporting higher risk projects, whether it is sufficiently aligned to the uncertain construction costs of pumped hydro and whether LTESAs are at odds with portfolio as opposed to single asset investments. The firming round tender requirement to offer capacity in Lack of Reserve (LOR) events was seen as discouraging participation.

[78] Section 31 of the EII Act states that the CT "must […] set a maximum amount for the prudent, efficient and reasonable capital costs for development and construction of the REZ network infrastructure project […] and must not disclose the maximum amount to any person."

7.4.3 Findings

With the experience the CT has gained and its importance in running LTESA auction rounds, it would be unwise to make any significant changes to the governance and processes supporting generation and long duration storage infrastructure under the Roadmap.

Engagement and information sharing between Energy Co and the CT appears to be less than optimal. Given the objective of the Roadmap was to coordinate generation projects with transmission infrastructure investment, there may be a need to ensure a better alignment of purpose.

The LTESAs are an innovative model but need to address feedback from industry through an ongoing engagement process.

Long-duration storage LTESAs

The CT itself acknowledged that long-duration storage LTESAs alone may not be enough to achieve the Roadmap targets. Allowing a more flexible approach by the CT to long-duration storage may help achieve market objectives. It is important that the CT continues to engage with industry on the LTESA design and considers refinements in response to market developments.

7.5 Governance and processes of the Energy Security Target Monitor (ESTM)

7.5.1 Background

The role of the Energy Security Target Monitor (ESTM)

The AEMO was appointed as the ESTM under the EII Act. AEMO is a member-owned company limited by guarantee. Its membership is divided between federal, state and the Australian Capital Territory governments (60%) and industry (40%). Its industry members are registered NEM market participants and network service providers. It is oversighted by a board appointed by Energy Ministers. AEMO's revenue comes from fees paid by market participants.

The ESTM is responsible for calculating and setting a 10-year energy security target (EST) for NSW, it then makes 10-year projections on the EST, monitors compliance with the EST, and provides recommendations to the NSW Minister for Energy on options to address any projected breach of the EST.

Importantly, the ESTM has significant information-gathering powers under the EII Act and can request material from market participants, including commercially sensitive information such as planned generation closure or entry, and status reports on a transmission infrastructure development. The information obtained can inform its modelling and advice on the ability of the

state to realise the EST based on market developments. Failure to comply with an ESTM request carries penalties.[79]

The ESTM reports are made public in around October each year and follow on from the release of AEMO's annual Electricity Statement of Opportunities (ESOO).

7.5.2 Stakeholders' views

Only a few stakeholders commented on the ESTM and comments were made about the EST methodology, not the ESTM as an agency. Some stakeholders questioned whether the EST provided additional reliability benefits to NSW.

7.5.3 Findings

AEMO has extensive and increasingly complex responsibilities. Its principal obligation is to operate the NEM, the WEM of Western Australia, and the east coast gas markets, but over time it has been tasked with a wide range of additional responsibilities.[80] Its ownership presents a perceived conflict of interest in prioritising NSW.

Without in any way reflecting on the performance or professionalism of AEMO, given the importance of the ESTM role and the significant powers given to it under the EII Act of NSW, it would be more appropriate for this role to be performed by a NSW Government agency singularly focused on NSW energy supply and reliability. The agency could be led by a newly appointed Energy Security Target Commissioner (ESTC) who reports to the Minister and works with the Department.

Even when transferred to NSW, the ESTM should work closely with AEMO and could utilise its modelling capability for projections on the EST. In making recommendations, the ESTM should use its powers to independently review assumptions, request additional material from NSW market participants and make recommendations, not just on actions to address EST breaches, but any matter that may impinge upon the reliability of the energy supply in NSW and could impact the state's consumers.

By using AEMO modelling, the ESTM need not be a large new agency and could be housed within IPART or a Department, so long as it can remain independent and able to assure the security of the sensitive material it may obtain through its information-gathering powers. If the recommendation of the Check Up to establish a NSW Responsible Generator Exit Policy is accepted (see section 8), it is to the new ESTM that generation owners seeking to exit the market would provide details of their plans.

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[79] In that sense, the ESTM's powers are similar to the information gathering powers of the Australian Competition & Consumer Commission (ACCC). https://www.accc.gov.au/about-us/publications/accc-guidelines-use-of-s-155-powers

[80] For example, AEMO is also the transmission planner for Victoria, the Consumer Trustee (CT) in NSW, the architect of the biennial Integrated System Plan (ISP), and has responsibilities to publish a range of short, medium and long term market outlook. AEMO is responsible for the day-to-day management and operation of a range of energy markets, including the NEM, the Western Electricity Market (WEM), the Victorian Declared Wholesale Gas Market (Vic DWGM), the Short Term Trading Markets (STTM), and the Gas Supply Hubs (GSH).

If such a step was taken, it would be consistent with the way the role was envisaged to operate under the EII Act, which in Part 3, Division 1, Clause (4) states that:

> *(4) In preparing the report, the energy security target monitor must—*
>
> *(a) consult with the Secretary and AEMO, and*
>
> *(b) take into account any matters prescribed by the regulations.*

AEMO consulting with AEMO on the EST misses the opportunity for 'peer review' of assumptions that may lead to decisions of significant consequence to NSW consumers. It would strengthen the ESTM to have it located in NSW, utilising the best expertise of AEMO and other experts it might commission to inform its recommendations.

7.6 Regulatory bodies of the Roadmap

7.6.1 Background

There are two agencies tasked with regulatory roles under the EII Act: the Independent Pricing and Regulatory Tribunal NSW (IPART) and the Australian Energy Regulator (AER). Their roles in relation to the Roadmap are discussed below.

The role of the IPART as a Regulator under the EII Act

Besides the AER, IPART is the other regulator appointed under the EII Act. Its role under the Roadmap includes undertaking performance audits on the entities delivering the Roadmap (e.g. the CT, FT, and the Infrastructure Planner). IPART's first annual report was published in October 2022. However, given that at the time of publication the Roadmap was in its infancy and that most agencies began operating in the later part of 2021, the Roadmap agencies had not exercised many of their powers under the EII Act before the IPART annual report was published.[81]

In addition, the IPART is also tasked with providing advice on whether the Renewable Energy Sector Board (RESB) Plan under the Roadmap protects the interests of consumers and is consistent with international trade obligations.[82]

IPART has other roles in NSW energy such as overseeing network license obligations, network reliability standards, operating schemes such as the Energy Saving Scheme (ESS) and conducting reviews into the retail market.

The role of the AER as a Regulator under the EII Act

Besides IPART, the AER is another regulator under the EII Act. It is a subsidiary of the ACCC and has a five-member board. Under the EII Act, the AER has a number of statutory functions (in addition to its functions under the national regulatory framework), including:

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[81] https://www.ipart.nsw.gov.au/sites/default/files/cm9_documents/Annual-Report-Electricity-Infrastructure-Investment-Act--to-Minister-for-Energy-October-2022.PDF

[82] NSW Electricity Infrastructure Roadmap | IPART

- applying a transmission efficiency test (TET) to authorised REZ network infrastructure projects
- approving a risk management framework developed by the CT
- reviewing tender rules in relation to LTESAs.

The AER was appointed under the Roadmap to review network infrastructure projects to ensure expenditure on REZ is prudent and efficient by applying a TET. It does not approve the Roadmap projects, but applies an additional layer of scrutiny to project expenditure.

The AER also has to oversight the Roadmap cost pass-through mechanism, which involves NSW distribution businesses recovering costs from NSW consumers. In 2022 the AER published its NSW Electricity Infrastructure Fund Contributions Determination Guideline, which sets out how the AER intends to make a contribution determination to recover the costs associated with the Roadmap.

The relevant costs include costs associated with REZ and PTIP infrastructure investments, potential costs arising from LTESAs contracts, and administrative costs of the Roadmap entities.[83] The costs are ultimately recovered from NSW distribution network service providers (DNSPs) who then pass the costs, through retailers, to NSW electricity consumers. The AER is required to make an annual contribution determination informed by the amount required for the scheme financial vehicle to meet its cashflow needs and liabilities. This approach under the Roadmap is designated as a jurisdictional scheme under the National Electricity Rules (NER) and this enables the contribution amounts to be passed on to NSW customers through DNSP charges.

In making the contribution determinations the AER must consider the need for an equitable allocation of the costs using the volumetric energy demand and the peak demand in the previous financial year as a guide.

In line with their requirement to pass through costs, the three NSW distribution businesses each put forward a recovery methodology. Not all methodologies are aligned, which creates added complexity and potential inequity.

The AER now has a designated team assigned to the Roadmap and significant experience in network regulation under the National Electricity Law (NEL). Again, it would be unwise to make any changes.

7.6.2 Stakeholders' views

Few stakeholders had a view about the respective regulators under the Roadmap as the processes had not been fully tested. There was a view from some consumer groups that the CT providing a network project budget to the AER, not Energy Co, was appropriate, even though it was questioned by Energy Co. There was also a view that as the Roadmap cost pass-throughs increase, the regulators' decisions will attract more public attention.

[83] The cost of the Roadmap is managed through the use of the Electricity Infrastructure Fund which is managed by the scheme financial vehicle.

7.6.3 Findings

IPART

Along with the Office of Energy and Climate Change (OECC) and Energy Co, IPART is the NSW government agency with the greatest energy expertise. Given its energy expertise and history, IPART could potentially house the proposed Energy Security Target Commissioner (ESTC).

IPART has significant energy expertise that is at present underutilised by the Roadmap. For these reasons, its role could be expanded to include the ESTM. Having an organisation with a culture of independence and consumer protection may be helpful to ensure the ESTM makes decisions that consider the impacts on NSW consumers.

Australian Energy Regulator

As the AER has experience in national network regulation and project approval, having it play the role of Roadmap regulator is a sensible arrangement. The AER has resourced its role under the Roadmap appropriately.

There is also an advantage in having the AER involved in Roadmap cost recovery. It has visibility on the way additional costs from the Roadmap add to the charges for nationally approved network projects under the ISP, and overall movements in electricity prices under the DMOs. It can provide ongoing advice to the NSW government on the sustainability of Roadmap costs.

Consumer groups clearly have a view that exempting transmission connected businesses places a disproportionate burden on smaller customers for Roadmap costs. The AER is an appropriate body to advise the NSW Government on a review of these exemptions.

7.7 Advisory bodies of the Roadmap

7.7.1 Background

Electricity Infrastructure Jobs Advocate

The Electricity Infrastructure Jobs Advocate, Dr Mark Apthorpe, was appointed on 7 March 2022.[84] The Check Up consulted with Dr Apthorpe and was provided with reports on his visits to all NSW REZs. Dr Apthorpe has a background in transport and logistics. As the first REZ is about to enter the construction phase, CWO should be the immediate focus of the Advocate.

In terms of the RESB created under the Roadmap legislation, no consultation was held but a member of the RESB was on the Check-up Expert Panel. Some comments on the RESB are made in Chapter 8.

[84] https://psnews.com.au/nsw-senior-appointme/apthorpe-first-electricity-jobs-advocate/

7.7.2 Findings

Electricity Infrastructure Jobs Advocate

With much of the early implementation of the Roadmap, transport, construction and logistics issues will be critical. A briefing from Dr Apthorpe to the Roadmap Intergovernmental Steering Committee (RISC) should occur as soon as possible. With Central-West Orana (CWO) REZ to be the first REZ, the Jobs Advocate role should focus on opportunities and training requirements in this region.

7.8 Other agencies relevant to the Roadmap

7.8.1 Energy Security Corporation (ESC)

The Energy Security Corporation (ESC) was a promise made by the then opposition, now government, to establish an entity like the Federal Clean Energy Finance Corporation (CEFC) with a $1 billion injection from the Restart NSW Fund.[85] The ESC was to offer funding support for key technologies such as pumped hydro and community batteries.

Given the challenges facing the Roadmap, getting the funds into the market should be the priority. Using an existing body would make this possible. A mandate that is technology neutral and focused on areas of market need such as storage and small grid enhancements is recommended.

As with other Roadmap bodies, the ESC could be progressed within an existing body. This would allow the $1 billion to be injected into the market sooner and overcome the challenges of recruiting staff.

The CEFC provides an option to manage the fund on behalf of the NSW Government, potentially through a subsidiary company with a NSW-appointed board operating to priorities set by the NSW Government.

7.9 Overall governance of the Roadmap as an infrastructure investment framework

The Roadmap governance structure is a complex one, especially when overlaid with the existing NEM governance. It is not surprising it has taken some time to establish and begin the process of achieving the Roadmap infrastructure objectives. Once understood, feedback from the private sector about the Roadmap institutions has mostly been positive.

The Roadmap agencies are, however, competing for talent in a competitive market for energy expertise. Implementation capability will therefore remain an ongoing challenge. For that reason, using existing agencies is a prudent step, if those agencies can give sufficient focus to the interests of NSW.

[85] https://www.afr.com/policy/energy-and-climate/nsw-labor-promises-1b-for-government-owned-energy-corporation-20230219-p5clna

This is relevant to the promise of the Minns government to establish the Energy Security Corporation (ESC) with a $1 billion injection from the Restart NSW fund to invest in key technologies such as long-duration storage and community batteries.[86]

7.9.1 Stakeholders' views

Broad support for the Roadmap was apparent amongst virtually all external stakeholders. While it was understood that following a change of government it was appropriate to review the Roadmap settings, the TOR restating support for bipartisanship was welcomed.

Within government agencies, understanding of the Roadmap was mixed but its importance to the state's future electricity supply recognised. There was a desire to offer support with resource limitations being the major barrier. The logistics of supporting major regional projects such as the REZs were challenging for existing infrastructure such as roads.

Some stakeholders warned about the engineering and cost challenges of the Roadmap's ambition. The generally challenging environment for infrastructure projects was frequently noted. Issues specific to the energy sector such as international competition for equipment and social license from landholders were seen as broader than NSW.

In the energy sector there is an appreciation that NSW is facing the most immediate reliability challenges from exiting capacity. For that reason, it was recognised why NSW had chosen to adopt its state-based framework. That framework was seen as more comprehensive and less threatening to private investors than other models.

7.9.2 Findings

A whole-of-government approach is required

Simply relying on the Roadmap institutions to deliver an historic transition to the state's energy system is unlikely to deliver a timely and effective transition. The Roadmap still takes place within the NEM and there will need to be alignment with NEM processes.

The scale of the Roadmap investment of $32 billion in the regions is such that for the State Government to leave it to the Roadmap agencies is to underestimate the challenge. The scale of that challenge is such that a whole-of-government approach will be required.

There has been no comparable regional infrastructure program in history, including the building of the original Snowy Mountains Scheme or the massive development program of the Electricity Commission of NSW in the 1970s and 1980s.

The Roadmap should be seen as a transformational state-sponsored infrastructure program that is critical to achieving the government's Net Zero by 2050 Target. While Net Zero will not rely solely on electricity system decarbonisation, it will be the biggest contributor.

[86] https://www.yasmincatley.com/news/media-releases/labor-to-create-the-nsw-energy-security-corporation-delivering-a-secure-energy-transition-through-investment-not-privatisation/

The government's decision to establish a new Net Zero Commission (NZC) will increase scrutiny of policies such as the Roadmap aimed at delivering on legislated emission reduction targets. It will see the Roadmap put in the context of a challenge that goes beyond the energy sector. The Roadmap alone cannot achieve Net Zero.

This Check Up formed the view that across government, understanding of the Roadmap was not as high as it should be. Secondly, that the Roadmap bodies were operating without sufficient oversight. A continuation of this siloed approach increases risks for NSW.

As such, it is recommended that the Roadmap be added to the list of Premier's priorities for NSW. Coordination of delivery of that priority should be led by the Roadmap Intergovernmental Steering Committee (RISC) that is Chaired by the Office of Energy & Climate Change (OECC).

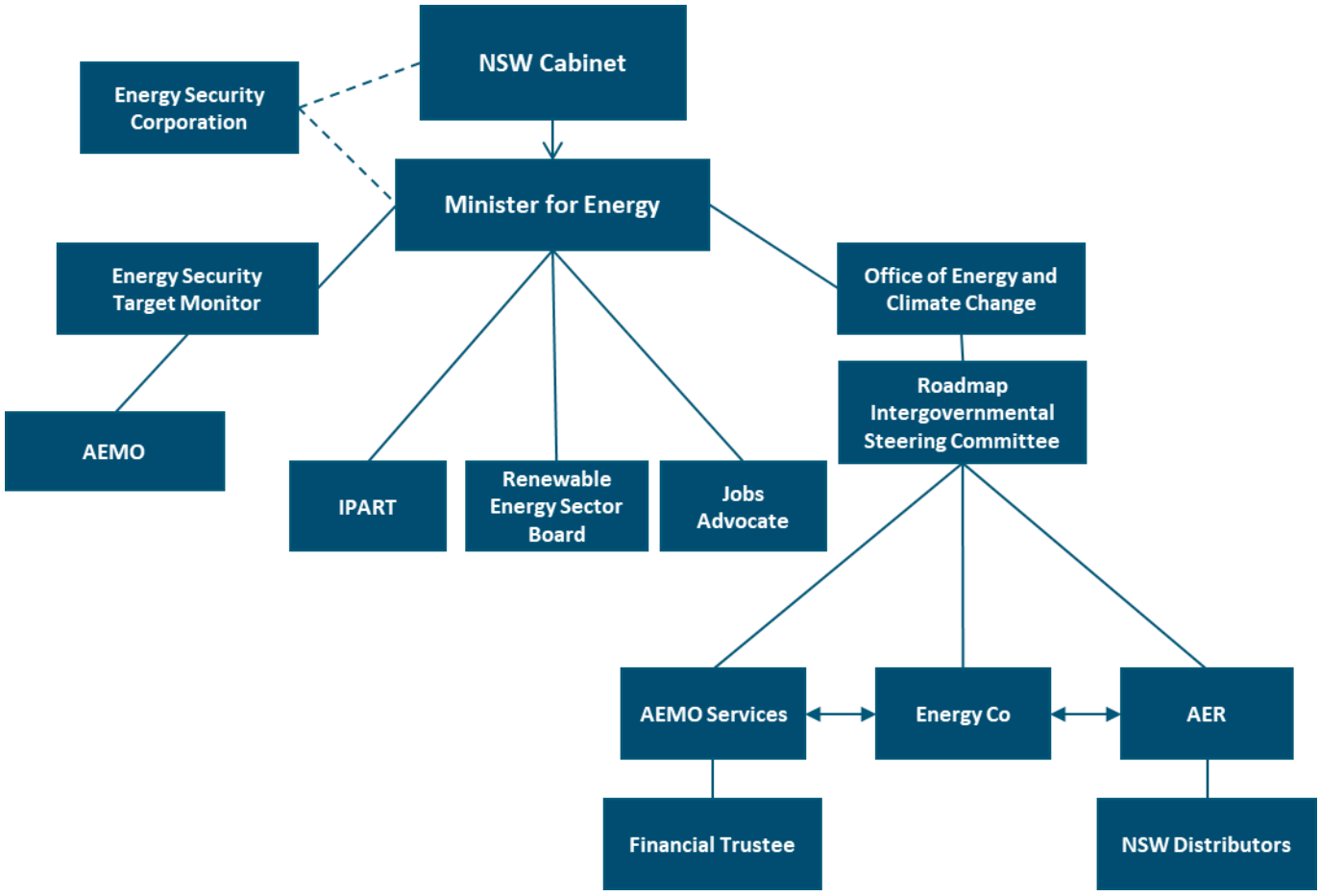
Engagement by the central agencies such as Treasury, Premier and the Cabinet Office will also be critical to ensuring a coordinated and financially disciplined delivery of the Roadmap.

7.10 Recommendations

1. That successful implementation of the Roadmap be added to the list of Premier's priorities for the state of NSW.
2. The current Roadmap Intergovernmental Steering Committee (RISC) be confirmed as having responsibility for coordinating whole-of-government implementation responsibility for the Roadmap. The RISC should include representatives of critical agencies such as Planning, Education, Transport, Treasury, Housing and Regional Development, as well as the Roadmap entities. The RISC should provide quarterly status reports to the NSW Secretaries Board to further support whole-of-government focus on the Roadmap.
3. The Energy Security Target Monitor (ESTM) should be transferred to a NSW agency with a target date of 1 July 2024.
4. The new ESTM should be led by an independent Energy Security Target Commissioner (ESTC) who oversees the Energy Security Target (EST) and reports to the Minister.
5. The ESTM should continue to engage the current monitor, AEMO, for modelling of the Energy Security Target (EST).
6. Consideration should be given to amending the EST methodology to align with the National Electricity Market (NEM) once the current review of the NEM reliability standard by the Australian Energy Markets Commission (AEMC) is complete.
7. The Minister should direct Energy Co under section 8(5) of the Energy and Utilities Administration Act 1987 to focus on financial closing of the Central-West Orana REZ, and, if deemed time critical, Priority Transmission Infrastructure Projects like the Waratah Super Battery (WSB) and Hunter Transmission Project (HTP).
8. Representatives of the Office of Energy and Climate Change (OECC), Treasury and Infrastructure NSW (INSW) should immediately be appointed as full members of the Energy Co Advisory Committee (EAC).

9. Before any procurement processes occur for future REZs, INSW should conduct an Assurance Review of the REZ program and assess procurement approaches and delivery focused structures for Energy Co.
10. Consideration should be given to engaging INSW's Projects NSW division to oversee the construction of the Central-West Orana (CWO) REZ by the first ranked ACE Consortium.
11. Once the Upper House inquiry into underground transmission is complete, should Transgrid not proceed with a final decision on the HumeLink project then consideration should be given to directing Transgrid to carry out the project as a Priority Transmission Infrastructure Project under s.34 of the Electricity Infrastructure Investment Act 2020.
12. To ensure an alignment of generation and network objectives in the Roadmap, information sharing arrangements between Energy Co and AEMO Services Ltd (Consumer Trustee) should be enhanced with a Joint Coordination Committee (JCC) of both organisations put in place.
13. Once the Central-West Orana REZ (CWO REZ) reaches financial close, a review of the approval process should be conducted to see if there are opportunities to make decisions faster.
14. The NSW Government together with NSW distribution networks should work with the Australian Energy Regulator (AER) on a common methodology to recover Roadmap costs. The government should closely monitor forward projections on estimated Roadmap recovery costs to ensure that affordability objectives are maintained.
15. The exemptions framework for Roadmap costs should be reviewed and also consideration given to including transmission-connected businesses to reduce the burden on small customers.
16. The Electricity Infrastructure Jobs Advocate should immediately brief the energy minister on skills and training requirements and construction and logistic challenges in the Central-West Orana REZ (CWO REZ).
17. Consideration should be given to establishing the proposed Energy Security Corporation (ESC) as a subsidiary of the Clean Energy Finance Corporation (CEFC) with a NSW-appointed board and mandate focused on market needs rather than specific technologies.
18. Under s.21(2)(b) of the Energy and Utilities Administration Act 1987, the Minister should commission an expert review of current Transmission Planning arrangements in NSW to reduce duplication and advise on the best approach to ensuring coordination between the Roadmap bodies (Energy Co, Transgrid, AEMO, AEMO Services).
19. Consideration should be given to ensuring a new REZ requirement for final design and interface with the shared network to be reviewed by Transgrid.

Figure 16: Potential Roadmap Governance Diagram based on recommendations



8. Residual risks from the closure of the Eraring Power Station

The Check Up required an assessment of the residual reliability and price risks for NSW consumers should the Eraring Power Station close in 2025. It also required a review of the controls available to mitigate these risks, including existing mechanisms under the Roadmap; the need for additional initiatives or programs; and the need for alternative forms of energy infrastructure to maintain reliability and security.

8.1 Introduction

On 17 February 2022, the publicly listed Origin Energy Ltd, owner of the coal-fired Eraring Power Station, advised the Australian Stock Exchange (ASX) that it had submitted notice to the AEMO of "the potential early retirement of the Eraring power station in August 2025".[87]

At the time of its announcement, which fulfilled the NEM's minimum 42 months' notice of closure provisions[88] introduced after the Hazelwood closure in 2017, Origin Energy stated, "we intend to utilise the Eraring site beyond the retirement of any closure of the coal fired power station, with plans to install a large-scale battery".

At the time of writing this report, Origin Energy is yet to announce any changes to its "potential retirement" date of August 2025. Therefore, the potential reliability and price risks to the NSW electricity system arising from the exit of Eraring Power Station at this date, a little more than two years away, are the subject of this chapter.

This chapter first provides an overview of the Eraring Power Station as a background to the discussions on the key considerations included in the TOR:

- the residual reliability and price risks for NSW consumers from the potential 2025 closure of the Eraring Power Station
- existing mechanisms under the Roadmap, and whether they are flexible enough to adapt to additional early closures of coal-fired generators
- any additional state or national initiatives or programs required to support the Roadmap
- the need for alternative forms of energy infrastructure than those currently being pursued under the Roadmap.

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[87] Origin Energy. (2022, February 17). Origin proposes to accelerate exit from coal-fired generation. https://www.originenergy.com.au/about/investors-media/origin-proposes-to-accelerate-exit-from-coal-fired-generation/

[88] https://www.aer.gov.au/wholesale-markets/notice-of-closure-exemptions#:~:text=National%20Electricity%20Market%20generators%20are,applicants%20are%20required%20to%20submit.

8.2 Overview of the Eraring Power Station

The Eraring Power Station was built by the NSW Electricity Commission and began operations between 1982 and 1984. It has four 720 MW units and an additional 42 MW diesel generator. With a total capacity of nearly 3 GW, it is the largest single generator in NSW and the National Electricity Market (NEM).[89] It accounts for around 20% of NSW's current electricity needs.

Origin Energy acquired the Eraring station from the NSW Government in 2013 for $50 million.[90] While Origin had previously flagged that its retirement date would be earlier than the end of its technical life in 2032, the bringing forward of that date by seven years to 2025 has created a significant challenge for the NSW energy transition.

Based on performance data from AEMO and advice from Origin Energy, it appears that the plant continues to perform operationally. The equivalent availability factor (EAF) has been around 80% in recent years and the forced outage rate is lower than the average of coal plants in the NEM.[91]

Eraring is better equipped than some other NSW generators to ramp electricity production up and down each day in line with the variations in operational demand caused by rooftop solar PVs.[92] Located on the shores of Lake Macquarie, it utilises sea water rather than fresh water for cooling, so faces lower risks from drought.

The Eraring has a rail loop that allows for deliveries of coal from the Hunter Valley, while also being connected by conveyors to neighbouring coal mines operated by Centennial Coal at Myuna[93] and Mandalong.[94] The plant therefore has a high degree of fuel security and diversity.

On 20 April this year, Origin Energy announced to the ASX it had financially committed to a new 460 MW two-hour battery at the Eraring site at a cost of $600 million.[95] It has the option of increasing that battery to 700 MW and four hours of duration in the future. It is understood the operations of the coal plant do not impact this battery proposal as they are physically removed and on a separate connection.

The battery proposal is consistent with what has happened at other NSW coal generation sites such as Liddell, where alternative energy uses for the site have been approved.[96] The high-capacity transmission connections at the coal plants remain an asset to the owners beyond the life of the plants.

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[89] https://www.originenergy.com.au/about/who-we-are/what-we-do/generation/eraring-power-station/

[90] https://www.originenergy.com.au/about/investors-media/acquisition-of-eraring-energy-20130801/#:~:text=On%201%20July%202013%2C%20Origin,to%20Origin%20of%20%24300%20million.

[91] The EAF represents the percentage of time the power station is available to generate relative to its theoretical maximum output including, for example, the consideration of de-rating of the power plant. Eraring's EAF for FY20, FY21 and FY22 was 79, 83 and 81.4 per cent, respectively. Eraring has a lower equivalent forced outage factor relative to other coal-fired plants in the NEM – 5 per cent compared to the weighted average benchmark of 11.8 per cent for coal fired plant. (Figures received from Origin Energy.)

[92] https://www.afr.com/companies/energy/model-flexible-coal-plant-set-for-early-closure-by-2032-20220110-p59n6f

[93] https://www.centennialcoal.com.au/operations/myuna/

[94] https://www.centennialcoal.com.au/operations/mandalong/

[95] Australian Stock Exchange announcement. "Origin approves construction of large-scale Eraring batter". 20 April 2023.

[96] https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2022/march/agl-s-hunter-energy-hub-takes-shape-with-liddell-grid-scale-batt

8.3 Residual reliability and price risks for NSW consumers from the 2025 closure of the Eraring Power Station

8.3.1 Reliability impacts of the closure of Eraring

The most recent reports on the reliability risks to NSW arising from the closure of Eraring are the 2022 Energy Security Target Monitor (ESTM) Report and the recently updated 2022 Electricity Statement of Opportunities (ESOO). [97] The 2022 ESTM forecast a projected breach of the Energy Security Target (EST) after allowing for the closure of Eraring. The breaches (i.e. the 'missing capacity' needed to avoid violating the reliability metric) was 262 MW capacity in 2025-26 and 62 MW capacity in 2026-27. The updated 2022 ESOO showed a projected breach of the Interim Reliability Measure (IRM) in NSW after the closure of Eraring of 450 MW in 2025-26 and of 560 MW in 2026-27, with the gap continuing to increase over the 10-year assessment.

Both reports were completed before it was officially announced that the Snowy Hydro 2.0 project would be delayed until December 2029, and before the release of the NSW Network Infrastructure Strategy (NIS), which shows the earliest delivery date of the CWO REZ as in 2027. They were also completed before the recent announcement of an extension to the Vales Point coal plant to 2033.[98]

Reliability assessment methodologies

It is important to note that while both the 2022 ESTM Report and the updated 2022 ESOO formed a similar conclusion, the ESTM Report and the ESOO operate to different reliability metrics. This difference in methodology is a key contributor to the differences in the reliability assessment outcomes in the two reports.[99]

The ESTM Report is based upon the EST methodology included in the EII Act, while the ESOO operates to the NEM reliability standard, with an additional assessment based upon a lower unserved energy threshold as part of the IRM.

The models underpinning the assessments in the two reports also have different assumptions. For example, the NSW-specific ESTM does not currently consider the availability of generation in neighbouring regions through the interconnectors. Nor in relation to short duration storage does it consider the full availability of energy during periods of supply scarcity.

AEMO in its role as the ESTM went on to recommend further investigations of these factors in future versions of the relevant NSW regulations to ensure EST assessments accurately describe the risks to NSW electricity consumers.[100] To date, this recommendation by the ESTM has not been acted on. There is a question as to whether the use of differing approaches to reliability (i.e. the EST methodology and the lower unserved energy threshold as part of the IRM) is adding value in assessing reliability.

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[97] Update to 2022 Electricity Statement of Opportunities (ESOO) 2022. February 2023. P 11

[98] This Check Up is required to be completed prior to the release of the 2023 ESOO and the 2023 ESTM Report which are likely to include these market developments, so we will have to work with the potentially outdated 2022 assessments.

[99] An overview of the NEM reliability framework and recent reforms such as the IRM are included in Appendix 5.

[100] Energy Security Target Monitor Report. AEMO. October 2022. P 4

8.3.2 Affordability impacts of the closure of Eraring in 2025

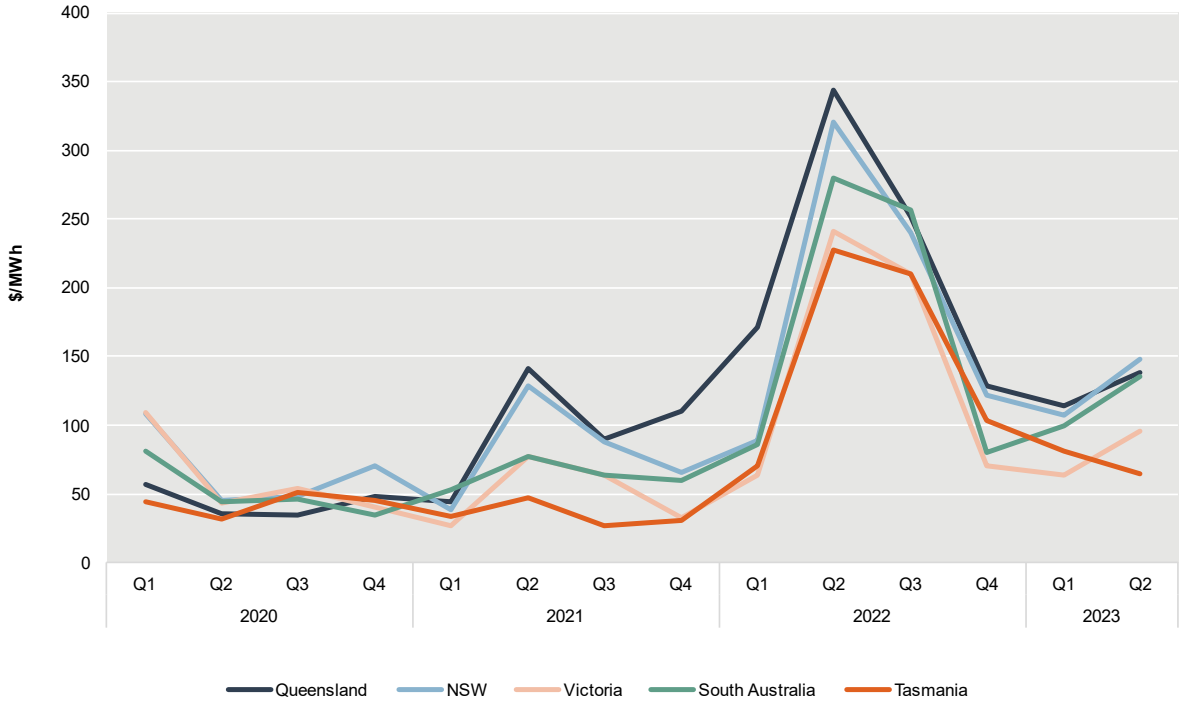
In undertaking their analysis of the Eraring closure in 2025 on reliability in NSW, neither AEMO nor the ESTM were able to provide guidance on the price impacts. While this Check Up was not provided with any modelling on the price impacts of the Eraring closure, there are precedents that can provide some guidance.

All discussions that occurred during this Check Up recognise that a tight supply-demand balance in the market generally means higher wholesale energy prices. Based on the ESTM Report and the updated 2022 ESOO, it is clear such a tight balance will be apparent in NSW from 2025-26.

Experience with other coal closures also indicates that the shorter the notice period, the greater the impact. The Hazelwood closure in Victoria in 2017 occurred with just five months' notice and led to a sustained increase in wholesale energy prices across the NEM. More recently, the Liddell closure in NSW in April 2023, for which seven years' notice was given, has led to an upward trend in NSW wholesale prices.

The AER's Wholesale Markets Quarterly Report for Q2 2023 showed that prices across the NEM increased in all regions from Q1 2023, with NSW showing the highest increase from $107 per MWh to $148 per MWh. While this was below the extreme prices of Q2 2022 (post-Ukraine conflict) and can be partly attributed to the onset of winter, the magnitude of the increase in NSW must in part be attributed to the loss of Liddell's capacity.

Figure 17: Quarterly wholesale electricity price movements – AER



Source: AER Wholesale Markets Quarterly Update. Released 20 July 2023

A price increase after the closure of Liddell is consistent with modelling undertaken for the Federal-State Liddell Taskforce by Frontier Economics. It predicted a slight increase in NSW wholesale prices after the closure, even with the entry of replacement capacity. At the time, the forecast price was $75 per MWh in NSW.

The Frontier Economics modelling was completed before the impacts of the Ukraine conflict on coal and gas prices in 2022. As shown in the preceding graph, the impact of that conflict since early 2022 on wholesale energy prices has been significant. Even after allowing for the intervention by the federal and state governments to cap domestic coal and gas prices later in 2022, prices have remained above the levels of 2020-21 in NSW.

These increases flowed through into the recent 2023-24 DMO prices in NSW, where the wholesale energy component was over $150 per MWh[101], or more than twice what was assumed by the Liddell Taskforce.

Recently, domestic and global coal and gas prices have moderated, but if Eraring's closure were to lead to a further impact on NSW wholesale energy prices in 2025, it would be from an already high base. The impact on households during a cost-of-living crisis and on business competitiveness must be considered. The NSW generation prices are already higher than those in other states.

8.3.3 Stakeholders' views

Not all stakeholders had a common view on an Eraring extension being a threat to reliable supply in the state. Few disputed that current projects were subject to the risk of delays and that generation exits are often associated with price increases.

Some had the view that to extend Eraring ran the risk of deterring new investment in replacement projects. Others believed any funds invested in supporting an Eraring extension would be better spent on other mitigants. All recognised that it would be at odds with emissions reduction targets.

Even those who advocated for a temporary extension believed that a NEM-managed exit policy was critical. In the absence of a NEM framework, a NSW exit policy should be established. All believed more certain dates for exits would help with managing the transition.

8.3.4 Findings

With the AER reporting an increase of 19% in customers entering hardship programs in Q1 2023, the case for an extension of Eraring on affordability grounds appears strong. Combining it with the proposed reliability gaps identified by AEMO, it is clear cut under an energy trilemma framework.

The NSW government should therefore put in place a framework to engage with the owner of Eraring, Origin Energy, on the nature of such an extension.

If Origin believes it will impact the company financially, it should be required to demonstrate this to the ESTM and provide all relevant commercial information.

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[101] Australian Energy Regulator. DMO 2023-24. Final wholesale price estimates. ACIL Allen. P 27

Any Eraring extension needs to be accompanied by a managed exit framework to avoid a reoccurrence of the current situation in the future. Even if Eraring is extended there are risks with ageing coal plants that need to be mitigated.

8.4 Roadmap mechanisms and Eraring closure

8.4.1 Background

As a result of the projected breach of the EST, actions in line with those enabled by the Roadmap and associated legislation had been taken to help address the reliability risks. These include proceeding with two Priority Transmission Infrastructure Projects (PTIPs): the Waratah Super Battery (WSB) and the Hunter Transmission Project (HTP). In addition, the Consumer Trustee (CT) has commenced preparation to procure 380 MW firming capacity, which has now been increased to 930 MW by allowing for additional procurement under the new Federal Government Capacity Investment Scheme (CIS).[102]

While these actions need to be recognised as mitigants to the reliability gaps noted by AEMO in the ESOO and the ESTM Report, the outcome of the CT firming tender will not be known until later this year, while the HTP will clearly take longer than two years to complete.

All projects, such as the WSB, HTP and those successfully securing firming LTESAs through the CT, are subject to construction/delivery risk. In recent times, those risks in relation to energy projects have been at heightened levels.

To rely on these projects as mitigants to an Eraring closure in August 2025 would be to expose the meeting of reliability targets to 'construction risk'. In the present environment, this is clearly a significant residual risk.

8.4.2 Stakeholders' views

There was a consensus that delivery risks with new energy infrastructure were high, especially in relation to transmission and pumped hydro projects. It was acknowledged that initiating a tender for capacity takes time and could favour projects already underway. As such, the mechanisms to respond to reliability breaches were seen as unlikely to manage the time frames of coal exits.

There was also a view that pumped hydro as a preferred way to achieve long-duration storage targets was the most obvious area where the Roadmap approach to long term reliability may have to adjust.

The costs and engineering risks of pumped hydro were seen as a significant deterrent for private investors. Most thought that further options to support pumped hydro will need to be considered by the government. This could present a role for the proposed Energy Security Corporation (ESC).

[102] https://minfister.dcceew.gov.au/bowen/media-releases/joint-media-release-capacity-investment-scheme-power-nsw-clean-cheap-reliable-energy

8.4.3 Findings

It is very unlikely that NSW will achieve the 2 GW long-duration storage (LDS) target in the Roadmap if it is restricted to pumped hydro. More assistance to private investors than currently offered by the Roadmap is likely to be required if pumped hydro projects are to reach financial close.

The first new private sector pumped hydro project being developed in the NEM is the Kidston Pumped Hydro Project in Queensland. It is a 250 MW eight-hour project being built for an estimated cost of $777 million (or $3,100/kW). The project has received a $610 million funding facility from the Federal Government's Northern Australia Infrastructure Facility and an additional $47 million grant from the Australian Renewable Energy Agency (ARENA). [103]

Whether it is cost-effective for the state to offer such generous assistance to pumped hydro is open to question. Considering a more flexible approach to storage needs is likely to be a better approach for NSW consumers.

What is clear is that by comparison to a Snowy 2.0 or the proposed Borumba Dam project in Queensland, NSW long-duration storage projects developed by the private sector will be smaller scale. They are likely to require greater support than storage LTESAs and the Pumped Hydro Refundable Grants (PHRG) to reach financial close.

8.5 The need for additional initiatives or programs to address reliability risks from early exit of coal generators

8.5.1 Background

As previously noted, Eraring does not appear to be limited by operational or fuel security considerations, nor would it prevent the development of alternative projects at the site by Origin Energy.

As also noted, Eraring continues to perform operationally. The equivalent availability factor in recent years has been around 80%, and the forced outage rate is lower than the average of coal plants in the NEM.

However, coal plants of Eraring's age do require an ongoing maintenance cycle, forward contracts for coal, and assurance for skilled and increasingly scarce workers. Any decision to extend Eraring's operation cannot be left until the cusp of 2025. The issue should ideally be resolved sooner rather than later. The question is whether, based on reliability and affordability risks, such an extension is warranted.

In recommending a possible extension to Eraring, it is acknowledged that extending coal can only be seen as a temporary measure on the road to Net Zero. Criticism may be levelled that it is 'kicking the can down the road', deterring new investment and setting back 2030 emissions reduction targets.

[103] https://genexpower.com.au/250mw-kidston-pumped-storage-hydro-project/

If the extension is temporary, the risk of deterring new investments is limited. Similarly, any delays to emissions reduction will be temporary and driven by the need to ensure reliability and affordability. In response to the challenges of the conflict in Ukraine last year, even climate leaders such as Germany decided to temporarily re-open coal plants.[104]

New South Wales coal plants are ageing and as previously noted, increasingly operating in a manner they were not designed for. They are, in many cases, more than 40 years old. Aside from already showing higher forced outage rates, the risk of a major failure increases.

In Queensland, such a significant failure recently occurred at the Callide C plant. Since that event, Queensland energy prices have increased.[105] The cost to repair the failed unit is estimated to be in the hundreds of millions and will now sit with the Queensland Government. Were such an event to occur in NSW, it is unlikely a private sector owner would repair the plant.

The risks to an industry perceived to be reaching the end of its life increase. Critical workers are increasingly hard to retain and replace, maintenance becomes more complicated, replacement parts difficult to source, and coal supply arrangements subject to uncertainty.

As such, while accepting the need to extend coal plants to allow for the delays to Roadmap transmission and long-duration storage targets, the Government will need to work with industry to ensure these risks are mitigated.

The desire for an 'orderly' and managed exit of coal generators is not specific to Australia.

The World Bank for example has commenced work to facilitate the exit of coal generators in its member developing countries through designing a series of reverse auctions. See the box below. Germany has also implemented a series of 'hard coal exit auctions'.

[104] https://www.bloomberg.com/news/articles/2022-10-21/germany-bolsters-coal-fired-power-to-meet-winter-power-demand
[105] https://www.afr.com/companies/energy/energy-grid-fears-as-callide-c-return-delayed-until-mid-2024-20230529-p5dc90

World Bank – Reverse auctions for coal exit

Coal generators have been the foundation for electricity provision in large parts of the world and they can have lifetimes of over 50 years. Many asset owners face financial challenges in shutting them down. An accelerated shutdown of coal generators faces barriers at the asset and grid level and causes reliability, political and social challenges.

The World Bank, supporting its client countries to achieve their commitments under the Paris Agreement, is currently exploring options for coal transition activities, including the decommissioning of coal power plants. One of the options to provide financial incentives for a phase-out is the use of reverse auctions.

Reverse auctions could serve as a mechanism for price discovery and the distribution of financial incentives.

Source: The World Bank. 2022. *The Use of Auctions for Decommissioning Coal Power Globally*, by The World Bank, Washington, DC, available: http://hdl.handle.net/10986/38213

8.5.2 Stakeholders' views

A support for some kind of NEM-managed generator exit policy was considered critical by most stakeholders. Some suggested that a comprehensive approach as part of a structural adjustment plan, similar to the one implemented in Germany, was a good starting point.

Many stakeholders considered that, in the absence of a NEM framework, a NSW exit policy should be established. All believed more certain dates for exits would help with managing the transition.

8.5.3 Findings

Even with an extension to Eraring, it and other generation exits should not be managed under the current approach. With Vales Point officially extended to 2033, Eraring's retirement will be the first of four coal exits to manage. Continuing reliance by the state on the NEM's uncertain and light-handed generation exit provisions, while attempting to manage the replacement generation through the Roadmap, is a risky pathway for NSW consumers.

Given the risks and delayed emissions reduction associated with coal extensions, it is important to consider additional options to progress the NSW energy transition while the Roadmap REZ and long-duration storage projects experience delays. These measures are all complementary to the objectives of the Roadmap in phasing out coal and replacing it with firmed renewables, storage and firming infrastructure.

National policy – Orderly Exit Mechanism (OEM)

There have been discussions for some time in the NEM forums about a 'managed coal generator exit policy'. NSW has appropriately taken the lead in these discussions given it faces the highest short-term risks of disruptive exits.

Particularly in relation to any payment framework, it would be preferable if a NEM exit policy could be put in place. Through a contagion effect on the NEM, other states' consumers will be impacted by NSW closures in the same way NSW was impacted by the exit of Hazelwood in Victoria.

NSW-specific policy – 'Responsible Generator Exit Policy'

While there have been a range of discussions in NEM forums about a controlled or managed exit policy for generation, to date, one has not been established. Those discussions remain current, but do not negate the need for a formal NSW mechanism. The NSW situation is different to other states.

Such a mechanism should be transparent and bring scrutiny to the exit decisions of major players. Those companies intend to be major retailers for the long-term in NSW, and they have invested substantially in their brands. In the retail market, they must compete for customers with over 30 alternative suppliers.

Customer pressure from a public review of the affordability, reliability and sustainability implications of any decision to close major generators will encourage market players to think twice about any premature exits.

This will not impinge on an owner's ability to operationally manage a coal generator in line with variations in demand and prices during a day, and between seasons. Nor should a company be expected to operate a loss-making plant. The objective is to encourage the major generation owners to work with the government to align the timing of exits with the entry of new capacity. Approaches like staging the exits of plants over time may help achieve this objective.

An independent, public and powerful NSW reviewer (not approver) to whom exit decisions must be submitted is recommended. A version of this approach applying to all exits was recommended in the Federal-State Liddell Taskforce in 2020. The Liddell Taskforce recommended that "a consistent and measured process to assess the impact of future closures similar to that undertaken by this Taskforce….at least 3.5 years before an expected closure".[106]

Under a NSW specific 'Responsible Generator Exit Policy', any generation owner proposing to close a plant must provide all details to the ESTM at least three years prior to closure. It encourages owners to work with the state in avoiding too much disruption to customers from generation closures.

The logical body to perform a role under the Roadmap, is the ESTM, which has significant information-gathering powers. This would allow the ESTM to fully assess the reliability and affordability impacts of the closure and make any recommendations to address potential breaches of the EST. The ESTM has significant information-gathering powers that would help NSW with its decision making. Any attempt to 'game' the policy can be mitigated through use of the ESTM information-gathering powers.

It is also important that the owners of the plants are seen to have the impact of their decisions publicly and transparently assessed. Given most of those owners are major retailers, they, along with the state, will be held to account by customers for any impacts on reliability and affordability.

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[106] Report of the Liddell Taskforce. Prepared for Public Release. 24 April 2020. P 21

The objective should be to ensure certainty in the market about the impacts and timing of closures. Owners may also be incentivised to manage their closures in line with the entry of new capacity, encouraging approaches such as staged exits.

Implementing such a policy is recommended, with or without a NEM exit framework.

8.6 The need for alternative forms of energy infrastructure than those currently being pursued under the Roadmap

8.6.1 The role of energy storage to mitigate reliability risks

In addition to generation LTESAs, the Roadmap framework also contains provisions for long-duration storage LTESAs and firming LTESAs. Storage providers with various technologies, including mechanical batteries (pumped hydro), electrochemical batteries (lithium ion, zinc, flow), thermal batteries (molten salt) etc. are key candidates for these LTESAs.

As previously noted, batteries, being both generation and demand, will from 2024 be classified in the NEM as bi-directional units. While recent technology improvements have resulted in battery storage duration to increase up to eight hours, they are by no means considered equivalent to baseload generators in addressing energy market needs arising from extended low wind and solar output conditions. Given their limitations, relying on them as mitigants to the Eraring closure is another residual risk.

Findings

The first round of the auctions by AEMO Services as the CT also showed the potential for innovation in storage projects. RWE's 50 megawatt Limondale battery project was awarded a long-duration storage LTESA by the CT based on its ability to provide the Roadmap requirement of eight hours duration.[107] Other technologies like Redox flow batteries present alternatives to traditional lithium ion batteries.[108]

Given the market need for storage, it is likely that innovation will continue. That innovation can now be supported through additional funding channels, such as the NSW Energy Security Corporation (ESC).

In addition, the Federal Government's Capacity Investment Scheme (CIS) provides additional support for new storage projects in NSW. Through an agreement between the Federal and State Ministers, the current NSW firming tender being conducted by the CT will now support the entry of up to 930 MW of new firm capacity by the end of the decade.[109]

The CT, through its IIO Report provides a signal to market investors on the storage needs of the state.

It is recommended that the CT commission a study that considers alternative pathways to achieving the Roadmap storage targets. Advice should also be sought from the CT on whether amendments to

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[107] https://au.rwe.com/projects/limondale-bess/
[108] https://www.abc.net.au/news/science/2023-02-02/vanadium-redox-flow-battery-and-future-of-grid-energy-storage/101911604
[109][109] https://reneweconomy.com.au/bowen-kicks-off-capacity-scheme-with-doubling-of-nsw-battery-tender-to-replace-coal/

the definition of long-duration storage (LDS) in the EII Act should be considered to provide more options to meet the state's storage needs. Subsequently, whether the LDS LTESA is suited for these new options should be considered.

8.6.2 Grid solutions and greater use of existing grid

Background

While the focus of new renewable generation in the Roadmap was on the REZs, the Roadmap legislation provided scope for projects to receive LTESAs if they were of outstanding merit.[110]

Given that under Energy Co's Network Infrastructure Strategy the CWO REZ Stage 1 is now proposed for 2027, and NE REZ in 2029 at the earliest, this criterion presents an opportunity to continue progress with utility renewables growth in NSW in coming years.

The first round of auctions by the CT earlier this year awarded LTESAs to one project outside the REZ, the Coppabella Wind Farm in the Southern Tablelands, and one in the yet to be developed South-West REZ, the Limondale battery.[111]

Inevitably, as existing grid locations become scarcer, such projects will be harder to find. That is, if the focus is restricted to the transmission grid.

At a sub-transmission level, on the regional distribution grid of Essential Energy, Ausgrid and Endeavour Energy, there may be opportunities for further utility scale projects.

It may be that through extending the Roadmap to the distribution grid and offering strategic funding for lower cost enhancements to both the transmission and distribution grid, more projects of 'outstanding merit' can be supported in coming years.

The Roadmap's REZ strategy should eventually see the 12 GW target realised. The major risk to the target is likely to be delays with the massive engineering challenge of building the REZs.

For that reason, an approach that looks for further opportunities for grid enhancements, including at the distribution level, should be explored to continue the transition momentum.

Smaller scale projects provide opportunities to a wider group of construction companies and help disperse social license challenges. Market interest is already apparent in sites on the distribution and transmission grid.

Stakeholders' views

Many stakeholders thought there was an opportunity to look for smaller grid enhancements to keep up the transition momentum, including at the distribution level. The Check Up was advised by Essential Energy that there was a significant pipeline of utility scale projects seeking to connect to its higher capacity regional lines.

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[110] https://www.energyco.nsw.gov.au/industry/long-term-energy-service-agreements

[111] AEMO Services national leading tender and contract design delivers for NSW. Press Release 1 May 2023

The Clean Energy Investor Group (CEIG) is on the record in supporting a 'Grid Black Spots Program' developed by Stride Renewables.[112] Their suggestion is further detailed in the box below.

Grid Black Spot Program proposal by CEIG and Stride Renewables

CEIG and Stride Renewables submitted that the current regulatory arrangements for network investments do not sufficiently consider some relatively small network augmentation projects that could deliver benefits at low cost and quickly. They considered that some network augmentations have the potential to unlock the supply of low-cost renewable electricity that is otherwise curtailed due to network constraints. The stakeholders proposed a Grid Black Spot Program that would allocate funds for network augmentations on a competitive basis: the lowest cost or best value-for-money network augmentation would be funded and a transmission efficiency test (TET) would apply to ensure that the network operator can only recover the prudent, efficient and reasonable capital costs associated with the projects. Once projects were selected, funding could be awarded to the nominated Transmission Network Service Provider (TNSP) to implement the augmentation project.

There were some concerns that small enhancements could 'cannibalise' the REZs. Overall, most believed the ongoing advantages provided by firm grid access in the REZ, priority planning, system strength and new high-capacity transmission will still make them the most attractive location for utility scale renewables in NSW in the medium to longer term.

Findings

The opportunity to develop small grid enhancements is certainly worth exploring. It is recommended that either the Office of Energy and Climate Change (OECC) or the CT engage a technical advisor to scope that opportunity and advise on any unforeseen impacts on grid performance, Consumer Energy Resource (CER) and customers in general.

Strategic use of funding from either the proposed Energy Security Corporation (ESC) or the repurposing of money from the Transmission Acceleration Facility (TAF) could provide an avenue for funding these small enhancements to the grid. Any such fund could be bid on a competitive basis. Smaller private REZs in regional and even urban areas could be encouraged.

The fund should also support 'Virtual Transmission Projects', which through use of batteries and other technologies enable more use of the existing grid.

8.6.3 Gas generation

Background

While there is an ongoing debate about the role of gas-powered generation (GPG) in supporting the energy transition, in NSW their role is assured. The state already has five GPG plants, with two more

[112] https://reneweconomy.com.au/black-spot-program-needed-to-address-solars-line-of-losses-and-other-grid-bottlenecks/

under construction. Together those plants will provide 2352 MW of firming support to the market by 2025.

Table 3: NSW gas plants

Plant	Owner	Generation capacity (MW)	Status
Uranquinty	Origin Energy	664	In operation
Colongra	Snowy Hydro	667	In operation
Tallawarra A	Energy Australia	435	In operation
Tallawarra B	Energy Australia	316	Under construction
Hunter Power Project	Snowy Hydro	660	Under construction
Smithfield Power Station	Iberdrola	123	In operation
Appin & Tower Gas [113]	EDL	85	In operation

Squadron Energy, a major renewable developer, has also flagged further investments in GPG starting with a 68 MW plant in Dubbo.[114]

As coal exits and wind and solar increases, the role of GPG as a peaking generator and as back-up during periods of low renewable output will become increasingly important.

Unlike the Federal Capacity Investment Scheme (CIS), the Roadmap firming tenders are open to gas generators.

The difficulties with meeting long-duration storage targets through pumped hydro projects mean that firming will increasingly rely on a mix of batteries and gas generation.

New designs allow gas plants to be hydrogen enabled, allowing for a technology refit that supports long-term Net Zero goals.[115] This is the case with the Tallawarra A gas plant, which received state and federal funding support when it was committed in 2021.[116] Use of renewable gases and biofuels could also enable gas plants to play a role in a decarbonised future.

Peaking generation

As described above, peaking generation plays an important role in firming up renewable generation (mainly solar and wind) and providing for renewable generation to grow its contribution to the energy market while maintaining supply reliability. Solar and wind generation are not controllable – they only provide electricity when the sun is shining or wind is blowing respectively, and this doesn't always match the times when electricity is required (e.g., the 'evening peak').

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[113] Appin and Tower Gas operate on waste methane gas from coal mines.
[114] https://www.afr.com/companies/energy/string-of-gas-power-plants-to-underpin-forrest-s-green-dream-20230522-p5daa7
[115] https://www.ge.com/news/press-releases/energyaustralia-modernizes-tallawarra-a-power-plant-to-support-energy-transition-in
[116] https://reneweconomy.com.au/energyaustralia-to-build-first-green-hydrogen-gas-generator-in-nsw/

Unlike coal, peaking gas-fired generation is well suited to address this issue, as it can just start up and run when solar or wind are not available, shut down when it is not needed, and it can operate if required to cover long periods of low wind and solar generation. Peaking generation is an important and necessary component of the assets that provide firming (others include batteries and pumped hydro). In relation to peaking generation, much of the generating infrastructure already exists and carbon emissions are (relatively) modest due to the low volume of peaking generation.

The major impact on the use of peaking generation is from the gas market, as they require gas capacity to run at the rates required. However, almost all GPG in the NEM are dual-fuel and can also operate using diesel. This dual-fuel capability mitigates the risks arising from access to gas capacity. Over time, a move to bio-diesel could allow the continuation of this practice in a manner consistent with Net Zero.

Gas quantity vs gas capacity

A challenge for NSW in supporting the role of GPG operating on gas (rather than distillates) in the transition will be ensuring that gas is available as and when it is required by the generators. That will often be during shorter winter days when retail demand for gas heating is also high.

NSW currently has no gas production occurring within its borders. Traditionally the state has relied on supplies of gas from Victoria and South Australia, which are depleting rapidly.

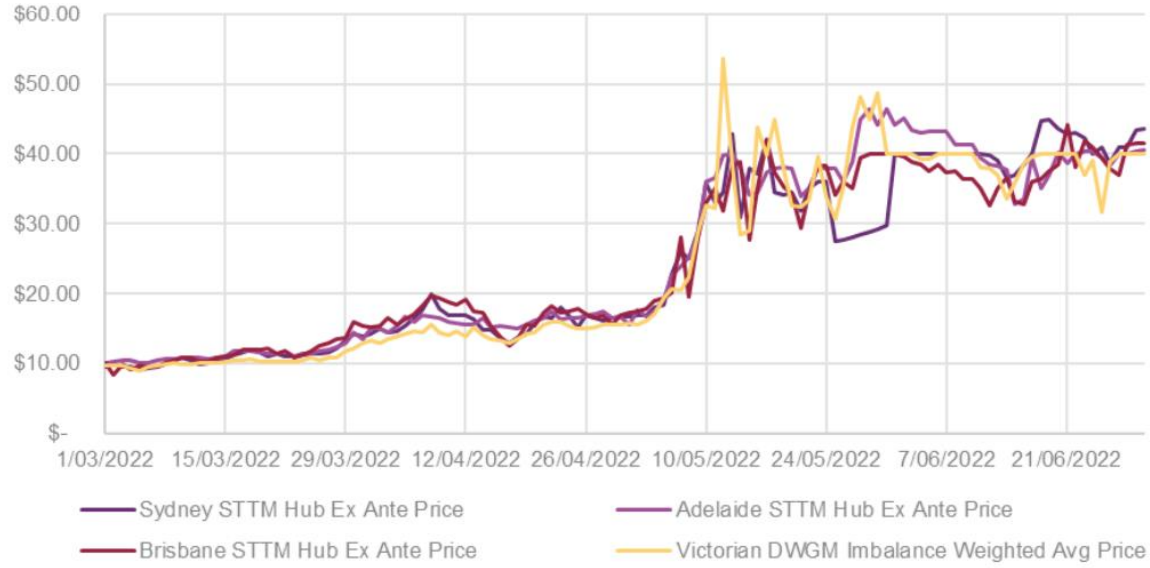
Until (and assuming) Narrabri is developed, new gas will increasingly come from the northern gas fields in Queensland and the Northern Territory. Those fields must also meet Liquid Natural Gas (LNG) export contracts.

The Federal Government's Domestic Gas Security Mechanism (DGSM)[117] helps to ensure that there is enough gas for domestic users in states such as NSW. While that may ensure enough gas, the issue with gas generation is that it can be required at short notice and is rarely pre-contracted.

When generators enter the gas market suddenly, gas supplies and prices for other users such as businesses and households can be impacted. This is what happened during the NEM winter suspension in 2022, when a combination of coal outages, low renewables output and cold weather leading to high retail and gas generation demand caused the gas market to spike.

[117] https://www.industry.gov.au/mining-oil-and-gas/oil-and-gas/securing-australian-domestic-gas-supply

Figure 18: East Coast Gas Price Movements - AEMO



In its outlook for east coast gas markets, the Gas Statement of Opportunities (GSOO), the system and market operator AEMO has expressed concerns about gas shortfalls arising in states such as New South Wales and Victoria during high demand periods, especially winter, on a regular basis.[118] This is caused by coincident gas demand for heating, industry use and generation.

The issue is not one of the quantity of gas throughout the year, but the unpredictable nature of demand requiring high volumes of gas to be transported at short notice. That means the capacity of the gas system to deliver the required gas becomes a problem. The box below presents a description and explanation of the terms capacity and commodity used in gas supply.

Capacity and Commodity

Commodity refers to the molecules of gas to be provided and capacity refers to the ability to deliver the required volume of gas in the required time.

- Commodity is defined as the amount of gas and is measured in energy (typically in PJ on yearly volumes and TJ on daily volumes). The total quantity of gas available to the market is related to the total of gas reserves (long-term issue) and the amount of gas that can be imported.
- Capacity is defined as the quantity (rate) of gas that can be supplied in a certain period. The usual basis is a day and capacity is reported as TJ/day. The gas system is required to be able to supply and transport gas to the required locations to meet days of very high gas demand.

[118] https://aemo.com.au/en/newsroom/media-release/gas-supply-improved-for-winter-2023-but-risks-remain

Stakeholders' views

The issue of the role of gas generation is also contentious in a Net Zero scenario, but for the time being it was recognised it would be part of the generation mix. There were differing views about whether gas supply for NSW would be problematic, but few believed Narrabri could address forecast shortfalls in the required time.

Findings

Gas generation in NSW has a role to play in supporting the transition. The state will have seven gas plants operating soon. One of those uses waste methane. Gas generation has lower emissions than coal, is used for peaking generation with lower capacity factors and is complementary to a wind and solar-based system. It is already eligible for Roadmap LTESA tenders and should remain so given the Federal Capacity Investment Scheme (CIS) excludes it. As it can operate at short notice, ensuring sufficient gas capacity is available in NSW given the current east coast outlook is the priority rather than changing Roadmap settings.

The most likely solution to this problem would be more stored gas that increases daily supply capacity. Unlike Victoria, New South Wales has limited gas storage infrastructure.

As this gas capacity problem could impact other NSW gas users, and the ability of gas generators to provide necessary support to the NSW electricity market, it will need to be addressed. The problem is likely to persist even if Narrabri proceeds to full production.

To manage these risks, it is recommended that the Government commission AEMO to undertake a NSW gas infrastructure needs analysis to inform what actions may be required to avoid gas capacity shortfalls in the coming decade.

8.6.4 Consumer Energy Resource Integration

Background

As has been emphasised all through this Check Up, there are two transitions occurring in NSW and the NEM. The Roadmap's focus is on supporting the utility scale transition.

The second transition occurring is at the customer or distributed level, with the uptake of Consumer Energy Resource (CER) such as rooftop solar PVs, batteries and EVs.

When it comes to rooftop solar PVs, the technology is already adopted by at least one in four NSW households. AEMO predicts that from now until 2050 rooftop solar will grow five-fold, and by the end of the period, 66% of households will have solar.[119] According to AEMO, distributed solar by 2050 will be able to meet around 20% of underlying NEM demand.[120]

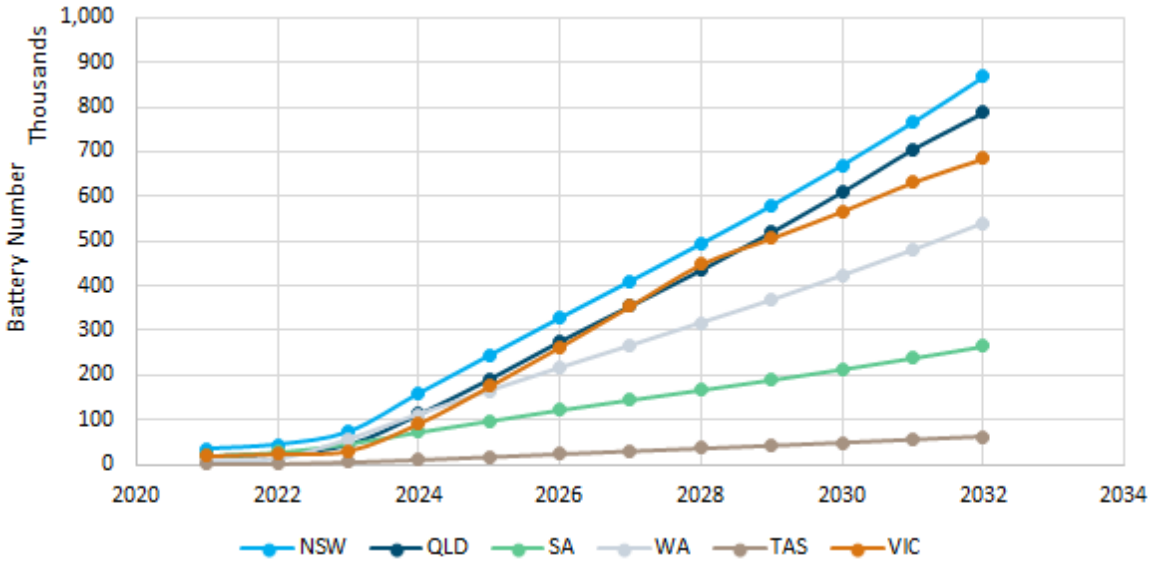
From a lower base, small scale batteries are forecast to increase significantly throughout the 2020s and beyond. The increased coupling of storage and solar presents a greater opportunity to capture

[119] https://aemo.com.au/newsroom/news-updates/aemo-ceo-speech-at-australian-energy-week
[120] Ibid

and effectively utilise rooftop generation during high demand periods. In short, it allows for rooftop solar PV to be optimised for the consumer and the overall market.

As electric vehicle uptake increases, the batteries can also be mobile. Vehicle to grid charging presents an opportunity to make the decarbonisation of transport beneficial to the electricity market, rather than just an additional form of variable demand.

Figure 19: Small scale battery installations in Australia forecasts - AEMO[121]



The NSW distribution companies have forecast ongoing growth in CER in their next 5-year regulatory period from 2024-29.

Ausgrid predicts that 620,000 CER assets will be connected to their grid in the 2024-29 period. Endeavour Energy forecasts 402,000 additional CER assets over the same period, while Essential Energy is forecasting 124,000 additional CER installations over the five years.[122]

All this growth will occur before a large utility scale project like Snowy 2.0 is complete.

Stakeholders' views

Most stakeholders agreed that a CER strategy to complement the Roadmap was important. There was even the idea of 'urban REZs' floated. There was a consensus that the momentum of CER uptake would continue and had to be harnessed.

The complexity and multiple elements to a CER strategy could no longer be an excuse to not address the issue. For many, ensuring common technical standards was the priority issue followed by getting a faster roll-out of smart meters. Differing perspectives existed on how much CER could reduce utility investment, with caution urged about promoting an either/or perspective.

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[121] AEMO, ESOO 2022 Sept 2022 Input Files, DER Forecasts
[122] NSW Networks joint submission to AEMC CER technical standards review. 2 June 2023

Findings

The NSW Government already has programs that support the uptake of CER. These include, for example, the Peak Demand Reduction Scheme (PDRS) and the Energy Saving Scheme (ESS).[123]

However, to meet the aspirations of the two-sided market, NSW Net Zero policies and address future network issues such as lack of load, further actions are needed to support the greater deployment of CER in NSW. The time is now ripe to bring a range of existing and new programs under the banner of a comprehensive Consumer Energy Resource Strategy (CER Strategy).

The CER Strategy should set 2030 targets for uptake of key enabling technologies such as smart meters, batteries, EV charging points and vehicle to grid models.

Comprehensive approach to benefit capture

Consumer Energy Resource is an area of untapped opportunity that will continue its growth trajectory in coming years. High grid prices encourage further uptake of CER in all its forms. While not an alternative to the Roadmap utility scale infrastructure, unlike the Roadmap there is an immediate opportunity to make progress on a CER Strategy. High uptake of rooftop solar will increasingly be complemented by batteries and EVs. Distribution networks and retailers are increasingly utilising CER to achieve business objectives. Success in integrating CER into the mix can help mitigate utility needs and help with managing peak demand, and growing challenges with minimum demand.

These upcoming CER technologies can address a range of energy, system security and network problems.

The CER Strategy should therefore consider embracing a wide range of opportunities that CERs can provide for consumers, networks and the market.

Existing schemes can be aligned to the strategy by supporting eligibility for enabling technologies.

In addition, having a CER-optimisation program as part of the mandate of the proposed Energy Security Corporation (ESC) would be a way to encourage innovation and leadership in NSW.

Equity considerations

A final, but equally important element to the CER Strategy, would be a CER access program. Programs such as the Solar for Low Income Households (SLIH) have supported CER but were only open to homeowners.

Those who rent are at risk of being denied access to CER technologies and energy efficiency technologies through cost barriers and split-incentives. The owners of rented properties do not have

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[123] Both programs are highly prescriptive in that they determine the types of appliances that may be used to provide the energy efficiency and peak demand reduction benefits sought. For example, the PDRS prescribes that peak demand reduction must be achieved using either refrigerators, lights, ventilators, washing machines, etc. However, solar PV, battery storage or EV chargers are not included amongst the eligible 'appliances' despite likely being better suited to provide peak demand reduction services. Both ESS and PDRS are based on a "baseline consumption methodology" where energy savings (for ESS) and demand reductions (for PDRS) are calculated relative to an assumed consumption level. This methodology would need a review in light of the role that home batteries and EVs can play.

the incentive to invest when the tenants capture the benefits. There is a clear role for government to play in addressing this inequality.

In the case of public and social housing, direct investments in CER and energy efficiency by government and mission-based owners should be a priority.

8.6.5 Wholesale Demand Response Mechanism (WDRM)

Background

Since 24 October 2021 a new Wholesale Demand Response Mechanism (WDRM) has supported paid demand response participation in the NEM.[124] According to AEMO's 2023 WDRM annual report, around 70 MW of demand response is currently registered across the NEM.

Stakeholders' views

Finally, some believed that demand response potential at both wholesale and retail level had not been sufficiently explored and that NSW's situation required it to be taken seriously as part of the portfolio of options.

Findings

There is potential for this to be significantly increased in NSW to help reduce peak demand and high prices. In terms of energy use, the NSW Government and all its agencies are the second highest electricity user in the state after the Tomago aluminium smelter.

The NSW Government in conjunction with ARENA has supported its own demand response program to help alleviate pressure on the grid during high demand periods.[125] Given the likelihood of ongoing pressure on the supply-demand balance in the state in extreme weather, ongoing government leadership provides an example to other large users.

Through its retailer, Shell Energy, the NSW Government could look for further opportunities to utilise the WDRM to support the grid. Under its contract with Shell, the Government's own energy retail contract has already been utilised to support a new battery project in Griffith.[126] Further opportunities to use government purchasing to support demand response and investments in new energy infrastructure are recommended as an additional mitigant to NSW reliability and affordability challenges.

[124] https://aemo.com.au/en/initiatives/trials-and-initiatives/wholesale-demand-response-mechanism
[125] https://www.energy.nsw.gov.au/nsw-plans-and-progress/regulation-and-policy/demand-response
[126] https://shellenergy.com.au/about-us/media/shell-energy-nsw-government-long-term-power-supply-agreement-battery-storage-project/

8.7 Recommendations

20. That given the proposed closure of the Eraring generator is now less than two years away, the NSW Government should consider new modelling on the affordability impacts of the proposed closure of Eraring in August 2025 on NSW and NEM customers.

21. That engagement begin with Origin Energy on an extension of the Eraring coal plant beyond 2025.

22. That the government seek clarity from Origin Energy on Eraring to provide certainty for workers and suppliers.

23. That Origin Energy be required to demonstrate any claims about the extension of Eraring to the Energy Security Target Monitor (ESTM) and provide all information required to verify those claims to the ESTM.

24. That an Orderly Exit Mechanism (OEM) for future generation exits continue to be progressed through National Electricity Market (NEM) forums by NSW.

25. That NSW simultaneously progress a 'NSW Responsible Exit Policy' under which any market participant in NSW proposing to retire existing generation capacity, or part thereof, above a firm generation capacity of 600 MW be required to submit their plans to the ESTM at least three years prior to the proposed retirement.

26. That compliance with the Responsible Exit Policy be a requirement for participation in Consumer Trustee LTESA auctions.

27. That the NSW Government immediately review the regulations supporting the Energy Security Target Monitor (ESTM) to address recommendations in the Energy Security Target Monitor (ESTM) 2022 report to consider risks associated with interconnectors and short-duration storage.

28. That considering the slow development of long-duration storage (LDS), the Government commission a review by the Consumer Trustee (CT) into the storage requirements of the NSW market and consider amendments to the definition of LDS in the Roadmap legislation.

29. That the Government engage a technical expert to advise on whether additional renewable generation projects can be developed on the existing transmission and distribution grid through small network enhancements.

30. If the technical expert confirms hosting capacity on the transmission and distribution grid is available, some funding from the Transmission Acceleration Facility (TAF) be repurposed to allow for a contestable bid for enhancements run by the Consumer Trustee (CT) in consultation with Energy Co. NSW transmission and distribution companies should also be required to publish generation hosting capacity.

31. That a NSW Consumer Energy Resources (CER) strategy be prioritised by the Department to better integrate CER into the supply mix by 2030. The strategy should ensure common technical standards for CER and set targets for uptake of technologies such as smart meters and distributed batteries.

32. That eligibility for the Peak Demand Reduction Scheme (PDRS) be expanded to include use of batteries, virtual power plants (VPPs) and other measures that help reduce peak demand.

33. That the investment mandate of the proposed Energy Security Corporation (ESC) include CER optimisation projects on the distribution grid.
34. That given NSW will have seven gas plants by the end of 2024, AEMO be commissioned to undertake a NSW gas infrastructure review to advise whether additional storage will be required for those generators given an impending supply gap in east coast gas markets.
35. That consideration be given to NSW Government participation in the Wholesale Demand Response Mechanism (WDRM) as a leadership example to other large users.

9. Enhancing local community support, workforce readiness and supply chain

The Check Up required a review of the opportunities for the NSW Government to enhance local community support, workforce readiness and supply chain improvements.

9.1 Introduction

In enhancing support for the Roadmap there needs to be a distinction drawn between measures relating to regional NSW, and those that relate to the wider community of NSW.

The wider issues relate primarily to the costs of the Roadmap which are recovered through consumers' bills. The regional issues are multifaceted.

9.2 Costs for consumers are expected to increase

9.2.1 Background

The Roadmap infrastructure is financed by distribution consumers rather than being funded by general taxation. Consumers are also among the beneficiaries of the generation, storage and network assets, and the benefits were found to outweigh the costs.

The original modelling on the Roadmap by Aurora Energy Research in 2020 found that its implementation would lead to retail electricity prices 8% lower than if no action were taken.[127] Being an investment in long-term infrastructure and generation assets, the Roadmap costs are incurred prior to the benefits being realised.

The mechanism for recovering Roadmap costs is by way of distribution network charges that flow into retail bills for NSW consumers. Those charges are reviewed by the AER but the costs arise from achieving the legislated Roadmap objectives and thus the cost drivers are largely outside the influence of the AER.

In making the cost recovery determinations for the Roadmap network infrastructure, the AER must consider the equity of cost allocation using volumetric energy demand and peak demand in the previous financial year as a guide.

The first of the Roadmap cost recovery decisions occurred in February 2023.[128] This cost recovery process will continue for many years into the future and will have increasing cumulative cost impacts

[127] NSW Electricity Infrastructure Roadmap benefits modelling report. Office of Energy and Climate Change. June 2023. P 9
[128] https://www.aer.gov.au/communication/aer-releases-the-first-contribution-determination-under-nsw-roadmap

as Roadmap projects are rolled out. At the same time, the costs arising from the broader NEM ISP projects such as EnergyConnect will also begin to hit consumer bills.

Independent of the Roadmap, distribution charges are increasing and more so in regional areas. In particular, Essential Energy's network charges are higher than the other two distribution networks in NSW. In turn, so are electricity prices in regional NSW. This can be seen in NSW DMOs.

This outcome approved by AER, [129] is driven by network costs incurred to meet network reliability standards. Essential Energy not only has a vast and costly network, it has less customers than Ausgrid and Endeavour Energy. Hence it must charge higher distribution charges to recover its costs from a smaller customer base. The recommendation in Section 8 to look for small grid enhancements should pay particular attention to projects on Essential Energy's network area that may help reduce regional electricity prices.

Table 4: NSW 2023-24 DMO 5 final determination prices, incl. changes from DMO 4 in nominal and real terms – AER

Distribution zone	Description	Residential without controlled load		Residential with controlled load		Small business without controlled load	
Ausgrid	DMO price	$1,827		$2,562		$4,999	
	for annual usage of	3,911 kWh		Flat rate 4,813 kWh + CL 2,005 kWh		10,027 kWh	
	Change y-o-y	+$315	(20.8%)	+$440	(20.7%)	+$639	(14.7%)
	Change y-o-y (real)	+$221	(14.6%)	+$307	(14.5%)	+$367	(8.4%)
Endeavour Energy	DMO price	$2,228		$2,977		$4,598	
	for annual usage of	4,913 kWh		Flat rate 5,214 kWh + CL 2,206 kWh		10,027 kWh	
	Change y-o-y	+$392	(21.4%)	+$594	(24.9%)	+$816	(21.6%)
	Change y-o-y (real)	+$277	(15.1%)	+$445	(18.7%)	+$580	(15.3%)
Essential Energy	DMO price	$2,527		$2,977		$5,761	
	for annual usage of	4,613 kWh		Flat rate 4,613 kWh + CL 2,005 kWh		10,027 kWh	
	Change y-o-y	+$435	(20.8%)	+$487	(19.6%)	+$860	(17.5%)
	Change y-o-y (real)	+$304	(14.5%)	+$331	(13.4%)	+$554	(11.3%)

Source: AER

9.2.2 Stakeholders' views

In the regions some felt an electricity price benefit from the Roadmap would have to be demonstrated. If the regions were the host for the future energy system, then a presentational issue would arise if they were paying higher bills.

There was a recognition by stakeholders that Roadmap cost pass throughs would inevitably become an issue and will need to be explained to the community. Public support at a time of cost-of-living pressures cannot be assumed. Some felt it was inevitable government will have to carry more of the

[129] https://www.aer.gov.au/networks-pipelines/determinations-access-arrangements/essential-energy-determination-2019-24

investment phase. Planning for this rather than waiting for issues to arise was seen as a better approach.

Stakeholders also raised that under current arrangements, costs are recovered from distribution customers. They questioned the equity of this arrangement given that large energy users are typically connected to the transmission lines. The current arrangements leave large energy users immune to the Roadmap costs and instead residential customers wear a disproportionate share.

9.2.3 Findings

Monitoring costs is crucial and alternative costs recovery mechanism may be required

General community support for the Roadmap is vital, not least because of the way it is financed.

The AER as the regulator of Roadmap and ISP projects, general network costs, and retail DMO has the best visibility on general electricity price movements. Roadmap costs will need to be monitored by the government and forward projections sought to ensure their affordability. Exemptions for certain projects from the cost recovery framework through distribution charges needs to be reconsidered and whether transmission connected users should contribute to the costs. Alternative models of cost recovery mechanisms may be considered.

Current arrangements do not impose costs on customers that are connected to the transmission grid. These are typically large electricity users. Also, under current rules, battery storage (or other form of bi-directional units) connected to the transmission grid do not pay distribution network charges. As a result, whilst these batteries would at times gain a charging benefit from REZs, they do not contribute to the costs.

The implications of the current cost recovery approach are wide ranging, including that assets that are connected to the distribution system (e.g. household batteries or community batteries) face 'distribution cost headwinds' relative to their transmission connected counterparts. In summary, there is a risk that the current cost recovery will disproportionately impact residential customers and may discourage the uptake of CERs on the distribution network.

These issues should be addressed as part of the review of the Roadmap cost recovery exemptions framework (recommendation 17). An instructive example of how Victoria implemented some cost recovery mechanism is provided in the box below.

Victorian electricity easement land tax

In 1984, the State Electricity Commission of Victoria (SECV) signed Electricity Supply Agreements (ESAs) with Alcoa, an aluminium smelter and the state's largest electricity consumer. To protect the smelter from the electricity price fluctuations, the ESA tied the electricity prices paid by Alcoa to the world price of aluminium. As a result, when the world price of aluminium rose/fell the electricity prices paid by Alcoa to the SECV increased/decreased regardless of the wholesale electricity prices. Fluctuations in world aluminium prices were to be absorbed by the SECV.

From the government's point of view, the ESAs were going to provide a long-term customer for the Loy Yang B plant, thereby funding its construction of additional generation capacity.

It was originally envisaged that the SECV would break even over the lifetime of the contracts, the ESAs were not intended to provide a subsidy. However, the world price of aluminium dropped and, as a result, Alcoa received electricity at a considerable discount compared to the market price of electricity. Consequently, there was a substantial shortfall to be covered by the SECV. Up until 1997, the SECV's losses were absorbed by the budget, at which point the Victorian Government implemented an alternative, a levy.

The Alcoa levy (officially called the Smelter Reduction Amount or SRA) was introduced was to be paid as an approximate 10% cost on top of the wholesale market prices. The cost of the levy was paid by retailers (and other wholesale customers) to the market operator who passed it onto the SECV. Retailers then recovered this cost from their consumers. The levy was not fully covering the losses and thus the proceeds from the sale of government assets were used to augment the cost recovery.

In 2003, The Australian Steel Company (TASCO) – a direct competitor to Alcoa's aluminium products in the building industry – lodged a writ against the SECV in the High Court, claiming that the SRA was an excise and therefore illegal under the Constitution. TASCO wanted the High Court to declare the SRA unconstitutional and therefore invalid and sought reimbursement of the SRA it paid since its introduction in 1997.

The Victorian Government continued to disagree with TASCO but in 2004 it ceased the SRA and introduced the electricity easement land tax, a land tax on the long corridors of land reserved for transmission lines. In 2006, the Victorian Government settled the case with TASCO out of court.

Public awareness and scrutiny are expected to increase

Public awareness and scrutiny of Roadmap costs will inevitably grow over time. Greater understanding of the Roadmap by those who pay for it is essential as are other policies that try to keep overall electricity prices down.

General community understanding of the Roadmap is low. The process of recovering costs from consumers will be noticed as the size of those recoveries increases. The Roadmap is an investment in the future and this will need to be explained, along with the opportunities that arise from it.

For valid reasons, electricity prices are higher in regional NSW, but that an active strategy to reduce them would help build support for the Roadmap. This strategy should actively involve Essential Energy as the government owned network for regional NSW.

Increasing public awareness could be managed by way of ongoing engagement with business and household consumer groups through a Roadmap Consumer Council involving Energy Co, the AER and the Department. This would be like existing network company consumer councils.

As costs increase, it may also require a general public information campaign on the role of the Roadmap in the transition. This could be supported by a campaign to promote the job opportunities that will arise from decarbonisation.

9.3 Land intensive nature of renewable energy development creates challenges for current planning

9.3.1 Background

With or without the Roadmap, the need to decarbonise electricity production would have always seen a more land intensive generation sector develop in the regions. There are few alternative pathways for decarbonising electricity than a diversified mix of renewables, storage, and firming generation.

Ignoring the reality of climate change and continuing with a high carbon system could be argued by some but would be in direct defiance of legislated emission reduction targets. It could lead to international pariah status and trade sanctions on Australian exports.

The Roadmap created a state led framework to accelerate the transition and coordinate generation and transmission in parts of the state. This was driven by the reality of an ageing and carbon-intensive generation sector in NSW and by the fact that the national market was not delivering the required speed of replacement capacity.

NSW had already seen significant investment in wind and solar prior to the Roadmap. That generation had benefitted from the Federal Government's LRET, a policy that runs to 2030 but is now fully subscribed.[130] Before the Roadmap was legislated there was already a large pipeline of renewables in areas like the Central-West Orana (CWO), New England (NE), and the South-West (SW).

The levelised cost of electricity for wind and solar is cheaper[131] than other forms of generation, although caution must be applied in suggesting this would lead to lower retail prices for consumers. The increasing penetration of renewables would have always made it harder for coal to remain viable. No private investor was proposing to build new coal plants.

The variable nature and lower capacity factors of renewables mean more installed megawatts are required to replace coal. That in turn requires greater amounts of transmission, short and long-duration storage, firming and system services.

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[130] https://www.pv-magazine-australia.com/2019/09/04/its-official-large-scale-renewable-energy-target-achieved-more-than-a-year-early/

[131] https://www.csiro.au/en/news/all/news/2023/july/gencost#:~:text=News-,GenCost%3A%20Wind%20and%20solar%20remain%20the%20lowest%20cost%20new%20build,generation%2C%20despite%20surging%20technology%20prices.

While much of the focus of the Roadmap has justifiably been on the REZs, NSW already has a significant amount of utility scale renewable energy operating across the state.

At present, there are 17 operating wind farms in NSW with a total combined generation capacity of over 2300 MW. There are also 31 operating solar farms in NSW with a total combined generation capacity of more than 2700 MW.[132]

Table 5: Existing renewable energy generators in the NSW region and their location and capacity

AEMO NAME	LOCATION	SIZE (MW)
Beryl Solar Farm	Gulgong	98
Bomen Solar Farm	Wagga Wagga	121
Broken Hill Solar Plant	Broken Hill	53
Coleambally Solar Farm	Coleambally	150
Corowa Solar Farm	Corowa	36
Darlington Point Solar Farm	Darlington Point	275
Finley Solar Farm	Finley	162
Goonumbla Solar Farm	Parkes	70
Griffith Solar Farm	Yoogali	30
Gullen Range Solar Farm	Goulburn	10
Gunnedah Solar Farm	Gunnedah	110
Hillston Sun Farm	Hillston	85
Jemalong Solar	Forbes	55
Junee Solar Farm	Junee	36
Limondale Solar Farm 1	Balranald	220
Limondale Solar Farm 2	Balranald	29
Manildra Solar Farm	Manildra	50
Molong Solar Farm	Molong	36
Moree Solar Farm	Moree	56
Narromine Solar Farm	Narromine	11
Nevertire Solar Farm	Warren	105
Nyngan Solar Plant	Nyngan	102
Parkes Solar Farm	Parkes	51
Royalla Solar Farm	Tuggeranong (ACT)	20
South Keswick Solar Farm	Dubbo (South Keswick)	15
Sunraysia Solar Farm	Balranald	229

[132] Figures provided by NSW Energy Co.

AEMO NAME	LOCATION	SIZE (MW)
Suntop Solar Farm Pty Ltd	Suntop	150
Wagga North Solar Farm (second entry)	Bomen	36
Wellington Solar Farm	Wellington	216
West Wyalong Solar Farm	Wyalong	105
White Rock Solar Farm	Glen Innes	20
Solar total		**2,742**
Bango Wind Farm	Boorowa	244
Boco Rock Wind Farm (first two entries)	Nimmitabel	113
Bodangora Wind Farm	Wellington	113
Capital Wind Farm	Tarago	141
Collector	Collector	227
Crookwell 2 Wind Farm	Goulburn	96
Crudine Ridge Wind Farm	Crudine/Aarons Pass	142
Cullerin Range Wind Farm	Cullerin	30
Gullen Range Wind Farm (both entries)	Goulburn	166
Gullen Range Wind Farm 2	Crookwell	111
Gullen Range Wind Farm 2	Goulburn	111
Gunning Wind Farm	Gunning	47
Sapphire Wind Farm (both entires)	Inverell	270
Silverton Wind Farm	Silverton	199
Taralga Wind Farm (all 3 entries)	Taralga	107
White Rock Wind Farm - Stage 1	Glen Innes	172
Woodlawn Wind Farm	Tarago	48
Wind total		**2,336**
Broadwater	Broadwater	38
Condong	Condong	30
Eastern Creek and Eastern Creek 2 Gas Utilisation Facility	Eastern Creek	13
Lucas Heights (all 3 entries)	Lucas Heights	23
Tumut Pulp and Paper Mill	Tumut	32
Bioenergy total		**135**
Blowering, Guthega, Jindabyne, Jounama, Tumut 3, Upper Tumut	Kosciuszko National Park	2,270
Burrendong	Wellington	19
Burrinjuck	Wollgarlo	27

AEMO NAME	LOCATION	SIZE (MW)
Copeton	Inverell	23
Hume Dam NSW	Albury	29
Wyangala A and B	Cowra	24
Hydro total		**2,392**
Total Renewables		**7,605**

While the objective of the Roadmap was to concentrate future development in the REZs, it is likely some development will continue outside those areas. The Roadmap legislation provided for projects of outstanding merit to receive LTESAs and the first auction provided support to a wind farm outside any of the REZs.[133]

Inevitably, if transmission enhancement is focused on the REZs then they will be the focus of new investment, but developments outside the REZ should not be discouraged. Furthermore, small, lower cost grid enhancements could be a way to ensure continuing decarbonisation momentum while the larger REZs are developed.

9.3.2 Stakeholders' views

Some stakeholders considered there was also a need to understand that while the REZs were the focus, renewable projects have and will continue to occur outside those areas. Hence consistent approaches to planning, landholder issues and benefits sharing were needed.

There was general acceptance of the need for a payment stream for transmission as well as generation. The Strategic Benefit Payments Scheme (SBPS) was broadly supported. However, some stakeholders considered that money alone would not satisfy all landholders so some level of opposition to the REZs would have to be accepted.

9.3.3 Stakeholder also considered that neighbour and visual amenity impacts had to be addressed. Findings

Consistent, transparent, and efficient planning approach is needed

Consistency in approach to the renewable energy sector is needed across the state in some areas. This is particularly so in planning policy. This means transparent and consistent guidelines for wind, solar and storage in the regions, developed in consultation with the industry.

It also means standard approaches to issues such as decommissioning of renewable projects at the end of their life. Putting aside bonds in the latter part of a renewable asset's operating life for the costs of decommissioning may be needed. This is important as a single instance of a landholder being

[133] https://www.coppabellawindfarm.com/

left with the remediation costs of end-of-life renewable assets is enough to have a significant impact on community support for the whole sector.

Policies need to recognise there is an asymmetry between the knowledge of a land holder and a renewable energy company. Standard agreement terms and templates accessible by landholders could help redress this imbalance.

At the same time, government needs to recognise that planning policy and implementation is a critical factor in competing for renewable generation. It is a competition internationally, and between states. NSW must be competitive as we have the most urgent need for replacement capacity.

The Clean Energy Council (CEC) noted that there were no new renewable projects that reached financial close in the first quarter of 2023.[134] A Rystad energy commentary in July this year claimed that Australia risked falling behind on all state energy targets due to increasingly onerous project approvals, with wind and solar approvals plunging by 75% since 2018.[135] The same commentary claimed NSW was the state most impacted by project delays. This may simply be a case of NSW having the largest pipeline of proposed new projects in the NEM states.[136]

It is imperative that NSW adequately resource the energy section of its planning portfolio to ensure an efficient, thorough, and transparent approvals process. This is not REZ specific, but across the board.

A properly resourced planning approval team would help investment in NSW alongside LTESAs, firm access and new transmission. Time equals money for investors. The industry itself must at the same time deliver quality submissions, comply with guidelines, and secure the support of landholders and communities. Across the state, innovation in community benefits sharing should be recognised and encouraged.

Key entities delivering the Roadmap should have a regional presence

For the regions identified as REZs, the Roadmap represents a rapid change of approach driven by both the emissions reduction imperative and the faster closure of existing generators. As mentioned earlier, there was already significant renewable generation in those areas, existing and proposed, but the REZ program will drive faster, state-led renewable generation and transmission development.[137]

Given it is seen as a state policy, having a state entity like Energy Co plan, coordinate and front the REZs was a logical step. Even if the infrastructure is built by a network company and the generation

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[134] https://www.cleanenergycouncil.org.au/news/clean-energy-construction-peaks-as-investment-pipeline-battles-headwinds

[135] "Storm Ahead? Australia's wind, solar approvals plunge by 75% since 2018." Rystad Energy Commentary. 4 July 2023. Renewable and Power Analytics.

[136] https://www.cleanenergycouncil.org.au/resources/project-tracker

[137] The REZ program was first identified not in the Roadmap, but in the 2018 TIS. The TIS provided no funding for developing the REZs and was only focused on Central West, New England and the South-West based upon existing and proposed enhancements to the shared transmission grid recommended in the ISP. The November 2019 Electricity Strategy progressed the REZ concept and proposed that a 3 GW pilot REZ would be developed in the Central West region. One year later this was quickly superseded by the Roadmap and the EII Act which expanded the REZs to five regions, including the Hunter-Central Cost and Illawarra. It also established Energy Co as the infrastructure planner for the REZs. In line with the NSW Electricity Strategy, Central West, now called CWO is the first REZ and is the most progressed. It is no longer a pilot.

by individual developers, in the REZ regions the state is now seen as the project initiator. For that reason, ensuring that Energy Co is appropriately structured, staffed and resourced to perform its role is important.

It is also vital that the entity has a strong footprint in the REZ regions, and most of its staff are employed and drawn from those regions. The same applies to the network infrastructure companies chosen to build the REZs.

A large city-based entity would immediately send the wrong signal. Essential Energy has a Sydney presence, but its head office is in Port Macquarie, reflecting its regional customer and stakeholder base.

Community benefit sharing and landholders' expectations

The support of landholders for new generation and transmission infrastructure in the Roadmap will in many ways be the most challenging issue to solve. Where human emotion is involved, no amount of money or benefits offered can ensure acceptance. The sense of violation when a new land use is proposed without consultation with the landowner can be difficult to overcome. It was observed that the sense of violation is what First Nations communities have felt for hundreds of years.

Payments from the new Strategic Benefit Payments Scheme (SBPS) will help with obtaining support, but money will not convince everyone. The SBPS will create ongoing revenue for transmission hosts where once a "just terms" one off payment had been the practice. With the amount of new transmission build in the Roadmap, the introduction of the SBPS was a necessary step.

Consistency of approach is important when community members talk. Where one landholder receives more favourable treatment than another, this will become a broader problem for the REZ. Hence the need for coordinated government and industry approaches led by Energy Co.

Approaches must also consider the issue of neighbour compensation. This is particularly so with transmission, where towers may at times be closer to the residence of a neighbour, even if they are not physically installed on the neighbour's property.

The broader issue of visual amenity needs to be tackled with a combination of physical mitigants and shared benefits. These issues are regularly considered and reviewed by the Australian Energy Infrastructure Commissioner (AEIC). They are not unique to NSW. The AEIC is presently conducting a 6-month review for the Federal Government to improve community engagement and support for energy infrastructure.[138] With its exclusive focus on community engagement issues, the state government has time to consider any recommendations arising from the AEIC review when it is handed down at the end of 2023.

While the AEIC will approach these challenges in a more thorough way that is possible in an 8-week Check Up, a NSW complaints process for the REZs should still be on the table. This could be led by Energy Co in each REZ region, with full participation by REZ generators.

[138] https://www.dcceew.gov.au/energy/renewable/improving-community-engagement-support-energy-infrastructure

First Nations communities must be involved

In terms of First Nations communities, the community must be involved in all landholder processes, community benefits schemes and complaints processes. The First Nations Clean Energy Network (FNCEN) was part of the expert advisory panel for this Check Up and should be included in future Roadmap forums on a regional, and state-wide basis.

An additional option would be to consider strategic investments by Essential Energy in remote First Nations communities as an option for community benefits funding. Essential Energy's network services the land of over 29 First Nations communities across NSW.[139]

Consistent approach to community benefits and complaints management is needed

A REZ is developed to coordinate transmission and generation, and for that reason Energy Co needs to work closely with the individual generation developers to ensure a consistent approach to community benefits, stakeholder management and complaints. An individual generation project that connects to the REZ infrastructure will still be seen by the community as a REZ project.

The REZ firm access rights for generators are aimed at incentivising generators to set up in those areas by ensuring they will not have their generation impacted by competing projects.[140]

The REZs infrastructure access fees provide a funding source to coordinate community benefits in the regions.[141] This pooled approach is a sensible way to allocate community benefits. It also needs to ensure the widest possible community representation in allocating those benefits.

At the same time, the planning system should be aligned to incentivising development in the regions. The highest planning status of Critical State Significance Infrastructure (CSSI) has been granted to REZ network projects.[142]

A blanket approach to generation and CSSI in the REZs could risk alienating the community but could potentially be awarded on a case-by-case basis where a project provides critical supporting infrastructure and enjoys high community support.

At the same time the planning system needs to adopt a more flexible approach to cumulative impacts and biodiversity impacts, given it is the state itself that has encouraged a concentration of renewable energy development.

An incentive and pooled approach to generation in the REZs is required to ensure their success and full utilisation of the infrastructure.

Onerous REZ specific community investment obligations on the generators would run the risk of creating an incentive to locate elsewhere, especially if, as recommended, small grid enhancements are also encouraged.

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[139] https://www.essentialenergy.com.au/about-us/acknowledgement-of-country
[140] https://www.energyco.nsw.gov.au/industry/access-schemes
[141] https://www.energyco.nsw.gov.au/community/our-commitment-communities
[142] https://www.energyco.nsw.gov.au/projects/central-west-orana-transmission-project/planning-approvals

Wider community benefits should instead rely on complementary actions by state and local government that see related investments in the REZs to support local participation. This would include suitable housing investments, appropriate post-secondary training courses in the REZs, road improvements and enhanced social infrastructure in areas like health to reflect the increased demand from the construction workforce.

These wider REZ benefits need to be coordinated through the Roadmap Intergovernmental Steering Committee (RISC) and involve Energy Co. They are critical to the successful delivery of the REZs.

The construction phase of the REZ program and the mooted $32 billion investment in the regions is less likely to obtain community support. As it is in the cities, new infrastructure development can be seen as disruptive and impactful on residents and businesses.

To focus on the building phase, is therefore to rely on a short-term stimulus without perceived legacies.

The Roadmap Intergovernmental Steering Committee (RISC), Energy Co and the industry therefore need to work hard on the legacy benefits of the REZ.

It is undeniable that wind and solar is not labour intensive. It still creates jobs, in some cases highly skilled, that do not exist now. The figures below from the REZ program show this.

The NSW planning system is as important as the Roadmap in encouraging investment in NSW. Ensuring it is adequately resourced to support the Roadmap is vital. Planning principles need to recognise that the REZ program itself concentrates electricity infrastructure development.

The planning system also needs to provide assurance to landholders their rights will be protected. Consistent guidelines and policies relating to industry as well as template agreements are measures that can help the perceived power imbalance.

Landholders need to see enduring financial benefits and consistency for all landholders is important. Neighbours and wider communities also need to see benefits.

The NSW Strategic Benefit Payments Scheme (SBPS) was necessary to achieve some equity between those impacted by transmission, and those impacted by generation.[143] It adds additional, but necessary costs to already expensive transmission projects.

9.4 Jobs and local content are expectations of the communities

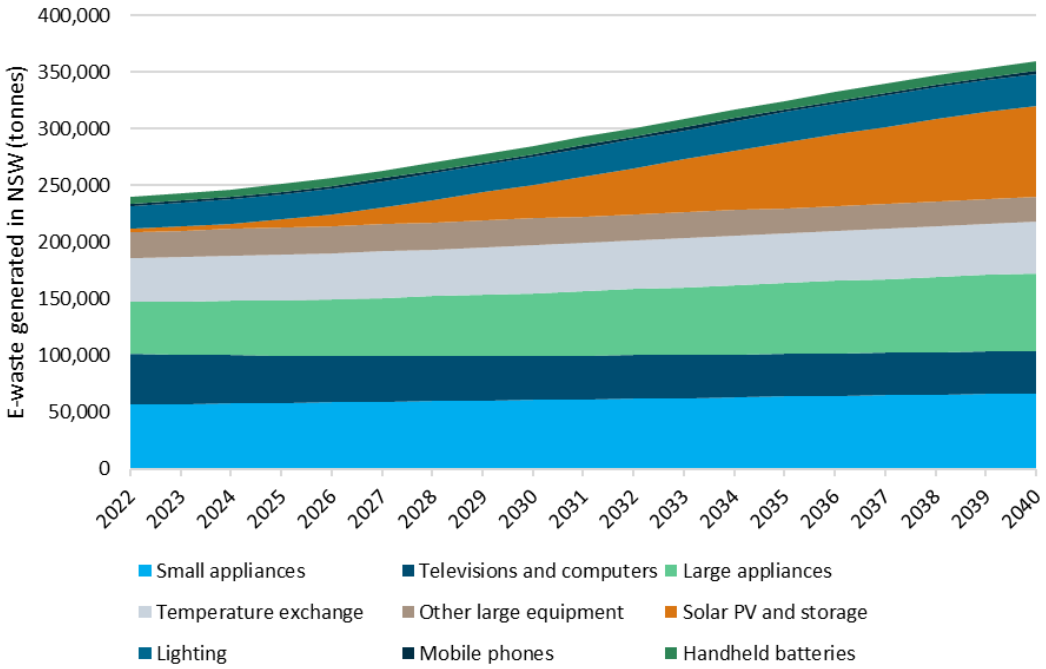
9.4.1 Background

Australia has the opportunity to become one of the biggest recycling industries in small and utility scale renewable energy and storage infrastructure. This can create significant jobs. With renewable developments focused in the REZs, these will be logical areas for new recycling infrastructure.

[143] https://www.abc.net.au/news/2022-10-25/nsw-transmission-compensation-australia-first-high-voltage-power/101573186

Analysis by Marsden Jacob below shows renewable energy as the biggest source of e-waste growth in the coming decade.

Figure 20: E-waste projections in NSW – Marsden Jacob Analysis



Marsden Jacob Analysis

If the transmission is in place, REZs will remain a valuable asset for a long time for local industries that could include metal, battery and solar PV recycling. While there may be decommissioning, there are likely to be opportunities in recommissioning when assets reach the end of their lives.

9.4.2 Stakeholders' views

Regions negatively impacted by the transition needed to be provided with transition assistance. Local content requirements and the opportunity to participate in the REZ build should be part of this transition support.

In the REZs there was general agreement that the construction phase was seen as more of an inconvenience than a benefit. That phase would involve impacts not just on the REZs, but regions that would be impacted by transport movements getting the equipment to the REZ.

Ensuring government supported the REZs with issues like training requirements, housing needs, roads and impacts on social infrastructure was vital.

The legacy of the REZs and long-term community benefits also required support from a whole range of government agencies. The benefits needed to be coordinated and involve other levels of government, but also wider community involvement. Disadvantaged communities should be prioritised in benefit funding.

Renewable energy was not a large employer but ensuring opportunities for local people in the REZs was important. Training courses that enabled this needed to be in the REZ regions. Existing large employers in the REZs should also see a benefit from the Roadmap. Long term opportunities associated with renewable energy such as recommissioning had to be considered.

The industry needed to work with Energy Co in selling the REZs but could not be asked to pay for too much or the incentive to locate there would be impacted. The NSW planning system was broadly seen as an impediment to the system. The REZ program would need to offer planning incentives and deal with issues like cumulative impact. Measures like the funding of additional planning resources by Energy Co were a welcome initiative.

9.4.3 Findings

Life cycle approach to jobs in renewables is needed

A life cycle approach to renewable infrastructure focused on construction, operation and eventual decommissioning will help build a wider benefits narrative.

Opportunities for local businesses and residents to participate in all stages of the life cycle of renewable energy assets can only be developed through a coordinated whole of government approach. State government programs like the Renewable Manufacturing Fund (RMF) can complement the REZ program.

Given the importance of NSW to the national economy, support from Federal Government programs like the National Reconstruction Fund (NRF) should also support for the REZ programs.[144] Local Government in the REZs will also be critical partners.

If suitable training opportunities are put in place, new career paths for residents could be highlighted. Existing employers in those regions should also be provided with information and opportunities to provide services to the REZ projects.

Case studies of existing renewable projects can also provide evidence of ongoing benefits. This is the case for more than just the landholders.

[144] The NRF is a Federal government co-investment scheme that is aimed at diversifying and transforming Australia's industry and economy through targeted investments. Renewables and low emissions technologies are one of the high priority areas identified by the fund. The NRF is an independent financier that operates commercially to deliver a positive rate of return. It is governed by a board that makes independent investment decisions guided by an investment mandate. See further details at: https://www.industry.gov.au/news/national-reconstruction-fund-diversifying-and-transforming-australias-industry-and-economy

Renewable Energy and Local Benefits

Bango Wind Farm (NSW) (operational): Bango Wind Farm is a 40 turbine/244MW wind project located approximately 14km south of Boorowa and 30km north of Yass in NSW. The project became fully operational in April 2023. During construction, the project supported around 320 jobs and $14 million investment into the regional economy. The project has a community benefit fund which contributes approximately $5,650 per annum per turbine (split between two local Councils) administered by two local Councils.

Bodangora Wind Farm (NSW) (operational): Bodangora Wind Farm is a 33 turbine/113.2MW wind project located approximately 15km east of Wellington near Dubbo in NSW. The project commenced operations in 2019 and is operated by Iberdrola Australia. The project created approximately 120 construction jobs and 7 ongoing jobs, including employment of local site manager from Wellington. The project allocates $50,000 annually for 25 years (until 2044) to a community fund administered by Dubbo Regional Council and also contributes $17,000 per year to an additional fund which sponsors local community events.

New England Solar Farm (part operational): New England Solar Farm is a 720MW solar project located in Uralla, in the New England REZ region. The first stage of the project (400MW) is operational, and the second stage is currently under construction. The project is expected to create up to 15 operational jobs over 30 years. The first stage of the project created opportunities for up to 400 workers during peak construction and around 80% of these workers were from the region. The project is providing funding of $250 per MW a year (around $150,000-$200,000 total) over a 25 year period for a community grants program. The community benefit program was also co-designed with a Community Reference Group. The project provided an initial contribution to be spent at the start of construction and has funded 43 projects through the program.

Local content

A genuine and credible program of local content in Roadmap infrastructure projects is likely to help with community support. The more businesses and employees who feel they are directly benefitting from Roadmap investments the better. This may require higher level leadership than that provided by the Roadmap's RESB.[145]

It could be a sub-committee of the Roadmap Intergovernmental Steering Committee (RISC) involving the Roadmap agencies, representatives of the Industry and Trade portfolio, Regional Development and the clean energy industry. It could take the existing work of the RESB and look to how it can be progressed across government.

LTESA tender and Roadmap Network Infrastructure criteria will inevitably arise in these discussions. This would seem to be counter to the focus on lowest cost for consumers, but a cost-benefit approach would allow for more consideration of supply chain, transport, and employment benefits.

Credible local procurement actions by the clean energy industry will also be required.

[145] https://www.ipart.nsw.gov.au/renewable-energy-sector-board-plan

The regions need to see a direct benefit from the Roadmap beyond the estimated $32 billion construction phase.

For the contractors delivering the REZ program is complicated by high existing workload. Regional projects present unique logistical and recruitment challenges.

The construction phase itself could be disruptive to both the REZs and regions through which equipment will be transported. A range of government agencies will be required to mitigate these impacts and ensure local participation.

There will need to be involvement across government to deliver legacy benefits in the REZs and ensure opportunities for regions negatively impacted.

Transition opportunities in areas of generation closure and local content purchasing will be important mitigants to these regions. The Hunter and Illawarra REZs are part of this story. Planning for future industries like hydrogen and offshore wind should also be considered.

In the REZs having a government entity like Energy Co fronting the project and coordinating benefits and complaints management is the right approach. Energy Co's needs to have a strong presence in the REZs.

Renewable energy is not labour intensive in the operational phase, but local employment opportunities in the industry should be maximised through appropriate training courses. Tangible benefits for local community groups and existing REZ industries are just as important as direct jobs in the sector.

9.5 Regional areas with disproportional impact and outstanding opportunities

The original REZ vision of renewable and transmission development in the interior of NSW in the Transmission Infrastructure Strategy (TIS) reinforced the perception that the traditional coal areas of the Hunter and Illawarra would be negatively impacted. In specific communities heavily tied to coal generation, in time this will be the case.

The extension of the REZ program to include the Hunter, Central Coast and Illawarra when the Roadmap was legislated sought to emphasise their participation in the transition.

In the first instance, it needs to be recognised that coal generation has a 10-15 year role to play in NSW so retention of skills are critical. New people are unlikely to enter an industry which is perceived to be in decline.

In areas such as the Hunter and Illawarra coal mining for export markets is likely to continue for a longer period than coal generation. In the case of coking coal for steel, this could be for an extended period.

Evidence from the Liddell and Eraring plants is that the generation sites will be repurposed for the energy transition. While the nature of energy use will change and be less labour intensive, the transmission infrastructure at these sites will be an asset for the owners.

There are other key roles these regions can play in the transition. The Port of Newcastle and Port Kembla are likely to be the preferred locations for imported energy infrastructure. Once docked, that infrastructure must be transported to the regions on specialist vehicles.

These areas are also home to the most critical energy intensive manufacturing industries in the state, such as aluminium and steel making. A credible program of local content in renewable infrastructure helps build support for the energy transition.

The Hunter has also been identified by the Federal Government as priority area for offshore wind development.[146] The alignment of this new generation opportunity with existing and proposed energy intensive industries, such as hydrogen production, can be part of regional transition plans.

Were an industry like hydrogen production ever to take off in the Hunter or Illawarra, significant new electricity generation infrastructure would be required. It is likely that offshore investors would need to fund this expansion.

A credible plan to support the growth of industries such as hydrogen could be considered as part of the proposed EII Act review in 2025.[147]

9.6 Recommendations

36. That Energy Co establish a REZ network infrastructure Consumer Consultation Council (RCCC) that includes the Australian Energy Regulator (AER), the Office of Energy and Climate Change (OECC) and small and large consumer groups to discuss Roadmap cost pass-through forecasts arising from Roadmap projects. This would be modelled on network company consumer consultative councils.

37. To complement the on the ground presence of Energy Co in the REZs, consideration be given to a broader public information campaign to explain the Roadmap and promote its benefits and opportunities.

38. That an expansion of Essential Energy's apprenticeship program in regional NSW be supported to help build the skills required for the energy transition.

39. That more consistency in the development assessment process for renewable energy in NSW be established through clear guidelines for wind, utility solar, transmission and storage projects. That standard guidelines also be issued for community benefit sharing.

40. That a regular forum for engagement on those guidelines be established by Department of Planning and Environment (DPE) involving Office of Energy and Climate Change (OECC), Energy Co and the clean energy industry.

41. That decommissioning plans be a part of all future renewable project approvals and that these be supported by remediation bonds at an agreed point in the project life.

[146] https://www.dcceew.gov.au/about/news/hunter-region-declared-suitable-for-offshore-wind
[147] https://www.energy.nsw.gov.au/nsw-plans-and-progress/major-state-projects/electricity-infrastructure-roadmap/regular-roadmap

42. That standard landholder agreement templates be available from the Department of Planning and Environment's (DPE) website.

43. That the Roadmap Intergovernmental Steering Committee (RISC) develop a whole-of-government plan for addressing community and workforce infrastructure needs and investments in the construction phase of the Central-West Orana (CWO) Zone. That a transport and logistics plan also be developed by RISC for CWO.

44. That selected REZ generation projects be considered for Critical State Significance Infrastructure (CSSI) where they provide system security services and enjoy community support.

45. That Energy Co establish high-profile offices in the REZs and look to increase local recruitment.

46. That the funding agreement between DPE and Energy Co for faster planning approvals in REZs be expanded, and a coordinated approach taken to cumulative impacts and biodiversity assessments.

47. That funding and resourcing of the Energy and Resources team in the Department of Planning and Environment (DPE) be increased.

48. That Energy Co, DPE and REZ generators establish coordinated approaches to benefit sharing funds, complaints and community engagement in the REZs.

49. That an updated local content policy for REZ infrastructure be developed by the RESB together with the Roadmap Steering Committee and be subject to a cost-benefit assessment.

50. That the Renewable Energy Sector Board (RESB) be supplemented by a sub-committee of the Roadmap Steering Committee (RISC) focused on local content opportunities identified by the RESB

51. That a future-looking study on the electricity infrastructure required to support a hydrogen industry in NSW be undertaken, which addresses options for funding the infrastructure outside the Roadmap.

52. That consideration be given to complementing the Strategic Benefit Payments Scheme (SBPS) with a NSW framework for neighbours and visual impacts.

53. That NSW consider the recommendations of the Australian Energy Infrastructure Commissioner's (AEIF) Community Engagement Review to be released later this year.

54. That the First Nations Clean Energy Network (FNCEN) or other appropriate representative bodies, be included in the Roadmap Steering Committee and Local Content Sub-committee.

Appendix 1. Consulted Parties

The following parties participated in the consultation process.

Table 6: Interviewed Parties

Interviewed Parties
AEMO Services Limited
Ausgrid
Australian Energy Infrastructure Commissioner (AEIC)
Australian Energy Market Commission (AEMC)
Australian Energy Market Operator (AEMO)
Australian Energy Regulator (AER)
Centennial Coal
Clean Energy Council (CEC)
Clean Energy Finance Corporation
Department of Regional New South Wales
Electrical Trades Union of Australia
Endeavour Energy
Energy Corporation of NSW
Energy Efficiency Council (EEC)
Essential Energy
Independent Pricing & Regulatory Tribunal (IPART)
Infrastructure New South Wales
Net Zero Emissions & Clean Economy Board (NZECEB)
New South Wales Department of Planning & Environment (DPE)
New South Wales Electricity Infrastructure Jobs Advocate
New South Wales Minerals Council
New South Wales Treasury
Office of Energy & Climate Change (OECC)
Origin Energy
Public Interest Advocacy Centre (PIAC)
Roadmap Special Advisor

Interviewed Parties
Transgrid
Transport for New South Wales (TFNSW)

Appendix 2. Submissions received

The following parties forwarded written submissions

Table 7: Submission Authors

Submission Authors
ACEN Energy
ATCO
Australian Constructors Association
Australian Energy Infrastructure Commissioner (AEIC)
BlueScope
Buildings Alive
Clean Energy Investors Group
Energy Corporation of New South Wales
Energy Networks Australia
John Holland
Plenary Group
Naera
RE-Alliance
Sev.en Global Investments
Shell Energy

Appendix 3. Expert Panel

Table 8: Expert Panel

Panel Entity	Representative
Australian Constructors Association	Jon Davies, CEO
Australian Energy Council	Ben Skinner, GM Policy & Research Ashley Bradshaw, Senior Energy Analyst
Australian Workers Union	Dan Walton, National Secretary
Clean Energy Investors Group	Simon Corbell, Chair & CEO
Energy Consumers Australia	Brian Spak, Director Energy System Transition
Energy Networks Australia	Dominique van den Berg, CEO
First Nations Clean Energy Network	Jonathan Kneebone, Director Policy & Engagement
RE-Alliance	Andrew Bray, Managing Director Bridget Ryan, Policy & Industry Engagement Manager

Appendix 4. Check Up Terms of Reference

Department of Premier and Cabinet

Terms of Reference

Electricity Supply and Reliability Check Up

Background

The NSW electricity system is part of a National Electricity Market governed by harmonised state-based laws. These national laws control the operations of the electricity system, including standards for system security and reliability and programs to address supply shortfalls such as the Reliability and Emergency Reserve Trader and Retailer Reliability Obligation.

In 2019, the NSW Government released the NSW Electricity Strategy to augment the national framework with NSW specific policies and programs. This includes enhanced and expanded schemes to support households and businesses reduce peak demand, a more stringent reliability objective called the Energy Security Target, funding to demonstrate emerging technologies and a NSW regulatory framework to support new generation and transmission investment.

In November 2020, the NSW Government released the NSW Electricity Infrastructure Roadmap (the Roadmap) that is legislated under the *Electricity Infrastructure Investment Act 2020*. The Roadmap sets out an investment framework to coordinate the replacement of coal-fired power stations and transition the electricity sector to a clean, affordable, and reliable system, based on best available modelling and forecasts at that time

This Roadmap and Act include mechanisms to deliver:

- 12GW of new renewable generation and 2GW of long-duration storage by 2030
- Long-term Energy Services Agreements for generation, storage and firming
- Five Renewable Energy Zones coordinating generation, storage and network infrastructure, including through new network infrastructure, network access schemes and community benefits
- Priority Transmission Infrastructure Projects in response to forecast breaches of the Energy Security Target.

The outlook for NSW's electricity sector has evolved and changed since November 2020. Key developments include:

- announcements of earlier planned coal plant retirements
- delays to major projects including Snowy Hydro's Kurri Kurri and Snowy 2.0 generators and new transmission projects
- national and global skills and supply chain shortages and issues following the impacts of COVID-19 and international acceleration of decarbonisation ambitions
- ongoing land use conflict and social licence challenges for infrastructure projects
- latest projections indicating NSW requires around 2640MW of firmed generation capacity by 2029-30 to continue to meet security and reliability standards.

The transformation of the electricity sector to meet NSW's growing and changing needs will require continued structural economic adjustment in NSW and across Australia. There is a need to ensure this effort supports the transition of our workforce from coal-related industries. This includes the

Commonwealth's National Net Zero Authority and the NSW Government's commitments to create a Net Zero Commission and four Regional Future Jobs and Investment Authorities.

The Australian Energy Market Operator's (AEMO) ongoing analyses provides clear and regular advice on whether NSW has sufficient projects to ensure electricity reliability and security. Nevertheless, there is an opportunity to assess the effects of recent market and policy developments and how capably the NSW Government's policies, programs and initiatives are responding.

Independent Check Up

The NSW Government will continue to implement the Roadmap and facilitate the transition and decarbonisation of the electricity sector as part of our commitment to achieve Net Zero by 2050. In this context, the Electricity Supply and Reliability Check Up (the Check Up) will:

- review the existing information, resources, known developments and structures rather than commission any new work or analysis
- consider the current overall policy and program approach to delivering a timely and cost-effective electricity sector transition, given the main developments that have occurred since the *Electricity Infrastructure Investment Act 2020* was passed
- comment on any residual risks for NSW (for reliability and price) should the Eraring Power Station close in 2025 and the potential additional controls available to mitigate them
- in undertaking the above, have regard to opportunities for the NSW Government to enhance local community support, workforce readiness and supply chain improvements.

The Check Up will be conducted by the selected independent and supported by the Office of Energy and Climate Change (OECC) and The Cabinet Office.

An Expert Advisory Panel (the Panel) will be utilised to support the Check Up. The Panel will consist of representatives of key stakeholder groups relevant to the electricity sector transition in NSW. Examples of relevant stakeholder groups the Panel members may be drawn from include, but are not limited to, Aboriginal and Torres Strait Islander organisations and communities, customers (small and large), generation developers and investors, civil and electrical contractors, existing generators, networks, regulators and market bodies, peak bodies, researchers and local government. The NSW Government will establish the Panel is consultation with the selected independent. The Panel will be utilised as a review process for the issues, opportunities and recommendations prior to formal submission to the NSW Government.

The Check Up will:

Review the existing information, resources, known developments and structures rather than commission any new work or analysis

- conduct targeted interviews with NSW Government agencies, market bodies and stakeholders
- review the latest reports and data available from NSW Government agencies and market bodies
- be provided with the current governance frameworks for evaluation

Consider the current overall policy and program approach to delivering a timely and cost-effective electricity sector transition, given the main developments that have occurred since the *Electricity Infrastructure Investment Act 2020* was passed.

- have regard to the commitments to establish a Net Zero Commission, the Energy Security Corporation and regional transition authorities to avoid overlap and duplication (current status and planning to be provided)

- consider any changes to simplify and streamline decision-making (including governance arrangements) under the Roadmap
- review the latest information available regarding the anticipated costs, benefits and timeframes of the Roadmap, and provide any relevant advice
- take account of how the Roadmap is contributing to NSW's emissions reduction targets, and if any emerging risks can be identified
- consider whether particular financing, planning and regulatory changes are required to accelerate projects.

Comment on any residual risks for NSW (for reliability and price) should the Eraring Power Station close in 2025 and the controls available to mitigate them.

- look at the existing mechanisms under the Roadmap, and provide comment on whether they are flexible enough to adapt to additional early closures of coal-fired generators and continue to meet growing demand for electricity
- identify any additional initiatives or programs beyond current consumer energy response (CER) programs and national initiatives, required to support the Roadmap
- the need for revised consideration of alternative forms of energy infrastructure than those currently being pursued under the Roadmap, to maintain reliability and security.

In undertaking the above, have regard to opportunities for the NSW Government to enhance local community support, workforce readiness and supply chain improvements.

- consider the effectiveness of current community engagement and the planned community benefits programs (including the Strategic Benefits Payment Scheme) in developing community support for the broad electricity transition
- advise on whether current and proposed policies and programs for local manufacturing and the minerals sector will sufficiently support the supply chains needed to implement the Roadmap (current and proposed policies and programs will be provided)
- consider current and proposed policies and programs for the skills and workforce requirements needed to deliver the transition of the electricity sector, and advise on how to effectively leverage complementary Commonwealth programs (current and proposed policies and programs will be provided)
- identify any principal challenges to Roadmap delivery (such as planning time frames and processes, the availability of transport routes and supply chain constraints) and provide recommendations to address the challenges identified.

- Note: all tenders under the Roadmap are out of scope and will not be affected by Check Up.

Specific Activities

Specific activities will include but not be limited to:

- considering the NSW Electricity Infrastructure Roadmap and the *Electricity Infrastructure Investment Act 2020* and ancillary instruments
- considering the AEMO Electricity Statement of Opportunities (ESOO) and the Energy Security Target Monitor Report (ESTM)
- targeted consultation with National Electricity Market bodies and industry associations representing electricity generators, networks and consumers in NSW
- considering any existing market testing reports produced for the Roadmap and the outcome of the recent tender for Long-Term Service Agreements (LTESAs).

Timeframe

The Check Up will take approximately 8 weeks and a final report is required to be delivered to the Government by 04 August 2023.

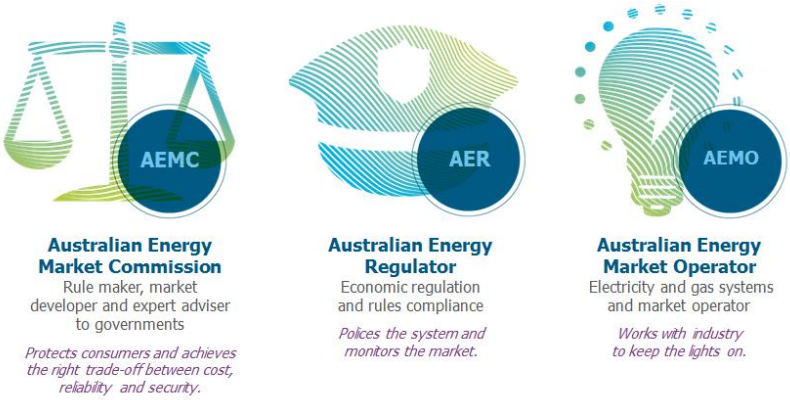
Appendix 5. NEM governance and reliability framework

Overview of NEM governance framework

The objective of establishing a national energy market governance structure was "to deliver effective competition, to provide clear accountabilities and to support investment certainty in the energy sector".[148] This is achieved through three key market bodies.[149] Each market body is an independent decision-maker with clear powers, functions, and accountabilities.

- AEMC - rule making for the energy system and market,
- AEMO - operation of the energy system and markets,
- AER - monitoring and regulation.

Figure 21: Energy market body roles[150]



Australian Energy Market Commission

The AEMC is the rule maker for Australian electricity and gas markets. Its function includes:

- making and amending the rules in order to
  - govern the operation of the wholesale electricity and gas markets
  - govern the economic regulation of the services provided by monopoly transmission and distribution networks
  - facilitate the provision of services to retail customers

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[148] AEMC website, https://www.aemc.gov.au/regulation/regulation-1

[149] In addition, the Energy Security Board was created in 2017 to implement the recommendations from the Independent Review into the Future Security of the National Electricity Market (Finkel Review). In addition, the ESB also provides a whole-of-system oversight of security, reliability, and affordability. The ESB has also been tasked to design the "post-2025" electricity market.

[150] AEMC website, https://www.aemc.gov.au/regulation/regulation-1

- conducting independent reviews and
- providing advice to governments on the development of electricity markets.

When performing the above functions, the AEMC is required by law to have regard to the National Electricity Objective (NEO) as stated in the National Electricity Law is: "to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to price, quality, safety and reliability and security of supply of electricity; the reliability, safety and security of the national electricity system."[151]

Australian Energy Regulator

The AER is the regulator of the wholesale electricity and gas markets in the NEM. It is also responsible for regulation of the retail sale and supply of electricity and gas in NSW.

The AER's functions include:

- setting maximum prices that energy network owners can charge, or the maximum amount of revenue that they can earn
- regulating the revenues of the natural monopoly businesses (e.g. transmission and distribution electricity networks and covered gas pipelines)
- monitoring of the wholesale electricity market
- enforcing compliance with rules and legislation
- publishing information on energy markets.

The AER also regulates energy retail markets in some jurisdictions, where its role includes:

- authorising retailers to sell energy
- approving retailers' policies for dealing with customers in hardship
- administering a national retailer of last resort scheme
- managing the energy price comparison website - Energy Made Easy.

The AER is a part of the ACCC but operates independently.

Australian Energy Market Operator

AEMO is responsible for the day-to-day management of the following energy market operations:

- NEM
- Western Electricity Market (WEM)
- Victorian Declared Wholesale Gas Market (Vic DWGM)

[151] AEMC website, https://www.aemc.gov.au/regulation/regulation

- Short Term Trading Markets (STTM)
- Gas Supply Hubs (GSH).

Its responsibilities include:

- market operation and administration of the procedures for the energy markets
- operation of the electricity power system, which is largely integrated with its role as market operator of the NEM
- coordination of the strategic development of the national electricity grid
- provision of strategic planning advice and forecasting to guide long-term investment and resource management for gas
- maintaining and improving power system security
- registering persons as market participants (and providing exemptions), and
- providing information to the market through its various electricity reports and the gas bulletin board.

Reliability framework in the NEM

In the NEM, the regulatory framework for reliability can be described as predominantly market based with an escalating series of interventions made available to AEMO to account for market limitations. The Figure below provides an overview of the elements of the current NEM reliability framework, including

- the market incentives
- the price settings that underpin the market settings
- the supplementary information that AEMO must make available to the market participants, and
- the intervention mechanisms available to AEMO if the above measures fail to achieve the desired reliability outcomes.

Each of these elements is discussed in detail below.

Market incentives

The core objective of the existing reliability framework is to satisfy the reliability standard through market mechanisms to the largest extent possible. The buying and selling of electricity in the wholesale market and financial products via contracts markets is the main mechanism through which reliability is expected to be met in the NEM.

Market participants make both operational and investment decisions based on the market price signals. In an operational timeframe, market participants with generation, storage and demand response services respond to price signals. For example, when the electricity spot price is increasing,

generators ramp up their output or more expensive generators (e.g. gas peakers) turn on to sell extra power to the market. Likewise, demand response may be activated and storage may be used to take advantage of the high price events.

Market settings

The market settings are a set of parameters that limit the range of market prices and thus they provide a 'price envelope' for market participants. The objective of market setting is to protect the integrity of the market by limiting the extent to which wholesale prices can rise and fall and to set a limit to the risk exposure of market participants, while also concurrently ensuring that price signals provide the incentives needed for investment and they remain consistent with achieving the reliability standard.

Every four years the Reliability Panel reviews the level of the standard and the market settings by undertaking extensive wholesale market modelling. The most recent review took place in 2022 and the resulting levels of the four elements of the market settings are:

- The Market Price Cap (MPC) is the maximum price that can be reached on the spot market during any dispatch and trading interval. The current level is $16,600 per MWh.
- The Cumulative Price Threshold (CPT) imposes a limit on sustained high prices in the wholesale market by capping the maximum cumulative price across seven days worth of trade. The current level is $1,490,200.
- The Administered Price Cap (APC) is the 'default' price cap that applies when the CPT is exceeded, the current level is $600 per MWh.
- The Market Floor Price (MFP) sets a lower limit on spot prices in the wholesale market, the current level is -$1000 per MWh.

Supplementary information

The market is also guided by AEMO's regular long, medium, and short term.

In the long term, AEMO's ESOO assesses supply adequacy across the NEM over the next ten years, taking into account any significant developments, such as the closure of a large power station.

The Energy Adequacy Assessment Projection (EAAP) considers the impact of potential energy constraints (water, gas shortages) over the next 24 months.

The regular Projected Assessments of System Adequacy (PASA) assessments indicate whether the electricity supply can meet the reliability standard over various medium and short term forward intervals.

AEMO provides all the above information to the market. If market participants do not respond to the projected shortfall, then AEMO may use additional tools to intervene in the market.

Interventions

If the above market-based and information-based approaches fail to deliver the desired reliability outcomes, then AEMO has various 'last resort' intervention powers that enable it to deal with actual or potential shortages of varying degrees of severity with the least distortion possible to the operation of the market. The three types of formal interventions[152] and their order in which they can be used are:

- the Reliability and Emergency Reserve Trader mechanism
- directions, and
- instructions.

These are further discussed below.

Reliability and Emergency Reserve Trader (RERT)

The RERT is a mechanism in the NER that allows AEMO to contract for emergency reserves ahead of a period where AEMO projects a reserve shortfall. The emergency reserves are made available on standby in the wholesale market in case demand and supply balance is tight and market response is not enough.

AEMO can procure emergency reserves through the RERT across three different timeframes:

- long-notice: up to a maximum of 12 months ahead of a projected shortfall
- medium-notice: between ten weeks' and 7 days' ahead of a projected shortfall
- short-notice: between 7 days' and three hours' notice of a projected shortfall.

While generation capacity, storage, and demand response may become emergency reserves, the reserves that are contracted under RERT must be *in addition to* those capacity that participates in the NEM wholesale market.[153] As a result, most emergency reserves are generators.

If supply continues to tighten, AEMO issues notices[154] to the market to encourage more generation or demand response. If there is not enough response to these notices, AEMO can dispatch emergency reserves.

Directions under NER clause 4.8.9

If there is a risk to the secure or reliable operation of the power system, AEMO can:

—

[152] Prior to any formal interventions, AEMO can engage in informal negotiations with market participants to alleviate any supply shortfalls. It can also use network support and control ancillary services (NSCAS) if shortfall is interrelated with network limitations.

[153] The additionality is achieved through a requirement that generation capacity or demand response cannot participated in the wholesale dispatch for at least 12 months prior to it entering a RERT contract. RERT involves an important trade-off: generation capacity that is set aside as emergency reserve is earmarked to provide a single benefit (increased capacity in the event of predictable lack of reserve events) while being prevented to provide a range of other benefits to the market (FCAS, voltage, network support, etc). This is to ensure availability under extremely rare but potentially high impact events. The potentially significant forgone revenue from participating in wholesale dispatch and other related markets is a main reason for the high levels of compensation that emergency reserve providers require to contract under RERT.

[154] These are known as the 'lack of reserve' (LOR) notifications and there are three escalating levels.

- direct a generator to increase its output, but only if this is possible and can be done safely[155] and
- direct a large energy user (that is a registered market participant) to temporarily disconnect its load or reduce demand.

Instructions under NER clause 4.8.9 (controlled load shedding)

As a last resort, controlled load shedding may be used by AEMO. This is when AEMO instructs network businesses to interrupt supply to some customers to bring supply and demand back into balance and help avoid a system-wide blackout or damage to generation or network assets.[156]

[155] To be effective, the generator must have enough time to 'ramp up'. If the generating unit is not already generating, it can take time for it to connect to the network and begin to ramp up. Gas generating units can usually turn on within a few hours if they have fuel available. Hydro plant can connect and ramp up faster than this, whereas coal generators can take several days.

[156] Controlled load shedding works by interrupting supply to a group of customers for say, up to half an hour, then rolling on to a different group. Importantly, controlled load shedding does not include sensitive groups such as hospitals and emergency services. Also, businesses or energy users that need continuous energy supply, such as data centres and customers on life support, have their own back-up plans, for example on-site diesel generators. Controlled load shedding has happened only on a few days in the past decade, most recently in Victoria in January 2019, all during extreme heatwaves.

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