



ERRATING CAN BE CLOSED ON SCHEDULE

July 2023

nexa
ADVISORY

About Nexa

Nexa is a 'for purpose' advisory firm. Our unwavering focus is accelerating the clean energy transition in a way that provides secure, reliable, and affordable power for consumers of all types.

Nexa Advisory is a team of experienced specialists in the energy market, policy and regulation design, stakeholder engagement, and advocacy. We work with public and private clients including renewable energy developers, investors and climate impact philanthropists to help them get Australia's clean energy transition done.

Nexa Advisory stands at the nexus of the energy sector's complex web of stakeholders. We support and direct their dialogue so as to remove the roadblocks to the transition.

We have a track record in policy creation, advocacy, political risk assessment, and project delivery. We are holistic in our approach and deliver solutions with people in mind, and commercial intent.

Acknowledgements

we would like to acknowledge our partner Endgame Economics for their contributions in providing the detailed analysis, modelling and charts for this project. Endgame Economics is an economics and mathematical consultancy that specialises in the energy sector. Endgame brings expertise in optimisation, quantitative analysis, and critical thinking to bear on complex problems.

Executive Summary

There is currently ongoing discussion about delaying the closure of Eraring coal-fired power station. While there is discussion there is no transparency about what it would take to close Eraring to the planned schedule.

The current slow pace of Australia's clean energy transition – generation, storage and transmission build and connection – may well necessitate delays to the closure of coal-fired power stations. This would shore up reliability in the near term, but would result in higher costs and emissions over the long term. The better approach would be to accelerate the rate at which we deploy new clean energy resources. This would negate or minimise the need to extend the lifespan of coal-fired power stations, and leave energy users and the nation much better off in coming years.

Given the risks associated with the slow pace of the transition in Australia, Nexa Advisory engaged Endgame Economics to provide evidence-based insights* into the likely impacts of delays to the transition and the closure of New South Wales' ageing coal-fired power stations, specifically Eraring and Vales Point.



* See Appendix 2 for detail

Summary of Findings

Several key findings emerged from the modelling and Nexa Advisory's research.

If we do not take action to accelerate the current build out rate of renewable generation, storage, and transmission we will continue to have **significant reliance on fossil fuel-fired electricity generation**.

This would mean:

- **Risks to our power affordability, reliability and security** – Our ageing coal-fired power stations are unreliable and expensive.
- **Emissions targets will be missed** – Extending Eraring's closure date generates additional carbon dioxide equivalent emissions, totalling around 18.3 for a delay of 2 years, and 34.5 million tonnes for a delay of 4 years.
- **Our emissions budget will be exceeded** – The total cost of the emissions on our current slow pathway would be \$160 billion, \$31 billion more than a planned transition. Delaying the closure of coal power stations would result in a total emissions cost of \$175 billion (2-year delay) and \$190 billion (4-year delay).¹ Delaying Eraring's closure contributes \$2.7 billion (2-year delay) and \$5.2 billion (4-year delay) to these costs.
- **Consumer bills will increase** – On the current slow pathway, the typical consumer will pay between \$4,500 and \$6,000 more in total (dependent on state) over the next twenty years unless the energy transition is more effectively managed.
- **Renewable energy generation targets will be missed** – On our current pathway, around 60% of electricity in the NEM will be generated by large-scale renewables in 2030, making the Federal Government's 82% target difficult to achieve without a significant acceleration.
- **A domino effect** – Should the closure of Eraring be delayed because replacement renewable generation is not built in time, then it is likely the scheduled closures of other coal-fired power stations will also be missed, such as Vales Point and Yallourn.

The NSW Energy Minister Penny Sharpe has noted that “there is significant interest in investing in NSW's energy transition, both inside the REZ and outside the REZ, which signals that any risks around grid reliability can be resolved by accelerating the development of a clean, reliable, consumer-focused energy system”.²

We strongly endorse the minister's view. Our analysis shows that there are more than sufficient renewable energy and storage projects in the pipeline ahead of the Eraring closure, with a total of 4.3 GW of committed and anticipated projects and a further 32 GW of proposed projects. Prioritising and accelerating the connections of these projects will provide investor certainty for financial close and facilitate timely commissioning.

Any reliability gaps identified by the Australian Energy Market Operator (AEMO) and AEMO Services are already being addressed.^{3,4}

It is not too late to take the necessary actions to get back on track - if we act now and work fast, we can meet build targets and achieve the current schedule of coal-fired power station retirements.

1 Based on a price of AUD\$150/_{tCO₂e}, referencing the EU price of EUR\$90, which is a requirement in NSW benefit analyses

2 <https://www.afr.com/policy/energy-and-climate/federal-scheme-to-unlock-10b-investment-in-firming-power-20230628-p5dk7g>

3 https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2023/february-2023-update-to-the-2022-esoo.pdf?la=en

4 <https://www.energy.nsw.gov.au/sites/default/files/2022-12/28October2022-Energy-Security-Target-Monitor-Report.pdf>

Summary of recommendations

In our paper, we provide complementary actions and solution options to accelerate investments and ensure consumers in New South Wales (NSW) have a reliable, affordable, and clean source of electricity.

1. Lean into new capacity build

- a. The Federal Government should continue to mobilise funding through the Capacity Investment Scheme (CIS) and/or the Clean Energy Finance Corporation (CEFC) to bring forward new dispatchable renewable generation (renewable generation plus batteries) in NSW, building on recent announcements.^{5,6}
- b. EnergyCo should be provided with additional resources, either directly or through expert support from the CEFC, to progress tenders at pace.

2. Bolster firming procurement in advance

- a. The NSW Government, through EnergyCo should accelerate firming auctions to replace Eraring, and bring on additional “insurance” capacity earlier in the Renewable Energy Zones (REZ).
- b. To improve the flow of committed projects, the NSW Government, through EnergyCo, could temporarily offer amended LTESA contracts or contracts for difference.

3. Explore Long Duration Storage

- a. The NSW Government, through EnergyCo, should explore whether there is a role for the LTESA to underpin a portfolio approach in delivering hybrid storage with generation projects (rather than separate tenders for individual generation or storage projects).
- b. The Federal and NSW governments should develop support for scalable long duration technologies, such as flow batteries and liquid air energy storage, leveraging ARENA and CEFC funding options.

4. Look beyond the REZ

- a. The NSW Government, through EnergyCo, should actively facilitate new renewable generation and storage projects outside the declared REZ, to ensure that all new capacity is connected in a timely manner and to utilise existing capacity in the transmission system.
- b. The Federal Government could explore underwriting Power Purchasing Agreements (PPAs) for new renewable generation (and storage) projects, which would ensure earlier financial close and a more rapid delivery of new firm generation projects.

5 <https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-capacity-investment-scheme-power-nsw-clean-cheap-reliable-energy>

6 <https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-100-million-investment-waratah-super-battery-deliver-more-reliable-cleaner-cheaper-energy-nsw>

5. Enable critical transmission lines

- a. The federal and NSW governments should advocate for new transmission lines to underpin the clean energy transition by designating it “nation-building” and expediting delivery of priority transmission, supported by appropriate compensation schemes for regional communities.
- b. The Federal Government should make transmission contestability a pre-requisite for access to Rewiring the Nation funds.
- c. The NSW Government should extend the competitive delivery of new transmission to all new transmission in NSW.
- d. The NSW Government, through EnergyCo, should explore delivery of priority transmission projects that would support the connection of new firming renewable generation and extend the “priority transmission” definition to all new transmission projects, including unsolicited projects, not those just those identified in the Integrated System Plans (ISP).

NSW already has in place all the legislative tools necessary to accelerate the delivery of REZ-related generation, storage, and transmission, and the delivery of non-REZ generation, storage and priority transmission lines.

Prioritising and accelerating the connections and statutory approvals, while maintaining rigor, for already committed and anticipated generation and storage projects would add a further 4.3 GW of firming low carbon generation to the NSW power system. This would provide investor certainty for financial close and facilitate timely commissioning.

Beyond the Eraring Closure

While we have proposed some immediate actions above that would promote a transition to a low carbon power system, there are further approaches that need to be taken to ensure that the power system and market are ready and accommodating of subsequent coal-fired power stations closures, without resulting in reliability or price shocks.

The closures of Liddell and Eraring power stations provide lessons for future closures, such as Vales Point (currently scheduled for 2029).

Providing clarity to the market on when a coal-fired power station will cease operation provides developers and investors with the confidence to progress new renewable generation and storage projects.

There are a number of options for providing clarity in NSW and other jurisdictions:

1. A ministerial declaration on the dates for coal-fired power stations to cease operation would provide certainty for the owners and operators, AEMO as the power system and market operator, and developers of new generation and storage projects.
2. A legislated coal closure mechanism (national or state) would set the closure date for coal-fired power stations in legislation.⁷ There would need to be a very limited degree of flexibility around the dates, with the owners and operators of the power stations required to define a window for closure, which would narrow as the date approaches. This mechanism would need to incorporate a penalty to ensure compliance with the closure date (e.g. funds in escrow^{8,9}).
3. A strategic operating reserve needs to be developed. This would underwrite new firming renewable generation through an auction, established under Capacity Investment Scheme. The auction would be held five years ahead of a scheduled closure. Once constructed and commissioned, the capacity would be in reserve (off market) such that in the event of an early closure (which is desirable) or a coal-fired unit failure near the end of its life, generation can rapidly be brought into the market. This would guarantee a smooth transition for any future coal closures and reduce price volatility, without distorting investment signals for other necessary firming renewable energy investments. The reserves could also be available to ensure the NSW Energy Security Target is met.

Distributed Energy is a complimentary measure

Rooftop solar PV is an important complementary approach to meeting emission and renewable generation targets and reducing electricity prices for all customers. Rooftop solar PV in 2022 provided 5,878G Wh or 7.9% of generation in NSW in 2022, exceeding that of utility solar generation (6.7%) and not far behind wind generation (8.3%).¹⁰ Yet because DER is owned and operated by the investor customers, who have their own motivations for its operation, household and small business DER cannot be depended on to respond in a system reliability event.

However, Commercial and Industrial (C&I) DER does and can play a significant role immediately. Commercial rooftop solar (systems >100kW) currently accounts for 4,150 MW in NSW or 43% of installed solar rooftop capacity.¹¹ While the market arrangements to provide flexibility and value for orchestrating these assets are currently in place through ancillary market services, demand response and tariffs, more work is needed to accelerate the participation of C&I in supporting the system. **The NSW Government could look at bolstering the C&I DER incentives to take advantage of this as a key resource.**

7 https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Coal_fired_power_stations/~/_/media/Committees/ec_ctte/Coal_fired_power_stations/Final%20Report/report.pdf

8 <https://grattan.edu.au/wp-content/uploads/2019/10/922-Power-play.pdf>

9 <https://ccep.crawford.anu.edu.au/publication/ccep-working-paper/6775/brown-coal-exit-market-mechanism-regulated-closure-highly>

10 OpenNem <https://opennem.org.au/>

11 APVI data: <https://pv-map.apvi.org.au/postcode>

Context - The clean energy transition is too slow

Australia is transitioning away from ageing fossil fuel power stations and shifting to cleaner and cheaper sources of energy generation, such as wind and solar, with associated storage.

There is broad recognition of both the urgent need to replace ageing coal-fired power stations, and the benefits of clean and low-cost renewable generation.

Australia's coal power stations are withdrawing from the system more quickly than anticipated, leaving a potential shortfall in generation unless we accelerate the rollout of replacement generation. In New South Wales, three coal-fired power stations are scheduled for closure over the next decade. The most cost-effective and environmentally responsible replacement for this generation capacity is renewable generation with integrated storage, to provide dispatchable 'firmed' electricity.

The scale of renewable power generation (of all types and size) that will need to be built is unprecedented. The transmission build that will be required to fully connect the new decentralised generation, rather than large and centralised fossil fuel power stations, is the equivalent of 25 per cent of today's entire grid. It will need to be built in less than 10 years.

The issues facing our energy transition are exacerbated by the global race to decarbonisation. New programs in the United States of America, European Union and Asia are accelerating the clean energy transition by providing clear financial incentives (e.g. the Inflation Reduction Act, USA; the Green Deal Industrial Plan, EU). These programs mean that Australia will need to move quickly to ensure it can attract funding, materials, and skilled people.

The Modelling

The modelling scenarios and inputs by Endgame Economics are based on AEMO's 2022 Integrated System Plan (ISP) Step-Change Scenario, including market, economic, political, and technical constraints, to determine the least-cost capacity mix for 2024 to 2043.

In addition, it was assumed that the new transmission lines in the 2022 ISP optimal development path were supported by the Rewiring the Nation program, and that coal-fired power stations closed as outlined in the 2022 ISP.

The modelling then explored our current transition approach by restricting the delivery of new renewable generation initially to 2.3 GW per year (as was delivered in 2022), growing to 3.8 GW per year by 2043. This scenario is described as "disorderly".

Further scenarios were developed by taking the "disorderly" scenario and also delaying the closure of all coal-fired power stations by two years ("disorderly coal 2y") and then four years ("disorderly coal 4y").

For details on the modelling see Appendix 1 [Endgame Economics paper, 2023]

In this paper we have defined the following terms used in the modelling as:

- Orderly to mean – a timely build out rate of renewable generation transmission and storage in line with the timing and investment outlined in the AEMO 2022 ISP Step Change Scenario
- Disorderly to mean – a slower build out rate of the renewable generation transmission and storage than is needed to meet the AEMO 2022 ISP Step Change scenario. This is the current situation, due to a range of issues, including but not limited to: the lengthy connection process, statutory approvals and transmission delays.

We are not on track

We are not building the renewable generation, storage, and transmission needed to replace the ageing coal-fired power stations fast enough. This is putting at risk electricity reliability and security in the National Electricity Market (NEM), and Australia's ability to meet emissions targets. It will also increase consumer electricity costs, in absolute terms and relative to what they would have been if we had achieved the transition more quickly.

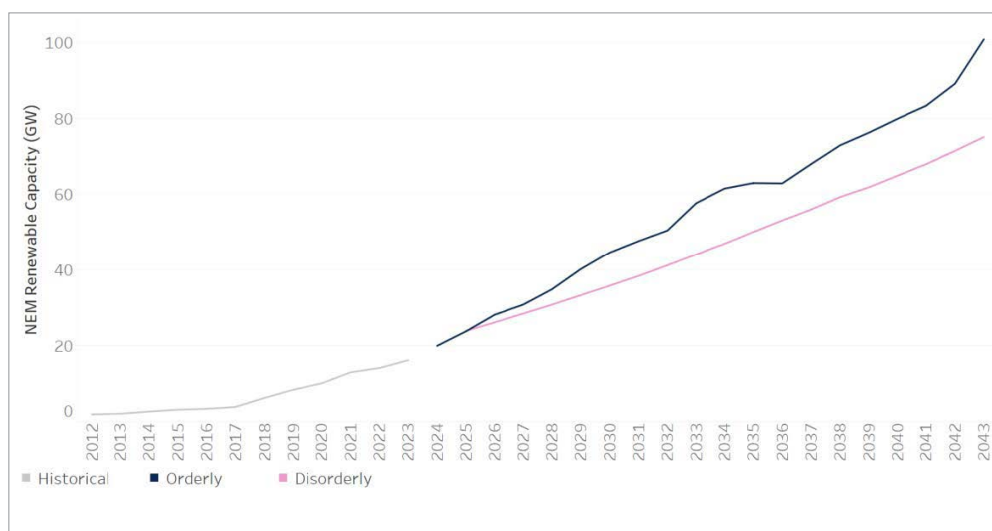


Figure 1: Required renewable generation (dark blue) in the NEM as recommended in the 2022 ISP Step Change scenario versus projected future delivery of renewable generation (pink) based on past delivery rates (grey) showing the significant and escalating shortfall in delivering renewable generation required [Endgame Economics, 2023]

While there is a great deal of positive investor sentiment about new renewable generation and storage in the NEM, as demonstrated by the NSW REZ, even expedited approaches to new transmission and firmed renewable generation are experiencing delays and cost increases.¹²

Unless we take action to quickly and efficiently expedite delivery of new generation, storage, and transmission, the current build out rate will lead to a shortfall in renewable generation capacity of 26 GW across the NEM by 2043.

To resolve any short-term reliability issues in NSW, the AEMO indicates that many of the developments that are already under consideration have the potential to significantly reduce the forecast reliability risk. This includes the renewable generation and long-duration storage to be developed under the NSW Roadmap by the end of 2029.

¹² <https://reneweconomy.com.au/nsw-renewable-zones-face-delays-and-cost-blowouts-as-questions-hang-over-eraring/>

The reliability risk in NSW associated with the closure of Eraring power station in mid-2025 can be mitigated¹³ by:

- the addition of necessary transmission, including the completion of the HumeLink and Hunter transmission projects
- a 380 MW tender for firming infrastructure
- a further 457 MW of anticipated battery developments,
- plus the current Retailer Reliability Obligation instruments that are in place

The urgent need for action has been recognised by the NSW Minister for Climate Change, Energy, the Environment and Heritage, who is actively exploring approaches to mitigate the need to delay the closure of Eraring power station. This is being progressed through the Expert Advisory Panel, led by Cameron O'Reilly.¹⁴

It is also pleasing to see the recent joint announcement by the NSW and federal energy ministers that they will progress a tender for an additional 550 MW of storage capacity under the Federal Capacity Investment Scheme,¹⁵ and the announcement of \$100 million of Clean Energy Finance Corporation funding for the 850 MW Waratah Super Battery¹⁶ which will support 1400 MW of new dispatchable capacity in NSW (Eraring Power Station has a capacity of 2,880 MW).

These are important steps towards managing the closure of coal-fired power stations, and ensuring that Australia and NSW will have a coordinated and well-managed transition to low carbon power.

Implications are significant

The current slow rate of renewable generation build, plus delays in building the new transmission to connect it to the market, means we could be reliant on fossil fuel-fired power generation for longer than planned. Modelling by Endgame Economics highlights the significant implications of this.

Risks to the NEM's power reliability and security

Our coal-fired power stations are old, increasingly unreliable¹⁷ and expensive. Even by achieving the power station closures as scheduled, the NEM, particularly in NSW and Queensland, will remain reliant on coal-fired generation into the future, backed up by increased use of flexible gas peaking plants because of coal plants' reliability issues.

New gas-fired power stations and pumped storage projects have been delayed significantly, presenting little hope of resolving the power reliability and security issues with a business-as-usual approach.

Should the rollout of renewable generation continue at the current slow pace, then it is likely the scheduled closure dates of other coal power stations will also be missed, such as Vales Point and Yallourn, exacerbating these issues.

13 https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2023/february-2023-update-to-the-2022-esoo.pdf

14 <https://www.nsw.gov.au/media-releases/electricity-sector-check-up>

15 <https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-capacity-investment-scheme-power-nsw-clean-cheap-reliable-energy>

16 <https://minister.dcceew.gov.au/bowen/media-releases/joint-media-release-100-million-investment-waratah-super-battery-deliver-more-reliable-cleaner-cheaper-energy-nsw>

17 <https://reneweconomy.com.au/coal-plant-reliability-hits-a-new-low-as-unplanned-unit-outages-hit-a-new-high/>

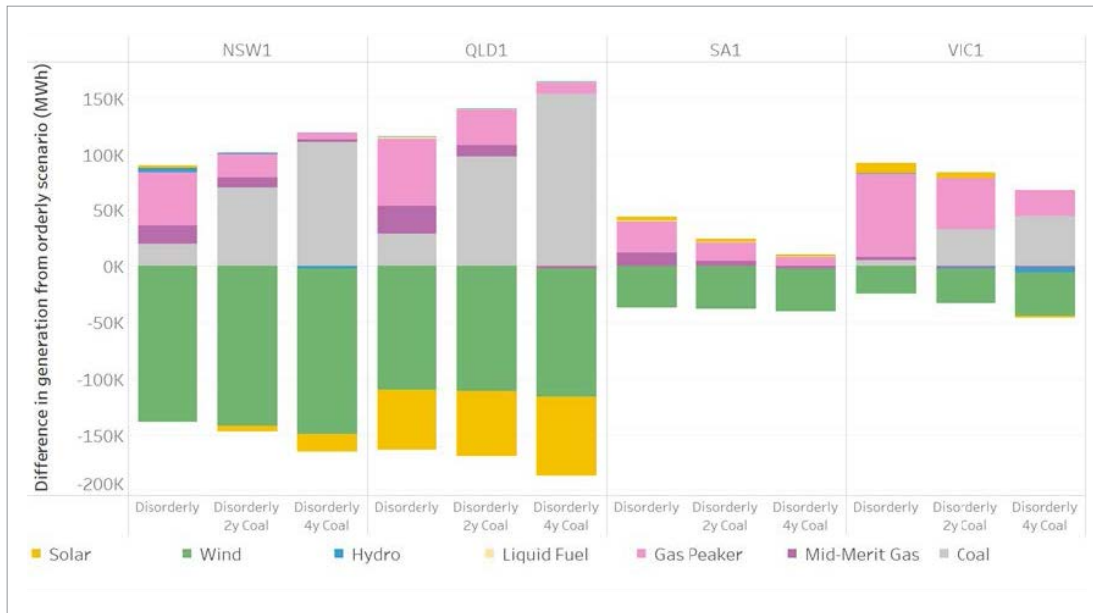


Figure 2: Continuing to transition at the current slow pace means that Australia will rely more on coal and gas, increasing emissions and pushing out clean generation such as wind and solar [Endgame Economics, 2023]

Emissions target and budget will be missed

Delaying the closure of our coal-fired power stations, such as Eraring and Vales Point, means that the NEM will be reliant on high carbon polluting generation, such as coal and gas, for longer. This undermines Australia’s chances of meeting carbon emissions goals.

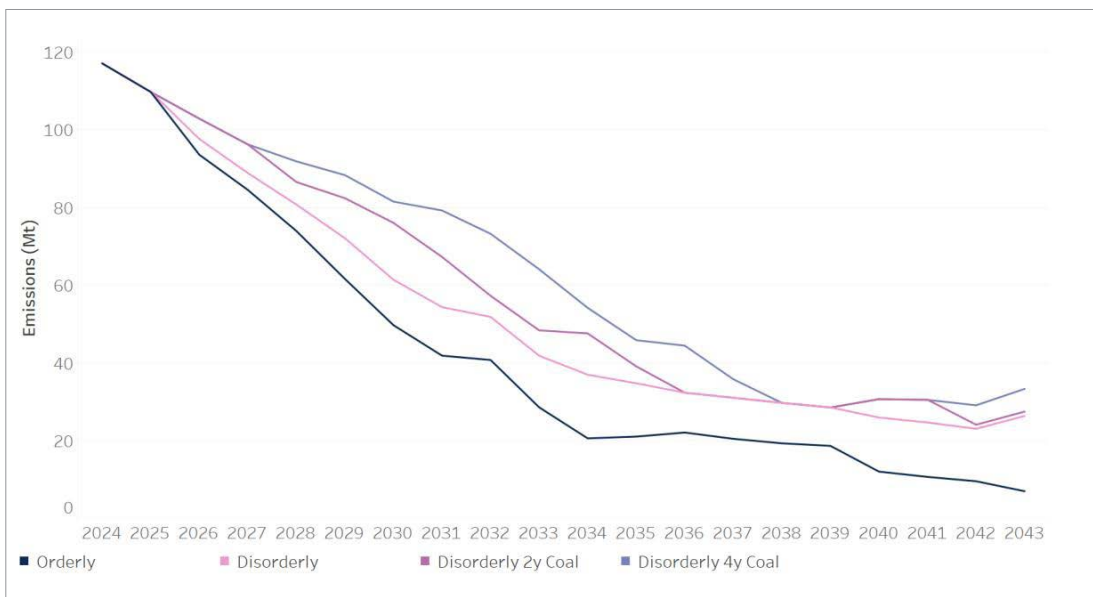


Figure 3: In a transition as outlined in the 2022 ISP, NEM carbon emissions steadily reduce to close to zero by 2043 (dark blue). On our current slow transition pathway, emissions also reduce over time, but more slowly, flattening out in 2042, and implying that net zero will not be achieved (pink). If the closure of coal power stations is delayed by 2 years (magenta) or 4 years (blue) then emission reductions occur more slowly and plateau in 2040, before increasing, resulting in net zero targets being missed [Endgame Economics, 2023]

If the transition continues on its current slow trajectory, Australia will exceed the carbon emissions ‘budget’ used in the AEMO 2022 Integrated System Plan in 2037. If all coal-fired power station closures are delayed by two years, the carbon budget will be breached in 2034.

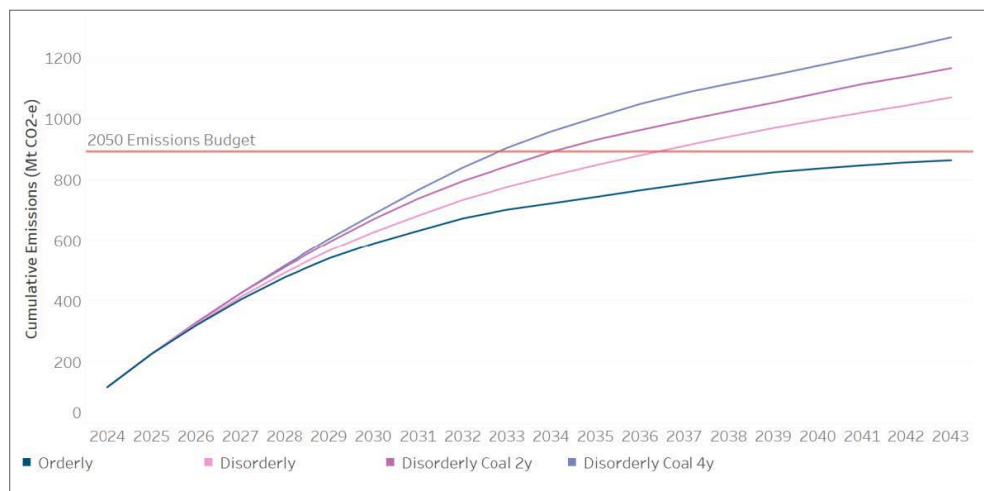


Figure 4: In a transition based on the 2022 ISP, Australia stays within the carbon budget necessary to achieve net zero by 2050 (dark blue). With our current slow transition, Australia will exceed its carbon budget in 2037 (pink) making it unlikely that net zero would be achieved. If the closure of coal power stations is delayed by 2 years (magenta) or 4 years (blue) then Australia will exceed its carbon budget in 2034 and 2033 respectively, resulting in net zero targets being missed [Endgame Economics, 2023]

The modelling indicates that extending Eraring’s closure date by two and four years generates around 18.3 million and 34.5 million tonnes of carbon dioxide equivalent (Mt_{CO₂-e}) respectively.

While Australia does not have a carbon price, the NSW Government has legislated that all investments in the state must take into consideration a carbon price when undertaking a cost-benefit analysis. The price to be used is that defined in the European Union Emissions Trading System,¹⁸ with a current average of EU\$90 per tonne of CO₂ equivalent carbon (t_{CO₂-e}) in 2023, equating to approximately AU\$150 per t_{CO₂-e}.

If we continue on our current slow transition pathway, the cost of the extra emissions produced would be \$160 billion by 2043. This is \$31 billion more than the emissions cost for a transition based on the 2022 ISP. Delaying the closure of Eraring would add a further \$2.7 billion over two years and \$5.2 billion over four years to the increased emissions cost of the slow transition.

Consumer bills will increase

If we do not take action to get back on track with our energy transition, consumers in all the mainland states will pay more for electricity than they otherwise would in an accelerated transition achieving the goals outlined in the 2022 ISP. Consumers in NSW will be paying an additional \$769 and consumers in Queensland an additional \$1110 by 2043.

	2027	2031	2035	2039	2043
NSW	106.3	352.0	441.5	340.6	768.6
SA	109.3	343.9	394.4	201.2	587.1
VIC	90.5	334.3	348.2	157.4	639.0
QLD	65.0	221.8	388.9	242.0	1109.5

Table 1: Additional costs to consumers on our current slow transition pathway

In total, the typical consumer will pay between \$4500 and \$6,000 more cumulatively (dependent on state) over the next twenty years, than they otherwise would have if the transition been more effectively managed.

¹⁸ https://www.treasury.nsw.gov.au/sites/default/files/2023-03/20230302-technical-note-to-tpg23-08_carbon-value-to-use-for-cost-benefit-analysis.pdf



Figure 5: Comparative cost per consumer of a transition based on the 2022 ISP (dark blue) and continuing our slow transition (pink), showing the increased costs of our current slow transition [Endgame Economics, 2023]

Renewable energy generation targets will be missed

Should the transition continue on the current pathway of lagging behind the required build rate for firm renewable generation and transmission, Australia will be highly unlikely to meet the Federal Government’s 82% Renewable Energy Target in 2030. On our current slow pathway, only slightly more than 60% of electricity in the NEM will be generated by large-scale renewables in 2030. Even on the ideal pathway, the 82% target can only be met in 2030 by including rooftop solar photovoltaic (PV).

Further, delaying the closure of Eraring power station may trigger delays in the closure of other coal-fired power stations to address short-term concerns related to reliability. Continuing reliance on coal generation beyond anticipated closure dates will reduce the confidence of potential investors in the new firm renewable generation that is needed to deliver a clean energy future.¹⁹

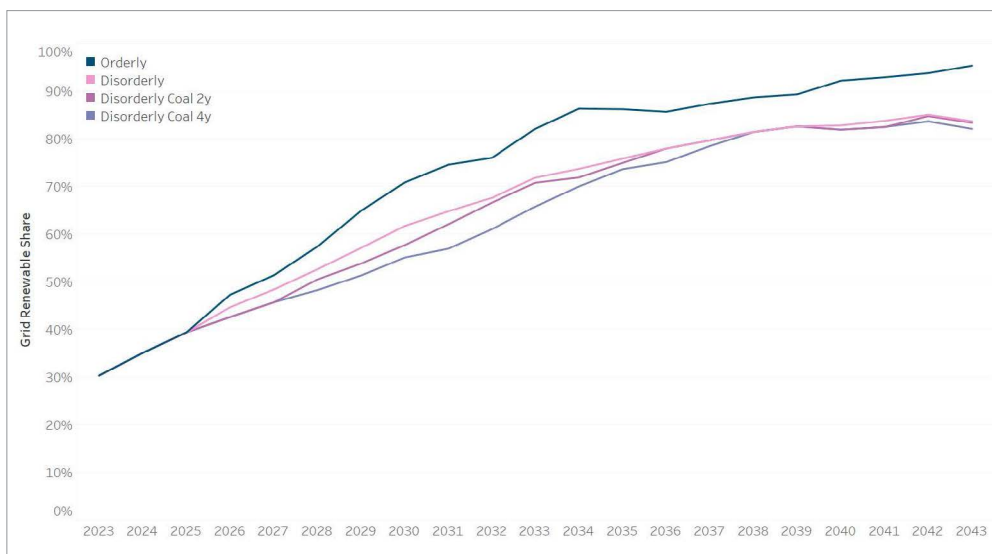


Figure 6: Renewable generation share (ignoring the contribution from rooftop solar PV) showing the target for meeting 82% renewable generation by 2030. On our current trajectory (pink) 82% renewable generation would not be achieved until 2038-39. Delaying the closure of coal power stations by 2 years (magenta) or 4 years (blue) similarly delays the achievement of the target [Endgame Economics, 2023]

19 <https://www.afr.com/companies/energy/taylor-moves-to-delay-the-exit-of-coal-from-grid-20220407-p5abjc>

Transmission the missing link

Australia needs to build 10,000km of transmission, equal to 25 per cent of today's entire transmission grid, in less than 10 years. Even if we could generate enough renewable energy, we do not have the transmission infrastructure required to convey it to consumers.

The scale of build required risks supply chain and procurement bottlenecks for the regulated monopoly networks. Transgrid must compete on the international stage for highly specialised assets, and skilled labour such as project management of large infrastructure projects.

Transmission is not being approved and built fast enough and this is then slowing down the renewable generation and storage build needed.

As part of this, lengthy and uncertain approvals process do nothing to ensure social licence from and compensation of host communities.

Recent work by Nexa Advisory²⁰ demonstrates that Australia's regulated monopoly Transmission Network Service Providers (TNSP) are small in comparison to the established international companies already operating in Australia. These international entities have asset bases equivalent to the entire transmission asset base of the NEM (\$22 billion), earning a revenue equivalent to the largest TNSP in the NEM, Transgrid.

Transgrid indicates that over \$14 billion of investment is needed in 2,500 km of new transmission in NSW, while needing a further \$16 billion a year to operate this expanded system.²¹ Transgrid has also repeatedly sought regulatory changes, because they are unable to finance the required new transmission without damaging their credit rating.^{22,23}

Opening up the transmission market in NSW to competition, as the NSW Government has done already for the delivery of the REZ transmission would:

- encourage innovation in both technical approach and delivery, promoting long-term efficiency and reducing energy costs to customers
- attract international private finance and capital quickly and efficiently, potentially alleviating financing constraints in the delivery of transmission by regulated PTNSPs
- achieve greater efficiency in the construction, operation and maintenance of transmission assets

Additionally, continuing to restrict the delivery of new transmission to the regulated monopoly TNSP will cost customers in the NEM \$13 billion more than seeking to deliver new transmission competitively.²⁴

20 https://nexaadvisory.com.au/site/wp-content/uploads/2023/06/Nexa-Advisory_Transmission-Contestability-in-Australia-Research-Report-June-2023.pdf

21 <https://www.transgrid.com.au/media/avyondr4/system-security-roadmap-2023.pdf>

22 <https://www.aemc.gov.au/rule-changes/participant-derogation-financeability-isp-projects-transgrid>

23 <https://www.aemc.gov.au/sites/default/files/2023-07/ENA%20rule%20change%20request%20-%209%20June%202023.pdf>

24 https://nexaadvisory.com.au/site/wp-content/uploads/2023/06/Nexa-Advisory_Transmission-Contestability-in-Australia-Research-Report-June-2023.pdf

We need actions to accelerate and get on track

It is not too late to take the necessary actions to get back on track - if we act now and work fast, we can meet build targets and achieve the current schedule of coal-fired power station retirements.

Taking the right actions now would see the timely build of sufficient renewable generation and storage, and its connection to the wider system by new transmission. Modelling estimates that 4 GW of dispatchable renewable energy capacity must be added each year across the NEM, ahead of the closure of coal-fired power stations. This would be ~2.3 GW of capacity in NSW alone. By 2043, the amount of renewable capacity in the NEM is modelled to be 26 GW higher in the scenario based on the 2022 ISP, rather than on our current slow trajectory (Figure 1).

A clear and certain approach to accelerating the transition is critical to ensure that private capital and investment is available to build the new generation, transmission and storage.

Recommendations to bring forward investment in NSW

The NSW energy minister is actively exploring approaches to mitigate the need to delay the closure of Eraring power station. We provide these potential complementary actions and options to be considered as part of the broader review that seeks to ensure consumers in NSW have a reliable, affordable, and clean source of electricity.

Lean into new capacity build

The Federal Government should continue to mobilise funding through the Capacity Investment Scheme (CIS) and/or the Clean Energy Finance Corporation (CEFC) to bring forward new dispatchable renewable generation (renewable generation plus storage) in NSW, building on recent announcements. This, in concert with the continuing actions of the NSW government through the NSW Energy Infrastructure Act and EnergyCo to bring forward renewable generation and storage, would be a robust response to managing these closures in NSW.

The federal and NSW governments should continue to work together to leverage the funding through the CIS and the CEFC to underpin the delivery of new renewable generation and storage capacity in NSW.

Bolster firming procurement in advance

The NSW Energy Infrastructure Act provides incentives for the delivery of new renewable generation, firming and long duration storage through the LTESAs.

However, currently a firming LTESA can only be sought when a future breach of the security requirements has been identified in the annual Energy Security Target Monitor. While the response to firming tenders has been robust, firming, such as batteries, may not be delivered in time if the only trigger is the identification of a future breach of reliability standards.

There may be benefits to procuring firming through the LTESA mechanism ahead of identified breaches, as this would provide cost-effective “insurance” against an unexpected earlier loss of capacity, such as the earlier-than-announced closure of a coal-fired power station. It would also be more efficient than urgently trying to secure firming.

Additionally, securing firming early provides a strong signal to investors of the need and desirability of new battery projects.

The NSW Government, through EnergyCo should accelerate firming auctions to replace Eraring, and bring on additional “insurance” capacity earlier in the Renewable Energy Zones (REZ).

The design of the LTESA contracts could also be amended as a tool to speed up the buildout of RE in the State.

The LTESA contracts are currently designed to act as ‘insurance’ products by providing minimum cash flows for projects if their revenues decline when electricity prices are low. Whilst this is useful to address the concerns of banks, equity financiers retain higher levels of risk.

There is a strong pipeline of projects in NSW. To improve the flow of committed projects, the NSW Government could amend its LTESA contracts to ensure they address the level of excessive risk for equity investors. Those amendments could be in place for a limited time only (say 2-4 years) while NSW builds a buffer of generation and storage capacity ahead of Eraring's (and other thermal plants') closure.

We note that there is bi-partisan support for the LTESA framework in NSW and this recommendation is not suggesting a re-write of the LTESA contracts, rather an add-on or amendment to the template LTESA contract to temporarily improve the risk profile for equity investors.

Whilst it may be more difficult politically, another alternative could be for the NSW and/ or Commonwealth governments to consider offering proven and effective mechanisms such as the more traditional and understood contracts for difference used in the ACT and Victoria.

To improve the flow of committed projects, the NSW Government, through EnergyCo, could temporarily offer amended LTESA contracts or contracts for difference.

Explore Long Duration Storage

Established electricity storage technologies with a discharge duration of eight hours or longer are limited. While very large batteries are an option for long duration storage, the only established such technology is pumped hydro-electricity. However, suitable geographic locations are few and community concerns about environmental damage may make securing sites difficult.

Additionally, holding back capacity from the market, to always ensure that a specified storage capacity can be delivered on the limited occasions it is required, will result in very high costs for availability.

One option is to adopt a portfolio approach to long duration storage, which includes a hybrid of renewable generation and batteries.

Further, the federal and NSW governments should work together to explore the development of scalable long duration electricity storage such as flow batteries and/or liquid air energy storage technologies. This is because larger and larger lithium-ion batteries are not best suited to long duration storage approaches and are not the most efficient use of fast response lithium-ion battery applications. Commencing this work now will ensure that long-duration storage technologies are ready to be deployed when needed.

The NSW Government, through EnergyCo, to explore whether there is a role for the LTESA to underpin a portfolio approach to delivering hybrid storage with generation projects (rather than separate tenders for individual generation or storage projects).

The federal and NSW governments to immediately commence exploring support for scalable long duration technologies, such as flow batteries and thermal energy storage, leveraging ARENA and CEFC funding options.

Look beyond the REZ

The immediate priority in NSW has been to focus on the declared REZs. However, there are likely to be high value, high-capacity projects outside of REZs that can be prioritised to deliver diversified sources of capacity and storage.

The NSW Electricity Infrastructure Investment Act 2020²⁵ specifies the capacity of generation to be added inside and outside the REZ. It suggests that 1 GW is needed outside in the REZ by 2029. However, the capacity outlined in the legislation is the minimum requirement and there is scope to seek additional investment.

There are a number of generation and storage projects that have been proposed by developers but not progressed due to the focus on investment in the REZs. Limiting the delivery of new projects to the REZs hampers the ability of the NSW government to address security concerns, particularly where there may be residual transmission capacity that can support new generation connections outside the REZs. Encouraging new developments beyond the REZs would attract investment where it is needed and allow the transition to progress at a faster pace.

²⁵ <https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044>. Clause 44.3

	Solar PV	Wind Onshore	Wind Offshore	Batteries	Other Storage	Total
Committed	980	396	0	300	0	1,676
Anticipated	205	617	0	1,769	0	2,591
Total Committed & Anticipated	1,185	1,013	0	2,069	0	4,267
Proposed	4,417	14,835	9494	3,421	200	32,367 [^]

Table 2: Committed and anticipated Renewable generation and storage waiting to connect outside the REZ in NSW (MW).

[^]The 32.4 GW of proposed generation and storage includes 1.5 GW of generation inside the Central West-Orana REZ²⁶

Analysis of the renewable generation and storage projects waiting to connect outside the REZ in NSW shows that there is 1.7 GW of committed projects and 2.6 GW of anticipated projects, providing a total of 4.3 GW of new renewable generation and storage. However, these projects are still working through connection arrangements to secure agreements. Expediting the connections and statutory approvals for projects determined as high value for NSW energy transition and reliability measures, would result in earlier commissioning of these projects. While we welcome the May 2023 announcement from the Energy and Climate Change Ministerial Council – Energy Ministers Sub-Group to provide support to AEMO to deploy additional resources to support NEM projects that are targeting connection for the 2023-24 summer,²⁷ we believe more can be done. Transgrid is a critical partner with AEMO in delivering new connections in NSW; providing resources to expedite the connections process would result in additional renewable generation and storage projects coming online earlier. It would also provide confidence to investors that projects can progress rapidly.

Additionally, underwriting Power Purchasing Agreements (PPAs) for new renewable generation (and storage) projects would support a more rapid financial close on new developments, supporting earlier delivery of new firm generation.

The NSW Government, through EnergyCo, should actively facilitate new renewable generation and storage projects outside the declared REZ, to ensure that all new capacity is connected in a timely manner and to utilise existing capacity in the transmission system. This will minimise the risk of reliance on REZs as the sole source of new generation investment.

The Federal Government could also explore underwriting Power Purchasing Agreements (PPAs) and or CIS for new renewable generation (and battery) projects, which would ensure earlier financial close and a more rapid delivery of new firm generation projects.

²⁶ https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/generation_information/2023/generating-unit-expected-closure-year.xlsx?la=en

²⁷ https://www.energy.gov.au/sites/default/files/2023-05/EMSG1%20final%20communique%2019%20May%202023_0.docx

Enable critical transmission lines

While EnergyCo has been focusing on the delivery of the transmission in the REZ, delivering other priority transmission projects outside of these REZ, including the interconnectors identified in the 2022 ISP, will further support the connection of new firmed renewable generation.

The NSW Electricity Infrastructure Investment Act 2020²⁸ supports the delivery of priority transmission lines identified in the ISP, but this should be extended to non-ISP identified transmission lines.

Where transmission capacity may be limiting new projects outside the REZs, it may be possible to identify a limited number of relatively minor priority transmission augmentations that would efficiently facilitate a large opportunity for new firmed renewable generation. By signalling the need for both generation and storage in these non-REZ locations, investors would be able to proceed with developments.

Innovative technologies can be used to maximise the available capacity of existing transmission lines (e.g. active network management via power flow controller technologies) and have already been used in NSW.²⁹

Developing social licence for new transmission is important and delivering the benefits of access to clean, low-cost firmed generation is critical. New transmission lines are essential nation-building infrastructure that underpin the security of electricity supply, while driving economic prosperity and reducing energy bills.

Extending the contestable delivery of new transmission lines in the REZ to all new transmission lines in NSW will introduce the competition that will accelerate delivery, enhance supply chain and procurement leverage, and innovation, and reduce costs for consumers.

The federal and NSW governments should advocate for new transmission lines to underpin the clean energy transition by designating it “nation-building” and expediting delivery of priority transmission, supported by appropriate compensation schemes for regional communities.

The Federal Government should make transmission contestability a pre-requisite for access to Rewiring the Nation funds.

The NSW Government should extend the competitive delivery of new transmission to all new transmission in NSW.

The NSW Government, through EnergyCo, to explore delivery of priority transmission projects that would support the connection of new firmed renewable generation and extend the “priority transmission” definition to all new transmission projects, including unsolicited projects, not just those identified in the ISP.

²⁸ <https://legislation.nsw.gov.au/view/html/inforce/current/act-2020-044>. Clauses 32 & 34

²⁹ <https://www.energymagazine.com.au/transgrid-delivers-45m-vni-upgrade-unlocking-170mw/>

Beyond the Eraring Closure

While we have proposed some immediate actions above that would promote a transition to a low carbon power system, there are further approaches that need to be taken to ensure that the power system and market are ready and accommodating of coal-fired power stations closures, without resulting in reliability or price shocks.

The closures of Liddell and Eraring power stations provide lessons for future closures, such as Vales Point.

Providing clarity to the market on when a coal-fired power station will cease operation provides developers and investors with the confidence to progress new renewable generation and storage projects.

There are a number of options for providing clarity in NSW and other jurisdictions:

1. A ministerial declaration on the dates for coal-fired power stations to cease operation would provide certainty for the owners and operators, AEMO as the power system and market operator, and developers of new generation and storage projects.
2. A legislated closure mechanism (national or state) would set the closure date for coal-fired power stations in legislation.³⁰ There would need to be a very limited degree of flexibility around the dates, with the owners and operators of the power stations required to define a window for closure, which would narrow as the date approaches. This mechanism would need to incorporate a penalty to ensure compliance with the closure date (e.g. funds in escrow^{31,32}).
3. The development of a strategic operating reserve, where new firming renewable generation is underwritten through an auction under the established Capacity Investment Scheme. The auction would be held five years ahead of a coal closure. Once constructed and commissioned, the capacity would be in reserve (off market) such that in the event of an early closure (which is desirable) or if a coal-fired unit fails near the end of its life, generation can rapidly be brought into the market. This would guarantee a smooth transition for future closures and reduce price volatility, without distorting investment signals for other necessary firming renewable energy investments. The reserves could also be available to ensure the NSW Energy Security Target is met.

30 https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Coal_fired_power_stations/~//media/Committees/ec_ctte/Coal_fired_power_stations/Final%20Report/report.pdf

31 <https://grattan.edu.au/wp-content/uploads/2019/10/922-Power-play.pdf>

32 <https://ccep.crawford.anu.edu.au/publication/ccep-working-paper/6775/brown-coal-exit-market-mechanism-regulated-closure-highly>

Note on the role of DER

Distributed Energy Resources (DER), such as household rooftop solar PV and batteries, and community batteries, do have an important proven role in supporting emissions reductions. They will lower costs for all consumers and ensure we reach the target of 82% of all electricity generation by renewables in 2030.

Rooftop solar PV is an important complementary approach to meeting emission and renewable generation targets and reducing electricity prices for all customers. Rooftop solar PV in 2022 provided 5,878GWh or 7.9% of generation in NSW in 2022 exceeding that of utility solar generation (6.7%) and not far behind wind generation (8.3%).³³ Yet because DER is owned and operated by the investor customers, who have their own motivations for its operation, household and small business DER cannot under current market arrangements count towards meeting reliability standards.

However, Commercial and Industrial (C&I) DER does and can play a significant role immediately. Commercial rooftop solar (systems >100kW) currently accounts for 4,150 MW in NSW or 43% of installed solar rooftop capacity.³⁴ While the market arrangements to provide flexibility and value for orchestrating these assets are currently in place through ancillary market services, demand response and tariffs, more work is needed to accelerate the participation of C&I in supporting the system. The NSW Government could look at bolstering the C&I DER incentives to take advantage of this as a key resource.

The 2022 AEMO Integrated System Plan (ISP) step-change scenario, which was the basis for the modelling in this paper, does include DER.

Note on reliability standards

The AEMC Reliability Panel sets both the Reliability Standard of 0.002% of Unserved Energy (USE, meaning 0.002% of electricity demand in a state (region) cannot be met by generation, which is equivalent to an average household having a power cut for 10-11 minutes in one year³⁵) and the more conservative Interim Reliability Measure of 0.0006 % USE.

The annual AEMO Electricity Statement of Opportunities (ESOO) assesses the ability of each state and the NEM to meet the standards in the coming five years. Additionally, AEMO Services assess the ability of NSW to meet the standards in the annual Energy Security Target Monitor (ESTM), who advise the NSW minister, in conjunction with the biennial Infrastructure Investment Objectives (IIO) report, on capacity and transmission lines needed to deliver electricity reliably.

However, in a recent review the AEMC Reliability Panel identified that the current standards may not be fit-for-purpose for a renewable energy power system and that work is underway on considering new metrics:³⁶

“A single ‘expected value unserved energy’ metric provides insufficient information on the distribution of USE in a high VRE power system and may not effectively reflect changes in the NEM’s reliability risk profile by 2028... The Panel considers that there is likely to be a material benefit from amending the form of the reliability standard following 1 July 2028.”

As experience in operating a high renewable generation system, with inverter support, reliability standards will inevitably adapt and may be less conservative.

33 OpenNem <https://opennem.org.au/>

34 APVI data: <https://pv-map.apvi.org.au/postcode>

35 <https://reneweconomy.com.au/this-is-no-time-for-energy-ministers-to-panic-over-reliability-standards-37320/>

36 <https://www.aemc.gov.au/sites/default/files/2022-09/2022%20RSS%20Review%20Final%20Report%20%281%29.pdf>



Copyright Nexa Advisory



www.nexaadvisory.com.au

info@nexaadvisory.com.au

nexa
ADVISORY