THE CASE FOR CLOSING ERARING IN 2027

Analysis of Eraring's operation and the impact of its unreliability on electricity consumers, taxpayers and the energy transition

February 2025

nexa ADVISORY

About Nexa Advisory

We are an advisory firm working with public and private clients. 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.

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Disclaimer:

Executive Summary

Nexa Advisory has analysed the performance of the Eraring Power Station and considered the likely impact of its unreliability on the consumers of electricity in New South Wales. We have also assessed the risks to the renewable generation pipeline, and therefore energy transition, of further extensions to this power station's operational life. In light of this analysis, Nexa Advisory makes recommendations to the New South Wales Government on actions it should take to mitigate these risks and issues, and the ongoing cost to taxpayers.

In this report, we examine the operation of Eraring Power Station, Australia's largest coal-fired power station. We find that this ageing 43-year-old generator is unreliable and incompatible with today's dynamic electricity system. This has real consequences for electricity consumers – particularly in New South Wales - and for investment in renewable energy generation, storage and transmission needed for Australia's future energy system.

We have shown that Eraring has high downtime and frequent unplanned outages, with an unplanned outage rate of 6 per cent in 2024. Each of Eraring's units have experienced an average of about two months of downtime annually and have operated at a low capacity for over half the time in recent years. Additionally, Eraring exhibits poor price responsiveness and limited technical ability to ramp generation up and down in response to demand.

These outages and poor performance have impacted Eraring's availability when needed most, such as throughout 2024 during days of high demand (20 June) and tight demand-supply conditions (27 November). This unreliability is also reflected by the record 144 Lack of Reserve alerts issued by the Australian Energy Market Operator (AEMO) throughout the last quarter of 2024 – which typically coincide with substantial spikes in wholesale electricity prices.

This indicates that Eraring cannot be relied on to ensure electricity reliability when needed most. This is contributing to wholesale price volatility and ultimately leading to higher costs for consumers.

Despite this unreliability, in May 2024, the New South Wales Government negotiated an extension and potential underwriting of Eraring's operation to August 2027, requiring the generator to be deregistered by April 2029. This could cost New South Wales Government up to $450 million to underwrite the potential financial losses of the continued operation of the plant by Eraring's owner - Origin Energy.

This means that, in addition to upwards pressure on consumer bills due Eraring's unreliability, the cost of this underperformance will be borne by New South Wales taxpayers.

Additionally, Eraring's estimated 13 Mt CO_2 of annual emissions in 2024 presents a significant obstacle to meeting the state's emissions reduction targets.

In addition to emissions, the ash waste management of Eraring will continue to have adverse local impacts on the community and environment until the power station is closed and its ash dam is remediated.

Keeping Eraring open beyond its use-by date is clearly not a feasible solution. To avoid another extension and reduce the state's reliance on this unreliable generator, the New South Wales Government must support alternative solutions outlined in this report to deliver secure, reliable and affordable electricity for New South Wales consumers.

There is a strong pipeline of renewable energy projects in New South Wales which will replace the energy generated by the 2,880 MW Eraring in the coming years. Over 4.5 GW of battery storage, 5.8 GW of solar and 4.6 GW of wind projects have received state planning, development and/or environmental approvals and can be accelerated to support the state's clean energy transition. This is part of a broader pipeline of proposed projects - including 16 GW of battery storage, 17 GW of solar and 27 GW of wind projects – which can also be accelerated to deliver additional capacity and avoid further reliability concerns in the future.

These projects will require on-time delivery of transmission infrastructure to connect to the grid and deliver benefits for power system reliability, security and consumer bills.

Summary of Recommendations

Nexa Advisory continues to advocate for the accelerated build out of the replacement generation in New South Wales. The New South Wales Government's urgent consideration and action of the following recommendations is critical to mitigate the risks and ongoing cost to consumers, taxpayers and investors arising from the continued reliance on ageing coal-fired power stations in the state.

Regardless, and as a matter of urgency to provide certainty for investors, the New South Wales Government must provide transparency and certainty on the closure date of Eraring.

1. Lean into new capacity build

The Federal Government, working closely with the New South Wales 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 New South Wales, building on recent announcements.

EnergyCo and/or AEMO Services should be provided with additional resources, either directly or through expert support from the CEFC, to progress tenders at pace.

This would allow the CIS or LTESA tenders for generation capacity to be brought forward/expanded in response to disorderly coal-fired power station closures.

2. Accelerate near-term project approvals

The New South Wales Government must expedite planning approvals for projects determined to be critical for the state's energy transition could also support earlier delivery of these projects. This could be achieved through broader use of the critical state significant infrastructure (CSSI) Ministerial declaration to accelerate assessments, reducing the risk of legal challenge while maintaining rigour.

At a minimum, the New South Wales Government should accelerate the approvals for projects included in the National Priority list developed jointly through the Energy and Climate Change Ministerial Council.

This would provide greater investor certainty and reduce time to financial close and commissioning for the 44 GW of solar and wind and 16 GW of large-scale battery projects currently proposed across New South Wales.

3. Bolster firming procurement in advance

The New South Wales Government, through EnergyCo should accelerate firming procurement, rather than providing ongoing support for existing coal-fired power stations such as Eraring.

This is critical, as securing dispatchable capacity early provides a strong signal to investors of the need and desirability of new battery and energy storage projects.

Procuring capacity through the Firming LTESA mechanism, ahead of identified breaches, would also provide cost-effective 'insurance' against unexpected capacity loss, such as earlier-than announced closure of a coal-fired power station. To improve the flow of committed projects, the NSW Government, through EnergyCo, could temporarily offer amended LTESA contracts or contracts for difference.

4. Look beyond the Renewable Energy Zones

The immediate focus in New South Wales has been on the declared Renewable Energy Zones (REZs). However, encouraging new developments outside of the REZs would attract investment where it is needed and accelerate the transition.

There are high value, high-capacity projects outside of REZs that can be prioritised to deliver diversified sources of generation and storage capacity. New South Wales 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.

This would also potentially encourage innovative projects, which minimise the impact on the network and other projects, such as contestable private transmission, 'virtual' transmission or co-located generation and load.

5. Enable critical transmission lines

Nexa Advisory has long advocated that the delivery of large-scale projects must be paired with on time delivery of transmission infrastructure[1]. While EnergyCo has been focusing on the delivery of the transmission in the REZ, delivering other priority transmission projects will further support the connection of new firmed renewable generation.

The New South Wales Government should:

a. Designate new transmission lines as "nation-building", expediting delivery of priority transmission, supported by appropriate compensation schemes for regional communities.
b. extend the competitive delivery of new transmission to all new transmission in NSW.
c. through EnergyCo, 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 those just those identified in the Integrated System Plans (ISP).

6. Leverage the untapped potential of Consumer Energy Resources

In addition to delivering bulk energy through large-scale renewable generation, dispatchable storage capacity and essential system services, there are significant untapped opportunities which have the potential to complement broader reforms and support the energy transition.

This includes distributed and consumer energy resources (CER), as well as demand-side participation (DSP). There is an estimated 7 GW of potential capacity across Commercial and Industrial (C&I) rooftop solar installations[2], which would help to lower bills for businesses . The New South Wales Government must undertake a dedicated program in the next 12 months to take advantage of this potential 7 GW opportunity.

The New South Wales Government should undertake additional actions to unlock this C&I capacity and accelerate the deployment of small-scale storage and Virtual Power Plants (VPPs). This must further progress the work undertaken as part of the New South Wales Government's Consumer Energy Roadmap and Peak Demand Reduction Scheme.

1 Nexa Advisory, Eraring can be closed on schedule, July 2023

2 Nexa Advisory, More NSW businesses with rooftop solar would be a 'win win' for power bills and the clean energy transition, June 2024

1. Context

There is broad recognition in Australia of the urgent need to build adequate capacity to replace our ageing and unreliable coal-fired generation fleet, to ensure energy security, reliability, and affordability. Australians also understand the benefits of clean and low-cost renewable generation. However, uncertainty about the retirement timetable for coal-fired power stations, such as Eraring in New South Wales, erodes the confidence of investors and developers in new energy resources and therefore poses a significant risk to an orderly energy transition[3].

As Australia's largest power station, Eraring has for decades played a key role in meeting scheduled electricity demand in New South Wales. Each of its four 720 MW units have historically supplied on average 4.5 – 6 per cent of the states' annual demand (Figure 1). In total, this equates to between 17 per cent and a peak of 25 per cent (in 2019).

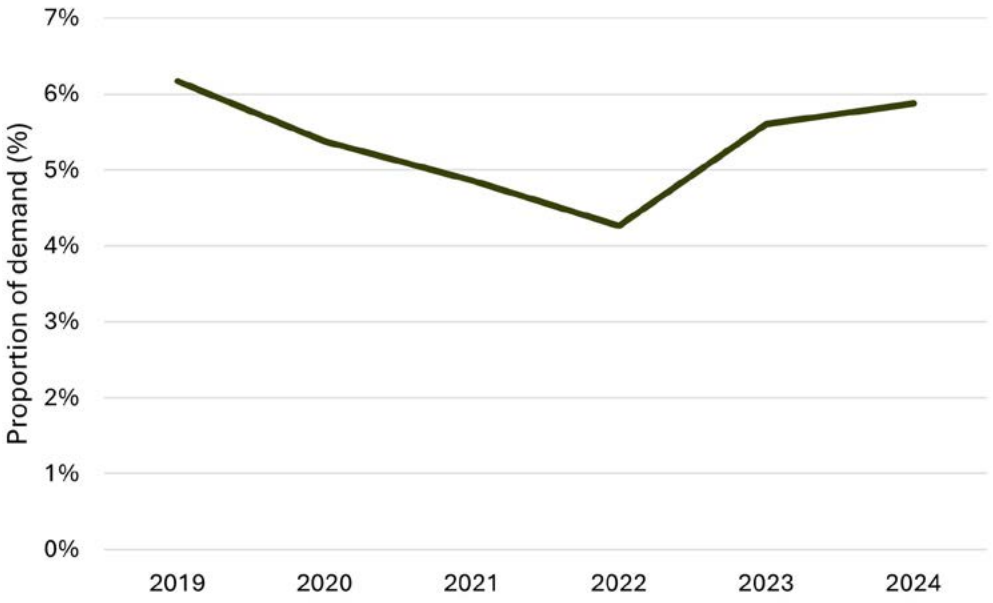


Figure 1 - Proportion of New South Wales demand for average Eraring unit

In 2022, the owner of Eraring, Origin Energy, announced it would bring forward the closure of the plant from 2032 to 2025[4]. This decision was driven by the high operating and coal fuel costs[5] However, this accelerated closure timetable put pressure on meeting electricity demand post-2025. In May 2024, the New South Wales Government negotiated an extension of Eraring's operation to August 2027, with the option to extend until August 2029. This agreement - which underscores the state's reliance on Eraring - could involve compensation payments of up to $450 million being made to Origin Energy[6].

3 Nexa Advisory, Eraring can be closed on schedule, July 2023

4 Origin Energy, Origin proposes to accelerate exit from coal-fired generation, 17 February 2022

5 ABC News, Secret documents shed light on failed taxpayer efforts to rescue giant coal plant Eraring, 6 Sept 2023

6 New South Wales Government, Agreement between the state of NSW and Origin on its plans for Eraring power station, accessed 15 January 2025

The arguments for the extension arrangements centre on the view that it will provide electricity reliability and/or ensure there is an adequate level of supply to meet demand.

In recent years though, the plant has experienced frequent outages and operational disruptions. These issues are common for coal-fired generators as they approach the end of (or move past) their technical lifespan.

This was exemplified in 2022, which was marked by widespread outages affecting more than 20 per cent of Australia's coal-fired capacity. This included disruptions at Eraring[7], Mount Piper and Vales Point in New South Wales, as well as unexpected failures across two units at Victoria's Yallourn Power Station[8].

These outages don't just cause power unreliability and risk blackouts on hot days. Outages, particularly those that are 'unplanned', cause higher energy market volatility which results in higher contract prices[9]. These higher wholesale costs ultimately flow to the prices paid by consumers[10].

These operational impacts are separate to the adverse local impacts associated with the power station's ash waste management. The dam has been estimated to already contain 40 million tonnes of coal ash waste and to have leached almost 685 tonnes of heavy metals into Lake Macquarie, resulting in the closure of a local sport facility, and limits on the consumption of seafood from the lake[11].

While Origin had been aiming to increase the reuse rate of waste ash to 80 per cent, it recycled approximately 49 per cent in FY23[12]. Under the deal with the New South Wales Government, Origin will only be required to maintain the reuse rate as at the time the deal was signed, meaning it will continue to produce waste ash and risk further local impacts.

This signals that keeping Eraring – a 43-year-old coal-fired power station – open beyond its use-by date is not a feasible solution, and puts energy security, reliability and affordability in New South Wales at risk.

The remainder of this report assesses Eraring's performance in detail.

7 The Australian, Supply disruptions from Centennial Coal forced our hand, says Origin Energy CEO Frank Calabria, 4 Nov 2024

8 RenewEconomy, Coal plant reliability hits a new low as unplanned unit outages hit a new high, 6 Mar 2023

9 AER, Wholesale electricity market performance report 2024, December 2024

10 AEMO, Quarterly Energy Dynamics Q4 2024, January 2025

11 Institute for Energy Economics and Financial Analysis, Extending Eraring has still not been adequately justified, May 2024

12 Origin Energy, Eraring Power Station Long Term Ash Management Strategy, October 2023

2. Analysis

The Eraring Power Station, the largest coal-fired power station in Australia, has played a key role in the nation's energy landscape. However, analysis of recent operational and market performance data highlights its growing unreliability, inefficiency and incompatibility with today's dynamic energy market.

Our analysis of Eraring's generation examines half-hourly generation data from the start of 2012[13], identifying trends in outage patterns and underperformance, as well as challenges with price responsiveness.

2.1. Eraring's Unreliable Generation Performance

Our analysis shows that Eraring has faced frequent operational interruptions since 2012, reducing the average monthly generation, and meaning it can't provide a steady output throughout the year.

Shown in Figure 2, Eraring's generation profile by month (on average, since 2012) shows that generation peaks in June and July, while it is lowest during the first quarter.

Since 2012, excluding periods of planned or unplanned outages, each 720 MW unit has on average generated around 540 MW in June and July, and around 450 MW during the first quarter.

In June and July, when including shutdown periods, average generation was reduced by 50 MW, or around 10 per cent. While this is smaller than the impact of shutdowns during October (see below), this reduced capacity is significant given it coincides with the winter demand peak.

Eraring's generation is lowest in October, at 310 MW - which is around 160 MW less than the average without shutdown periods. This indicates that October is likely when most planned outages occur.

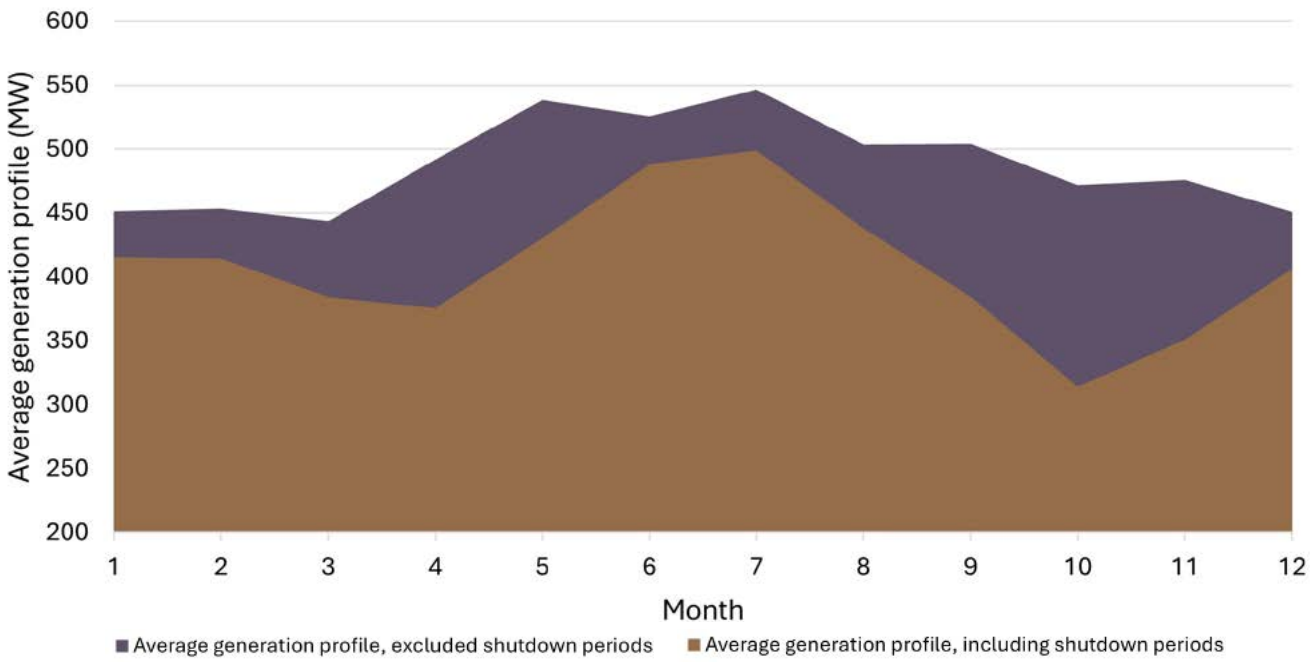


Figure 2 - Eraring's average generation (MW) by month since 2012, with and without shutdown periods

13 Source: AEMO; as at 19 November 2024

Given Eraring's role in providing reliable electricity during periods of peak demand, we examined its generation on days of high demand. Shown in Figure 3, Eraring's average generation on the two highest demand days in 2024 was well below 720 MW nameplate output (shown in yellow) – particularly for Unit 4 (ER04). On the third highest average demand day (20 June), Unit 4 was unavailable.

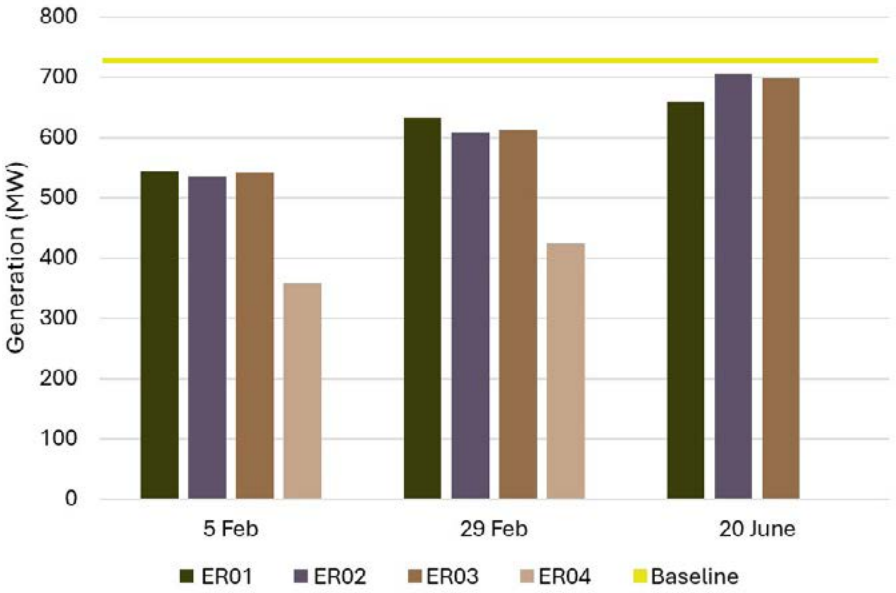


Figure 3 – average generation (MW) during highest daily New South Wales demand in 2024

2.2. Downtime analysis

To better understand Eraring's performance, we assessed downtime to determine potential causes for this low reliability.

Shown in Figure 4, Eraring's four units have totalled approximately 6,000 hours of downtime on average each year over the last four years – peaking at 7,000 hours in 2022. This is equivalent to each unit being down for approximately two months each year.

While there is variability across units each year, there has been a steady upward trend in overall downtime since 2017.

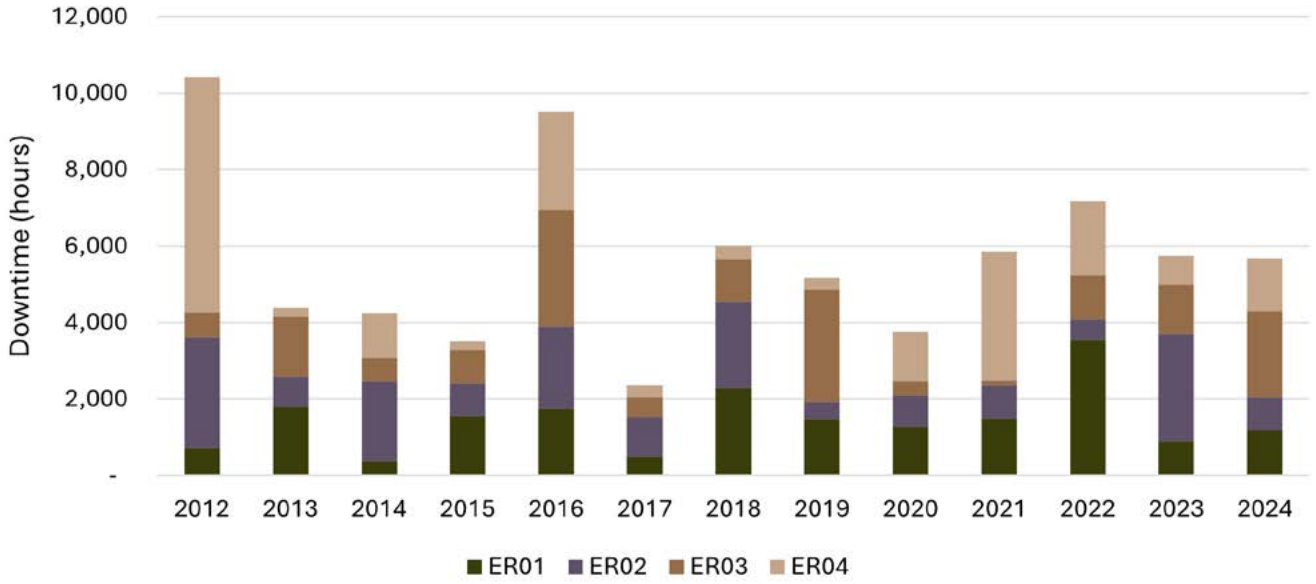


Figure 4 - Eraring's downtime over the years

Quarterly analysis of downtime as a proportion of total hours shows both the reliability and operational efficiency of a power plant. A high downtime rate can signal maintenance issues, ageing infrastructure or operational inefficiencies, which impact the plant's ability to meet demand.

When analysing Eraring's downtime across quarters, no clear cross-unit seasonality emerges; each unit exhibits a distinct profile:

- **Unit 1 (ER01)** has the highest downtime factors in the third and fourth quarters.
- **Unit 2 (ER02)** shows consistent downtime across the last three quarters of the year.
- **Unit 4 (ER04)** experiences its highest downtime in the second quarter.

Importantly, the high outages in the second and third quarters coincide with peak demand periods, during which planned downtime would typically be expected to be minimal.

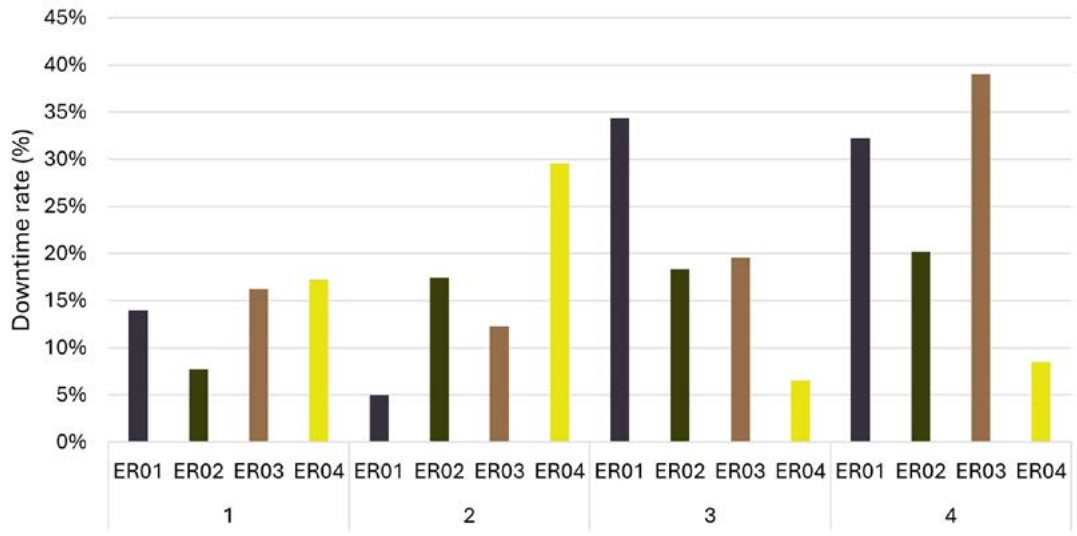


Figure 5 - Eraring's quarterly downtime rate (average of 2022 – 2024)

To better understand the potential drivers for downtime, we have analysed outage types and classified them as planned or unplanned[14]. It is worth noting that this analysis is limited to the last 12 years of Eraring's 43-year operation.

Figure 6 shows that the annual unplanned outage rate across individual units has typically remained between 0.5-1 per cent. However, looking at Eraring as a whole, the unplanned outage rate – when any unit is experiencing an unplanned outage in a given half hour – has remained above 2.5 per cent since 2019, spiking to 6 per cent in 2024.

While this analysis focuses on Eraring, further work is required to assess outage rates across the entirety of Australia's coal-fired power station fleet as they progressively approach end of life.

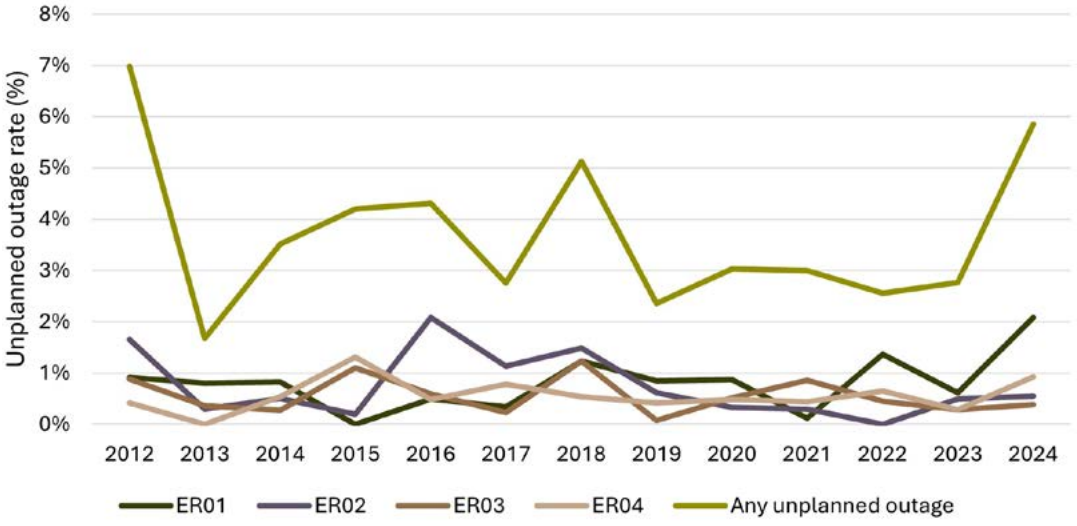


Figure 6 - Eraring's unplanned outage rate

As discussed above, this presents a significant reliability risk for New South Wales and the broader electricity system, and it flows through to higher market volatility and contract prices leading to higher consumer electricity bills.

14 For this, we use rebidding explanations available in rebid data (see Appendix 1).

2.3. Eraring's consistent underperformance

In addition to unreliability, Eraring exhibits frequent underperformance. This reflects its low utilisation in an electricity system increasingly dominated by low-cost renewables. Both supply and demand have become increasingly dynamic and responsive, resulting in the concept of 'baseload' electricity becoming redundant.

Coal-fired power stations have typically maintained stable levels of output, with low sensitivity to prices or market dynamics due to technical limitations around how fast they can react to changes in demand. Additionally, they must maintain a minimum stable level, which is the lowest output at which the plant can operate continuously without risking mechanical instability or inefficiencies.

In recent years, during periods of low to moderate demand combined with high solar and wind generation potential, significant amounts of renewable electricity have been curtailed to maintain coal units at safe operating levels[15].

As a result of the challenging operational behaviour of Eraring, the Australian Energy Market Operator (AEMO) has recently approved a reduction in Eraring's minimum load to 25 per cent of its capacity - approximately 180 MW, representing a 30 MW reduction from its previous minimum generation level per unit[16].

While lower utilisation is a positive for emissions reduction objectives, it poses a significant challenge to the financial feasibility of the plant. Given this context, we consider Eraring to be underperforming when it generates below 50 per cent of its nameplate capacity - double its current minimum stable level of output.

We have also considered this underperformance metric to assess this coal-fired power station's role as a 'baseload' generator. However, we note that the intention of the New South Wales Government's deal is for Eraring to provide supply to ensure reliability during periods of peak demand – which has traditionally been referred to as 'peaking' capacity. This mismatch between operational reality and the intention of the New South Wales Government deal is likely to subsidise the underperformance of this asset year-round, in order to have this capacity available in the peak demand periods when most needed.

15 RenewEconomy, The wind and solar regions hit hardest by network and economic curtailment, 2 May 2024

16 WattClarity, Origin Energy drops Minimum Generation levels at Eraring Power Station to 180MW, 12 Sept 2024

Our analysis of total number of underperforming hours since 2012 shows significant underperformance across Eraring's four units.

Shown in Figure 7, over the past few years, each unit has underperformed for roughly 4,500 hours annually, which is more than half of total hours each year. This could be due to several market factors, such as high solar or nocturnal hours or low demand periods, as well as operational factors such as outages. This low utilisation will also likely be further driven down due to the changing nature of electricity supply and demand in the National Energy Market (NEM).

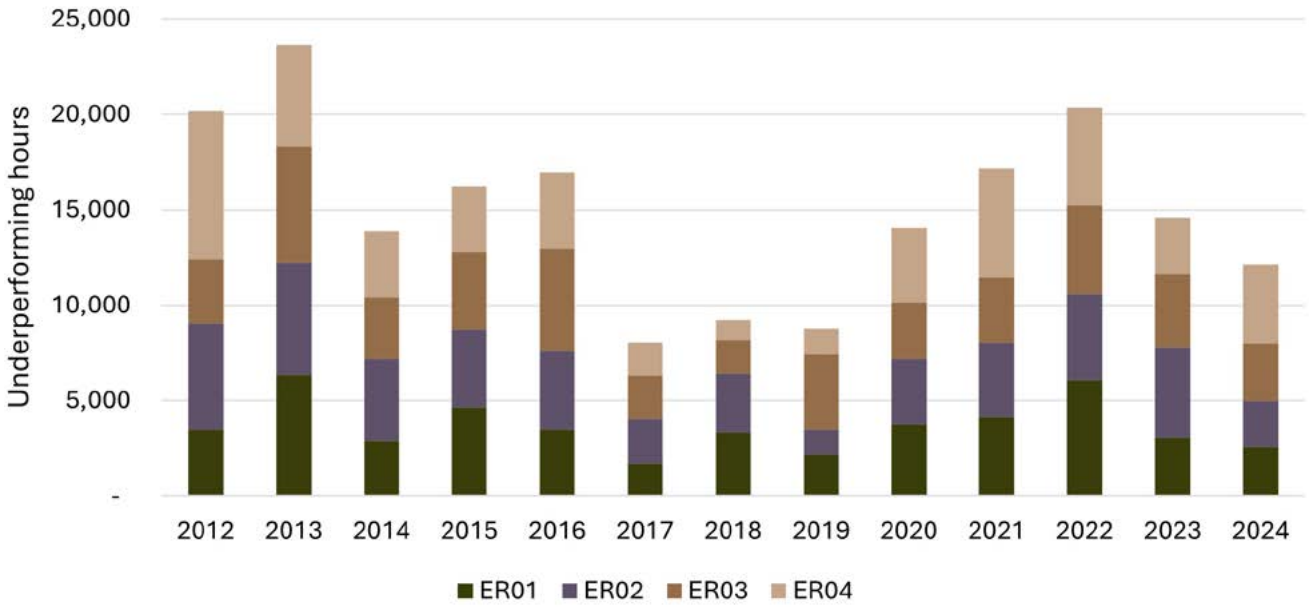


Figure 7 - Eraring's total underperforming hours since 2012

Shown in Figure 8, the underperformance rate across quarters (on average, between 2022 and 2024) shows that there is little seasonality in underperformance across units.

The lack of distinct seasonality across units indicates that Eraring's underperformance is likely not driven by seasonal market factors (such as solar or nocturnal hours), but rather a structural decline in the utilisation of coal-fired power stations.

> Eraring is facing persistent challenges around the structural decline of coal in the market, rather than one-off or short-term operational dynamics.

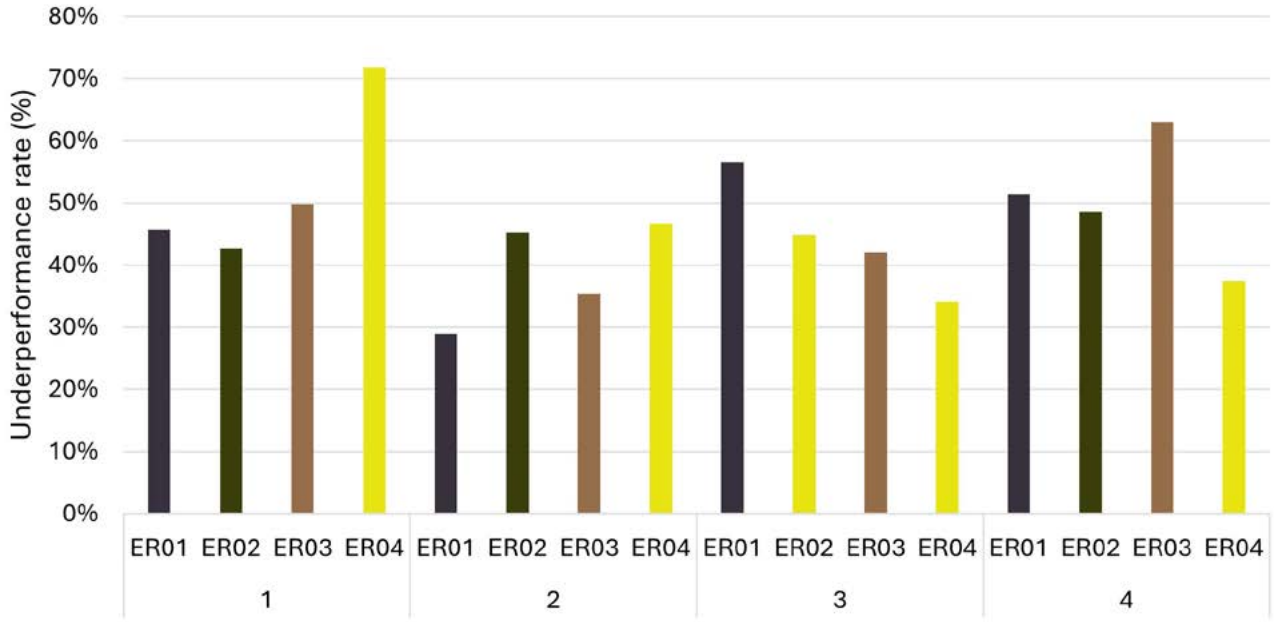


Figure 8 - Eraring's underperformance rate (average of 2022 – 2024)

For example, Unit 2 (ER02) exhibits a flat profile with an underperformance factor of approximately 45 per cent across all quarters. In contrast, Unit 4 (ER04) shows the highest underperformance factor in Quarter 1, while Unit 1 (ER01) peaks in underperformance during Quarter 3.

2.4. Eraring's lack of price responsiveness

Eraring's responsiveness to market signals is critical to justifying its role in today's energy system.

> Our analysis shows its lack of responsiveness to high wholesale prices due to its inability to respond to shifting demand in today's dynamic energy system.

Price Responsiveness

Our analysis of Eraring's price responsiveness over the past three years shows a lack of adaptability to market price signals, namely an inability to ramp up generation during high-price periods (> $300/MWh). This indicates Eraring's inefficiency in aligning with market demand and maximising economic value during peak price periods.

Shown in Figure 9, on average since 2022, three Eraring units have not exhibited a consistent response to high prices. However, Unit 1 (ER01) shows some response during the first and second quarters – with notably higher generation during high price periods.

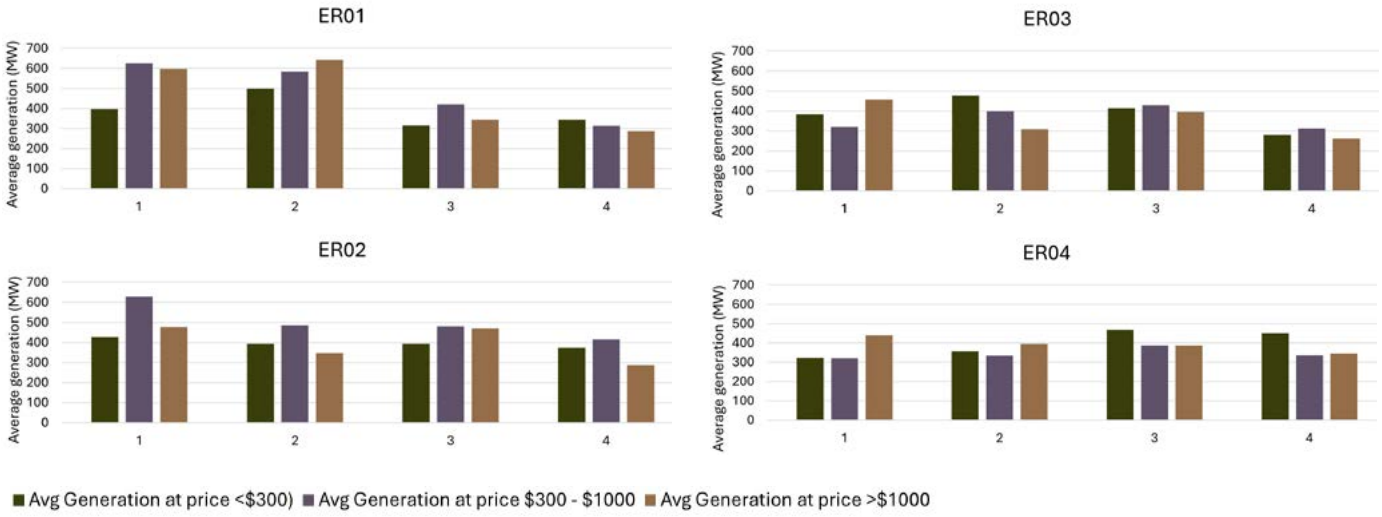


Figure 9 - Average generation levels of each Eraring unit under different price brackets by quarter (average of 2022 – 2024)

This may be due to several non-market operational and commercial factors which decrease the responsiveness to market prices, such as contracting, as well as the significant downtime and underperformance discussed above.

Running below optimal capacity can increase maintenance costs, as equipment designed for continuous operation experiences more wear and tear from frequent starts and stops. This is likely a key driver of its limited responsiveness in operation.

Underperformance During High-Price Periods

To further assess Eraring's market inefficiency, we consider underperformance during high price periods - calculated as total underperforming hours as a proportion of total hours during high price periods. For this analysis, we consider anything above $300/MWh as a high price.

Shown in Figure 10, over the last four years, Eraring's underperformance during high-price intervals highlights its inability to capitalise on critical market opportunities. This undermines its role in an energy market that has transitioned from a constant, flat baseload model to a dynamic, price-responsive system designed to efficiently meet consumer electricity demand.

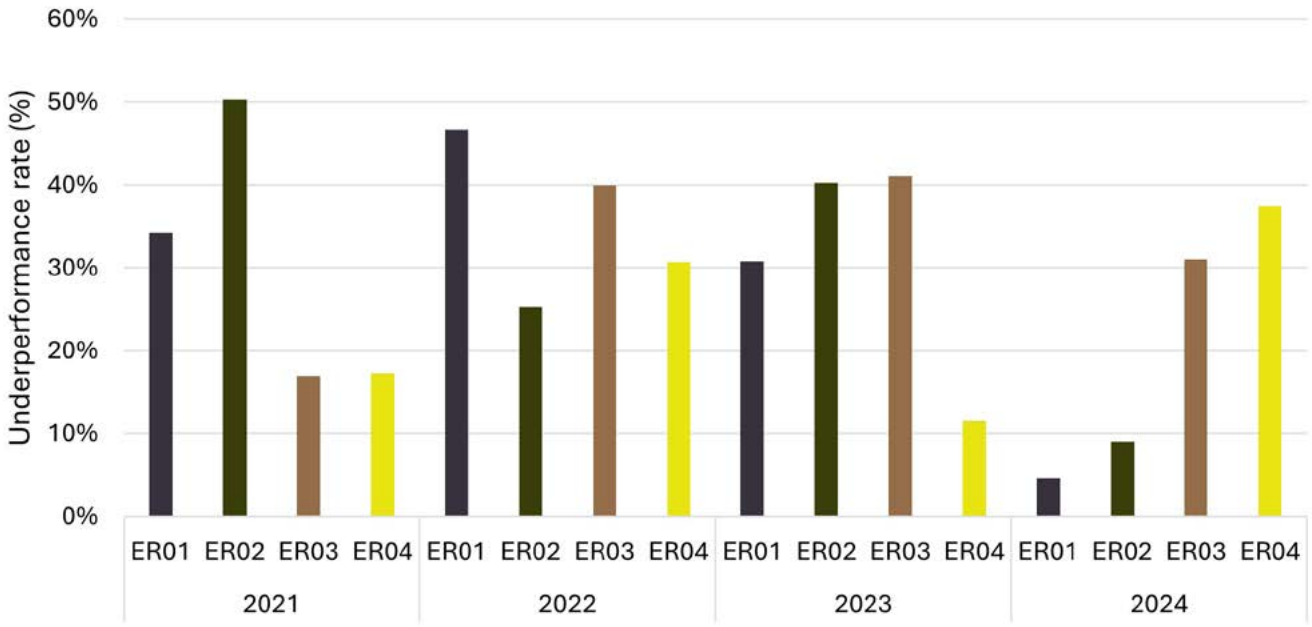


Figure 10 - Underperformance rate during high price periods of greater than $300/MWh (2021-2024)

Furthermore, with minimum demand steadily decreasing each year due to the rapid uptake of rooftop solar, Eraring's operational model appears increasingly misaligned with the evolving market dynamics and the push towards decentralised renewable energy generation.

2.5. Eraring's carbon emissions

In addition to Eraring's unreliable generation and inefficiency in terms of price responsiveness, the coal-fired power station remains a risk for meeting emissions reduction targets. With an emission intensity for generation sent-out of 0.91 tonnes/MWh[17], we estimate Eraring's four units have emitted more than 3.2 Mt CO_2 each year – totalling almost 13 Mt CO_2 across all units annually. This is shown in Figure 11.

In comparison, in 2019, around 141 Mt CO_2-e was emitted in New South Wales, of which 52 Mt – or 37 per cent - came from stationary energy for electricity generation[18].

Based on recent dispatch behaviour, extending Eraring's closure by two and four years would result in an additional 25.8 Mt $CO_2$and 51.65 Mt CO_2, which is valued at $380 million and $764 million respectively[19].

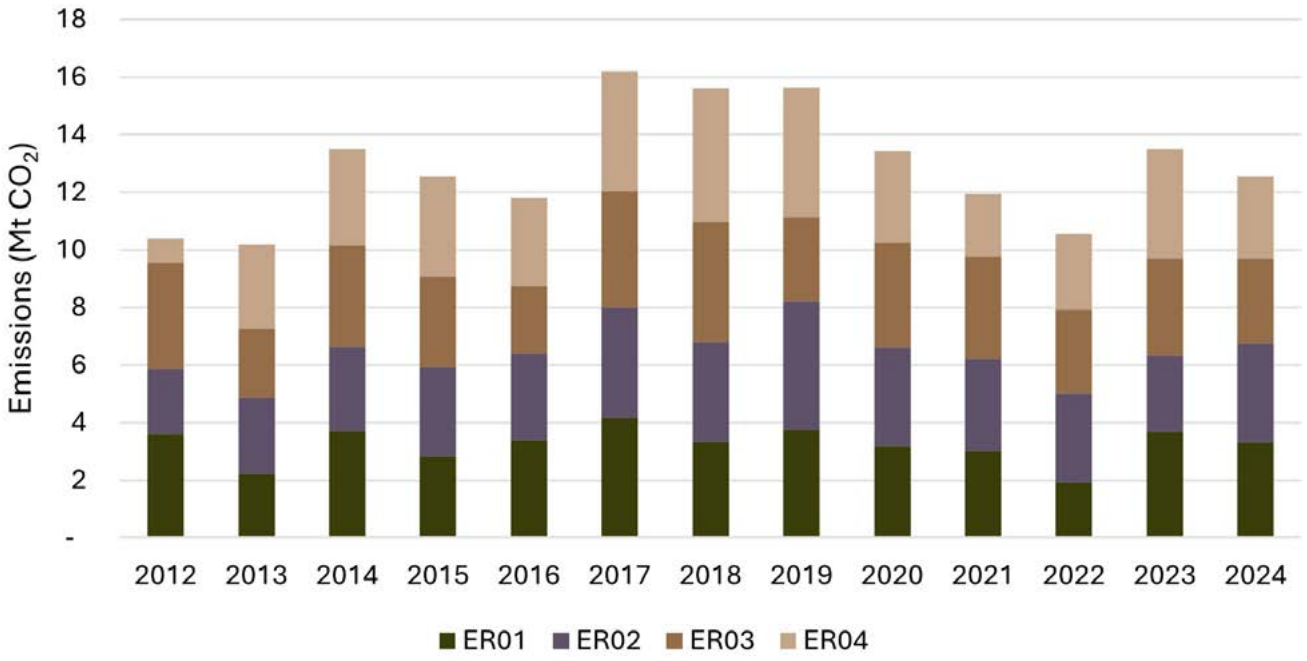


Figure 11 - Eraring's carbon emissions

Given the scale of Eraring's emissions, this generator presents a significant obstacle to meeting emissions reduction targets. We have previously discussed the impact of delays of coal-fired power station closure on the carbon budget, as well as the economic costs of a delayed transition[20].

> Closing Eraring and other coal-fired power stations on time is critical to meeting emissions reduction targets and providing investment certainty for the renewable replacement capacity.

17 ACIL Allen, Emission Factors Assumptions Update, 2016

18 New South Wales Government, NSW greenhouse gas emissions, accessed 15 January 2025

19 The price used is that defined in the European Union Emissions Trading System, equating to approximately AU$148 per tCO2-e.

20 Nexa Advisory, Eraring can be closed on schedule, July 2023

3. Case Study - Eraring's performance during recent events

In late November 2024, extreme weather conditions impacted the electricity system across Queensland and New South Wales. Severe heatwave conditions were forecast to drive high demand in New South Wales, leading to concerns around the balance of supply and demand. On November 22, AEMO forecasted Lack of Reserve (LOR) conditions - LOR1 and LOR2 for November 26, and LOR1, LOR2 and LOR3 for November 27 - indicating the tight reserve margins.

These forecasts indicated the risk of significant load interruptions, with up to 1,052 MW of load anticipated to have been impacted in New South Wales.

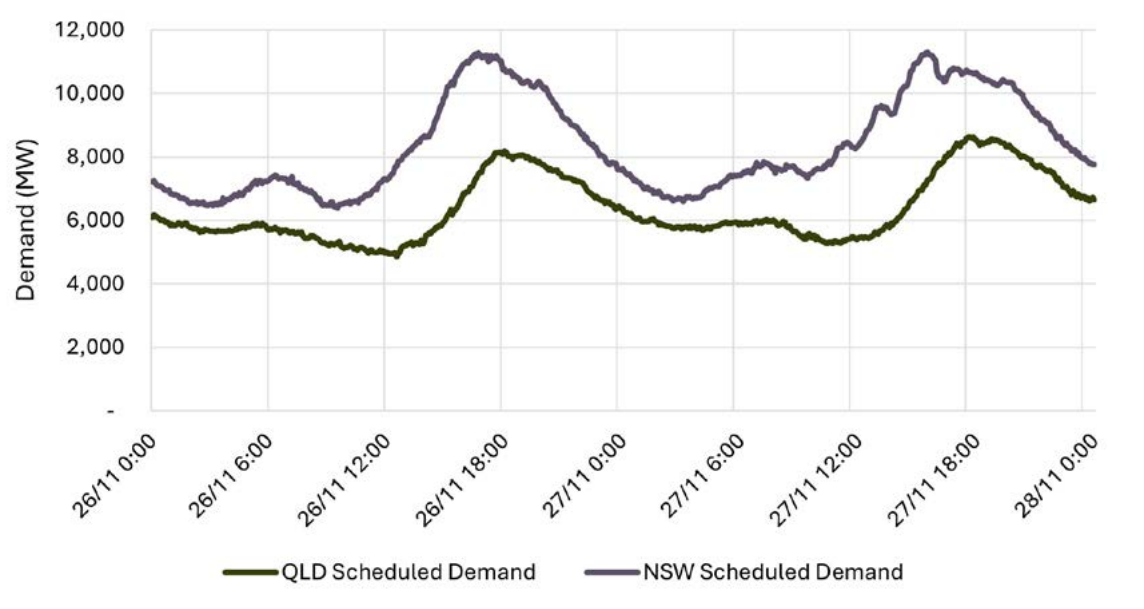


Figure 12 - Scheduled demand in NSW and QLD between 26 and 27 November

On November 27, the anticipated peak demand occurred at 3:30pm. But instead of rising again during the evening peak, demand exhibited a sudden and sharp decline of approximately 1,000 MW, as seen in Figure 12. This was likely the result of demand-side response measures. For example, the NSW Government enacted protocols to curb electricity demand across its agencies during this period to ease pressure on the system[21].

21 NSW Government enacts protocols to "reduce electricity demand from government agencies" on 27th Nov 2024 - WattClarity

3. Case Study - Eraring's performance during recent events (continued)

However, during this period when the system needed additional generation most, a significant amount of coal-fired generation capacity was unavailable. This is shown in Table 1.

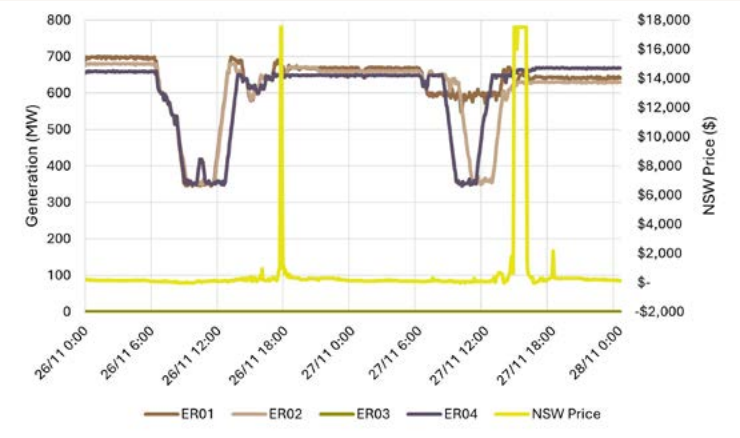
Table 1 - Major power plant outages for 26 and 27 November[22]

Name	DUID	Outage Type	Return Date
Bayswater	BW02	Planned	7 Dec 2024
Bayswater	BW03	Unplanned	3 Dec 2024
Eraring	ER03	Planned	27 Nov 2024
Vales Point	VP6	Planned	30 Nov 2024
Callide B	CAL_B_1	Planned	2 Dec 2024
Gladstone	GSTONE5	Unplanned	28 Nov 2024
Kogan Creek	KPP_1	Planned	26 Nov 2024
Tarong	TARONG2	Planned	7 Dec 2024
Tarong North	TNPS1	Unplanned	30 Nov 2024

From the availability observed on November 24, Eraring only had three units generating, with its Unit 3 (ER03) on a planned outage and scheduled to return on November 27. However, this unit failed to come back online as planned. These conditions resulted in wholesale electricity prices spiking to the market price cap of $17,500/MWh during the afternoon demand peak on both days.

This resulted in AEMO activating reserve contracts through the Reliability and Emergency Reserve Trader (RERT) mechanism – which has been estimated to have delivered 65 MWh at a cost of $3,557,700[23].

As shown in Figure 13, Unit 3 remained offline during these critical periods, exemplifying Eraring's unreliability in meeting the electricity needs of New South Wales.



These events form part of the trend of increasing prevalence of tight demand-supply conditions. For the last quarter of 2024, AEMO issued a record 144 Lack of Reserve alerts, 92 of which were for New South Wales[24]. This highlights the concerning threat to consumer bills due to the market volatility in wholesale electricity prices seen during these events if the system continues to rely on large, unreliable coal-fired power stations.

22 Based on Projected Assessment of System Adequacy data, 24 November

23 AEMO, Estimated payments and volumes for RERT activation on 27 November 2024

24 AEMO, NEM Lack of Reserve Framework Report 1 October to 31 December 2024, January 2025

4. Key findings

Eraring is past its use-by date and is no longer compatible with the energy system of today. As discussed above, this is demonstrated across the following areas.

1. High downtime and frequent unplanned outages, leading to market volatility

- Each of Eraring's units have experienced about two months of downtime annually in recent years, with an unplanned outage rate of 6 per cent.
- These outages have impacted Eraring's availability when needed most, such as during days of high demand (20 June) and tight demand-supply conditions (27 November).
- Given the state's high reliance on Eraring, this could pose a significant reliability risk for the broader electricity system, particularly during periods of high demand.
- Frequent outages drive higher market volatility, which leads to higher contract prices and consumer electricity bills. This causes unpredictability for AEMO through its system and reserve margin planning, increasing the likelihood of relying on expensive, out-of-market contracting measures, such as the Reliability and Emergency Reserve Trader (RERT) mechanism.

2. Consistent low utilisation and underperformance

- Each of Eraring's units operate at a low capacity for over half the year on average, significantly limiting Eraring's ability to compete in the electricity market. This translates to missed revenue opportunities, making it harder for the plant to cover fixed costs like maintenance, staffing and fuel procurement.
- The lack of any seasonal trend in Eraring's underperformance indicates that its challenges are not limited to short-term market conditions like solar output or overnight demand dips but likely reflect the structural decline of coal-fired power generation.
- This trend will likely continue as renewable energy projects (with lower operating costs) continue to gain market share, and Eraring becomes less competitive - further challenging the plant's profitability.
- Because of the deal between Origin Energy and the New South Wales Government to underwrite potential financial losses, this underperformance will likely be borne by New South Wales taxpayers.

3. Low price responsiveness

- Eraring's poor price responsiveness and limited technical ability to ramp generation up and down in response to demand highlights that its 'baseload' operation is incompatible with today's dynamic electricity system.
- This inability to react to market signals is likely driven by non-market operational factors related to the deteriorated physical condition of the ageing infrastructure as it approaches the end of its technical life, as well as commercial factors such as contracting or high operating costs.

4. Eraring's emissions impact

- As the largest coal-fired power station, Eraring's estimated 13 Mt CO_2 of annual emissions in 2024 presents a significant obstacle to meeting the state's emissions reduction targets.
- New South Wales and the broader energy system will bear the cost of the above risks if the closure of Eraring continues to be delayed.

From a reliability perspective, it is critical that New South Wales progresses renewable generation to replace this capacity, integrates firming capacity such as demand response and batteries, and delivers critical transmission infrastructure. Together, this will provide cheaper and more reliable electricity for New South Wales electricity consumers.

5. A strong pipeline of replacement generation in NSW

We have assessed the current development pipeline to better understand what will be needed to ensure replacement capacity for Eraring Power Station can be delivered on time. Critically, while there is a strong pipeline of projects, these require certainty around coal-fired power station closure, transmission buildout, planning, environmental and grid connection approvals in order to ensure they will be delivered on time. These sit within the mandate of the New South Wales Government.

Renewables Pipeline Overview

AEMO currently considers approximately 2.1 GW of large-scale solar PV, 1.6 GW of wind and 3.8 GW of large-scale battery projects to be sufficiently progressed to be included as committed or anticipated[25] projects in New South Wales. Most of these projects – namely solar PV and battery projects - are expected to be in operation by the start of 2027, before the expected closure of Eraring date in 2027.

These projects are already considered in the reliability forecasting undertaken by AEMO[26], which has found a small 488 MW gap in firm capacity required by New South Wales after the closure of Eraring in 2027-28.

However, as highlighted in Table 2, there is a strong development pipeline of approved and proposed renewable generation and storage projects which if accelerated, could fill the above-mentioned gap. This includes 10.4 GW of wind and solar, and 4.5 GW of large-scale battery projects which have received approval.

These figures exceed those currently considered as committed and anticipated, reflecting AEMO's more stringent selection criteria which considers development progress across several areas beyond just approvals.

Table 2 – New South Wales renewable energy project pipeline[27]

	Under construction (GW)	Approved (GW)	Proposed (GW)
Solar PV	1.45	5.8	17
Wind	0.4	4.6	27
Large-scale battery	2.1	4.5	16
Total	3.95	14.9	60

It is important to note the role of battery storage, as well as long-duration storage to shift the renewable energy generated and satisfy demand during peak periods, as well as to provide essential system services.

There is a clear role for the New South Wales Government to help accelerate the development of these projects to deliver cheaper, more reliable replacement capacity before the expected closure of Eraring in August 2027.

25 AEMO, Generation Information, January 2025

26 Such as through the New South Wales Energy Security Target Monitor Report

27 Source: AltEnergy; where approved projects are defined as having received state planning, development and/or environmental approvals, and proposed projects are those publicly announced. See Appendix 2 for a full list of projects under construction and approved.

6. Slow delivery and importance of transmission

The factors contributing to the slow transition are many and complex, but a key issue is the ongoing delays to delivering new transmission projects[28]. The lack of national coordination and accountability for delivering nation-building transmission infrastructure remains a key challenge to the transition[29]. This failure to build transmission quickly enough reflects market structure rather than market design.

We have previously discussed that Australia's transmission markets face complex and fragmented regulatory barriers which are preventing competitive outcomes in the delivery of major transmission projects[30]. Despite contestable frameworks in New South Wales and Victoria, this is preventing global transmission operators from leveraging their experience and global supply chain bargaining power to support Australia's energy transition and deliver the 10,000 km of transmission required by 2050.

The ongoing delay of new transmission projects, particularly transmission interconnectors, poses significant threats to power system security and increases costs for consumers both large and small[31].

Addressing this transmission limitation requires a focus on opening transmission to market players, particularly transmission network service provider (TNSP) companies in Australia, rather than relying solely on regulated monopolies. This has already been recognised by state governments – including New South Wales – which have developed jurisdictional frameworks with varying governance, procurement, contestability and regulatory arrangements[32].

28 Nexa Advisory, We Plan and then Don't Build, May 2024

29 Nexa Advisory, Supercharging Transmission Buildout, September 2024

30 Nexa Advisory, Transmission Contestability in Australia, June 2023

31 Nexa Advisory, The Consumer Cost of Transmission Delays, March 2024

32 Nexa Advisory, Supercharging Transmission Buildout, September 2024

7. Policy recommendations

An orderly transition in New South Wales will require robust, enduring policies and market mechanisms to provide long-term certainty while minimising investment risks associated with shifts in government priorities and the extensions of coal-fired generation.

We have previously advocated for the New South Wales Government to bolster existing support mechanisms to ensure an orderly and timely retirement of Eraring, without the need for further extensions past 2027. This also has implications for the upcoming closure of other coal-fired power stations across all states, including Callide B and Yallourn expected by 2028.

Rather than underwriting the poor performance of coal-fired power stations, we recommend that the New South Wales Government undertake the actions outlined below.

1. Lean into new capacity build

The Federal Government, working closely with the NSW 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 New South Wales. The recently announced over-subscription of the Capacity Investment Scheme[33], as well as the vast capacity of proposed projects as described in Section 5, reflects strong investment appetite to deliver this new capacity.

EnergyCo and/or AEMO Services should be provided with additional resources, either directly or through expert support from the CEFC, to progress tenders at pace.

We have previously discussed[34] that to ensure the additional capacity required is delivered by 2030, additional funding could be mobilised, CIS or LTESA tenders could be brought forward or expanded in response to disorderly coal closures. While the recent announcement of a 'super-sized' Capacity Investment Scheme tender round is a step in the right direction, an additional expansion may be required to ensure adequate capacity is delivered prior to the retirement of coal-fired power stations.

33 RenewEconomy, Bowen says first battery storage tender is "massively oversubscribed" with 19,000 MW of projects, 30 April 2024

34 Nexa Advisory, A solution looking for a problem: a capacity mechanism and related post-2030 market reforms, November 2024

2. Accelerate near-term project approvals

The New South Wales Government must expedite planning approvals for projects determined to be critical for the state's energy transition could also support earlier delivery of these projects. This could be achieved through broader use of the critical state significant infrastructure (CSSI) Ministerial declaration to accelerate assessments, reducing the risk of legal challenge while maintaining rigour.

In South Australia, this has been achieved through the Crown Sponsorship initiative, which sought Expressions of Interest in 2023 from large-scale battery projects with the objective of streamlining approvals to deliver projects ahead of forecast reliability gaps in 2027[35]. At a minimum, the New South Wales Government should accelerate the approvals for projects included in the National Priority list developed jointly through the Energy and Climate Change Ministerial Council[36].

This would provide greater investor certainty and reduce time to financial close and commissioning for the 44 GW of solar and wind and 16 GW of large-scale battery projects currently proposed across New South Wales.

3. Bolster firming procurement in advance

The New South Wales Government, through EnergyCo should accelerate firming procurement, rather than providing ongoing support for existing coal-fired power stations such as Eraring.

Additional firm capacity can be delivered through use of the Firming LTESAs – which is a distinct process from generation and long-duration storage LTESAs as well as the CIS. This is critical as securing firming capacity early provides a strong signal to investors of the need and desirability of new battery projects.

The existing firming LTESA product is intended to address reliability gaps. However, currently a firming LTESA can be sought when a future breach of the security requirements has been identified in the annual Energy Security Target Monitor. Alternatively, this may be delivered proactively as part of the firming infrastructure pathway identified by the New South Wales Consumer Trustee, which currently expects the next addition of firming capacity to 530 MW required in 2034[37].

While the response to firming tenders has been robust, adequate firming capacity may not be delivered in time if the only trigger is the identification of a future breach of reliability standards. This was reflected in the LTESA Tender Round 2 – which originally sought 380 MW of firming capacity but awarded 1,075 MW after it was expanded through the CIS[38].

For comparison, while the New South Wales Eraring Agreement may pay up to $225 million to Origin each year[39], the Tender Round 2 LTESA has an annuity cap of $40,000/MW[40], - equating to $43 million across the 1,075 MW of projects.

Additionally, procuring firming through the LTESA mechanism ahead of identified breaches 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. This would be more efficient than urgently trying to secure firming in a short period if a reliability breach is identified.

35 Government of South Australia, Department of Energy and Mining, Business battery storage builds streamlined, 23 October 2023

36 Energy and Climate Change Ministerial Council, Meeting Communique, 19 July 2024

37 AEMO Services, 2023 Infrastructure Investment Objectives Report, December 2023

38 AEMO Services, NSW Roadmap - Tender Round 2, 19 April 2024

39 New South Wales Government, Agreement between the state of NSW and Origin on its plans for Eraring power station, accessed 15 January 2025

40 AEMO Services, Market Briefing Note Further information on outcomes of Tender Round 2 - Firming Infrastructure, 13 November 2023; Real $ 2023, weighted average across the portfolio of awarded projects

4. Look beyond the Renewable Energy Zones

The focus in New South Wales has been on the declared Renewable Energy Zones (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.

There are several 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 outside of the REZs would attract investment where it is needed and allow the transition to progress at a faster pace. This should encourage innovative projects which minimise the impact on the network and other projects, and may include contestable private transmission, 'virtual' transmission or co-located generation and load.

5. Enable critical transmission lines

Nexa Advisory has long advocated that the delivery of large-scale projects must be paired with on time delivery of transmission infrastructure . While EnergyCo has been focusing on the delivery of the transmission in the REZ, delivering other priority transmission projects will further support the connection of new firmed renewable generation.

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.

Additionally, innovative technologies (such as active network management via power flow controller technologies) could be used to maximise the available capacity of existing transmission lines and have already been used in NSW.

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 New South Wales Government should:

a. Designate new transmission lines as "nation-building", expediting delivery of priority transmission, supported by appropriate compensation schemes for regional communities.
b. extend the competitive delivery of new transmission to all new transmission in NSW.
c. through EnergyCo, 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 those just those identified in the Integrated System Plans (ISP).

6. Leverage the untapped potential of Consumer Energy Resources

In addition to delivering bulk energy through large-scale renewable generation, dispatchable storage capacity and essential system services, there are significant untapped opportunities which have the potential to complement broader reforms and support the energy transition. This includes distributed and consumer energy resources (CER), as well as demand-side participation (DSP). In particular, there is an estimated 7 GW of potential capacity across Commercial and Industrial rooftop solar installations[41].

There is a clear opportunity for New South Wales to unlock this capacity, as well as the deployment of small-scale storage and Virtual Power Plants (VPPs) as part of its Consumer Energy Roadmap and Peak Demand Reduction Scheme.

If the New South Wales Government undertakes these actions, it will create additional certainty in the state's ability to reliably meet its electricity needs. Alongside these measures, Eraring's unreliability, incompatibility with today's dynamic energy system, and potential impacts on market volatility and consumer prices, there is a clear case for its planned closure in 2027.

41 Nexa Advisory, More NSW businesses with rooftop solar would be a 'win win' for power bills and the clean energy transition, June 2024

Appendix 1

We classify outages into planned and unplanned using different keywords (see Table 3) present in the rebidding explanations. Any extension to a planned outage is also considered as an unplanned outage in our analysis.

Table 3 Keywords in rebidding explanation for classifying outages

Planned	Unplanned	Neutral/Ambiguous
"daily bid", "planned", "scheduled", "inspection", "testing", "standby", "recall time", "RTS profile revised", "maintenance profile revised", "AVR test", "unit on maintenance"	"forced", "unexpected", "issue", "failure", "leak", "trip", "limitation", "extended", "repair", "repairs", "extended outage", "unplanned", "unknown repair times", "delays", "replacement", "unit outage", "unit on outage", "RTS delayed", "avoid short mill movement", "repairs", "fault", "delayed", "failure", "restored", "air heater outage"	"avoid short mill movement", "ambient temp", "correct bid"

41 We note there are a significant number of ambiguous re-bids which we have conservatively omitted in categorisation. While planned outages are well explained in the explanations, we consider 'ambiguous' outages are more likely to be 'unplanned'; our analysis may therefore under-represent unplanned outage rates.

Appendix 2

Table 4 List of projects under construction in NSW

Project	Fuel Type	Capacity (MW)
Atlas-Campaspe Mine Hybrid Microgrid	Hybrid	11
Boggabilla Solar Farm	Solar PV	5
Culcairn Solar Farm	Solar PV	350
Eastern Creek Landfill Gas BINGO	Bioenergy	4
Eraring BESS	Battery	700
Forest Glen Solar Farm	Solar PV	90
Glenellen Solar Farm	Solar PV	200
Hay Solar Farm (CleanPeak)	Solar PV	7.5
Liddell BESS	Battery	500
Limondale BESS	Battery	50
Moama Solar Farm (CleanPeak)	Solar PV	7.5
Moorebank Logistics Park Microgrid	Solar PV	60
Mudgee Solar Farm	Solar PV	5
New England Solar Farm BESS Stage 1	Battery	200
Orana BESS	Battery	415
Orange Community Renewable Energy Park	Solar PV	4.99
Quorn Park Hybrid Project	Hybrid	80
Riverina Solar Project	Solar PV	40
Snowy 2.0	Pumped Hydro	2200
Stubbo Solar Farm	Solar PV	400
Uungula Wind Farm	Wind	414
Williamsdale BESS	Battery	250
Wollar Solar Farm	Solar PV	280
Total Capacity Under Construction		**6,274**

Table 5 List of approved renewable energy projects in NSW

Project	Fuel Type	Capacity (MW)
Amaroo Solar Farm	Solar PV	5
Apsley BESS	Battery	120
Awaba BESS	Battery	50
Back Henty Road Solar Farm	Solar PV	5
Bellambi Heights BESS	Battery	408
Beresfield BESS	Battery	170
Bilbul Solar Farm	Solar PV	4.95
Birriwa Solar Farm and Battery	Solar PV	600
Blind Creek Solar Farm	Solar PV	314
Boco Rock 2 Wind Farm	Wind	157
Boggabri Solar Farm	Solar PV	8.2
Bonshaw Solar Farm	Solar PV	100
Boorowa 1B Solar Farm	Solar PV	4.99
Bowmans Creek Wind Farm	Wind	347
Brocklehurst Solar Farm	Solar PV	29
Byron Bay Solar Farm	Solar PV	7.14
Calala BESS	Battery	300
Canally Orchards Microgrid	Hybrid	6.5
Capital 2 Wind Farm	Wind	144
Carawatha Solar Farm	Solar PV	4.95
Coleambally BESS	Battery	100
Conroys Gap Wind Farm	Wind	30
Coppabella Wind Farm	Wind	295
Daisy Hill Solar Farm 1A	Solar PV	4.99
Daisy Hill Solar Farm 2A	Solar PV	4.99
Daroobalgie Solar Farm	Solar PV	100
Dubbo Micro Solar Farm	Solar PV	5
Dunedoo Solar Farm	Solar PV	55
Finley 2 Solar Farm	Solar PV	5
Finley Solar Farm (Atlas)	Solar PV	4.95
Geurie Solar Farm	Solar PV	4.99
Gidginbung Solar Farm	Solar PV	25
Gilgandra 1A Solar Farm	Solar PV	4.99
Gilgandra Solar Farm	Solar PV	50
Glanmire Solar Farm	Solar PV	60
Goulburn River Solar Farm	Solar PV	450
Great Western Battery	Battery	500
Gregadoo Solar Farm	Solar PV	65

Table 5 List of approved renewable energy projects in NSW (continued)

Project	Fuel Type	Capacity (MW)
Grenfell Solar Farm	Solar PV	4.99
Gunnedah 2A Solar Farm	Solar PV	4.99
Gunnedah Solar Farm	Solar PV	27
Gunning Solar Farm	Solar PV	250
Guyra Solar Farm	Solar PV	5
Hay 2A Solar Farm	Solar PV	4.99
Hay Solar Farm	Solar PV	140
Hills of Gold Wind Farm	Wind	372
Jindera Solar Farm	Solar PV	150
Kerarbury Orchard Solar Farm and BESS	Solar PV	4.95
Langs Crossing Solar Farm	Solar PV	4.99
Little Bogan Solar Farm	Solar PV	4.99
Liverpool Range Wind Farm	Wind	1332
Lockhart Microgrid Energy Project	Solar PV	10
Manilla Solar Farm	Solar PV	4.6
Marulan Solar Farm	Solar PV	152
Maryvale Solar Farm & BESS	Solar PV	230
Maxwell Solar Farm	Solar PV	25
Mayfield West BESS	Battery	28
Merriown Solar Farm	Solar PV	5
Middlebrook Solar Farm	Solar PV	320
Midkin Gin Solar Farm	Solar PV	4.99
Moama Solar Farm	Solar PV	28
Molonglo BESS	Battery	11.5
Moorambilla Solar Farm	Solar PV	5
Mulwala Solar Farm	Solar PV	25
Muswellbrook BESS	Battery	150
Narrabri 3A Solar Farm	Solar PV	4.99
Narrabri South Solar Farm	Solar PV	60
Narrandera Solar Farm	Solar PV	5
Nevertire Solar Farm (GGE)	Solar PV	5
Nevertire Solar Farm BESS	Battery	50
New England Solar Farm BESS Stage 2	Battery	1400
Olive Grove Solar Farm	Solar PV	29.9
Orange Grove Solar Farm	Solar PV	110
Oxley Solar Farm	Solar PV	215
Peninsula Solar Power Station	Solar PV	80
Sandigo Solar Farm	Solar PV	100

Table 5 List of approved renewable energy projects in NSW (continued)

Project	Fuel Type	Capacity (MW)
Sandy Creek Solar Farm	Solar PV	12
Sapphire BESS	Battery	30
Sapphire Solar Farm	Solar PV	180
Silverleaf Solar Farm	Solar PV	120
Smithfield BESS	Battery	65
Springdale Solar Farm	Solar PV	100
Stringybark Solar Farm	Solar PV	29.9
Stubbo BESS	Battery	200
Taminda Solar Farm	Solar PV	9
Tamworth Solar Farm	Solar PV	65
Temora Solar Farm	Solar PV	4.99
Tenterfield Solar Farm	Solar PV	25
Territory Battery	Battery	300
Thunderbolt Community Solar Farm	Solar PV	8.8
Thunderbolt Wind Farm	Wind	192
Tilbuster Solar Farm	Solar PV	152
Upper Hunter Energy Park	Wind	75.6
Uranquinty Solar Farm (CleanPeak))	Solar PV	4.95
Uungula Battery	Battery	150
Vales Point Solar Farm	Solar PV	62
Wallaroo Solar Farm	Solar PV	100
Wallerawang 9 Battery	Battery	500
Warral Solar Farm	Solar PV	5
West Wyalong 1C Solar Farm	Solar PV	4.99
White Rock Wind Farm Stage 2	Wind	202
Yanco Delta Wind Farm	Wind	1500
Yanco Solar Farm	Solar PV	60
Yarrabee Solar Project	Solar PV	900
Yarren Hut Solar Farm	Solar PV	28
Yenda Solar Farm	Solar PV	5.6
Yoogali Solar Farm	Solar PV	15
Yoogali Solar Farm (ACEnergy)	Solar PV	4.95
Total Capacity Approved (MW)		12,391

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