COAL'S SUMMER OF BREAKDOWNS

HOW UNRELIABLE, AGEING COAL PLANTS FAIL OUR COMMUNITY

RELIABILITY WATCH

Reliability Watch is a collaboration between the peak environmental bodies for Queensland, New South Wales and Victoria that builds upon the previous Gas and Coal Watch project by The Australia Institute.

This report is brought to you by the Queensland Conservation Council, Nature Conservation Council of NSW and Environment Victoria.

Executive Summary

Coal and gas in the National Electricity Market (NEM) is ageing, unreliable and prone to breakdowns which is leading to higher prices and energy insecurity.

During the hotter months of 2024-25 (October 2024 - March 2025), on average 25% of Queensland and NSW coal capacity was offline at any given time. Victorian coal fired power stations performed only slightly better, at 23% offline.

On average 5.1 GW of coal fired power station capacity was offline across the three states during the months where electricity demand is highest. This is equivalent to around one-fifth of the average demand [1] in the NEM.

Over this reporting period, there were 17 scheduled outages at coal fired power stations and 128 unplanned breakdowns. This means breakdowns were eight times more common than forecast outages. This is an average of 8.5 breakdowns at each power station in just six months, and 0.7 breakdowns per day. There were 21 coal fired power units that were offline for more than 1,000 hours over the summer period. Many units also required a longer maintenance period than forecast. Yallourn, for example, forecast maintenance at each of its four units, and exceeded forecast time offline by an average of 60%.

There are many factors determining wholesale electricity prices, but this past summer has shown that coal unreliability is likely to send prices soaring. In November, 35% of coal was offline in Queensland and NSW. In response, prices jumped from around $70/MWh in both states in October to $177/MWh in Queensland and $220/MWh in NSW [2].

Throughout the summer period, there was a strong correlation between coal being offline and high prices. In Queensland, when more than 30% of coal capacity was offline, energy prices were on average double compared to when less than 10% of coal was offline. In NSW, this differential was almost three times.

Given the tight supply of electricity, especially when coal power stations are broken down, more renewable energy backed by storage is needed to bring prices down. Batteries were more reliable than coal in November in NSW, and there is a strong correlation between high renewable energy generation and lower prices [3]. It is clear that our coal fired power stations are no longer up to the task of keeping our lights reliably on and need to be replaced with modern alternatives.

Coal fired power stations

Australia's National Electricity Market (NEM), which connects the eastern seaboard states, South Australia and Tasmania, was built around coal fired power stations. In 2004, coal provided 88% of the electricity in the NEM. This has fallen rapidly to 55% in 2024 [4].

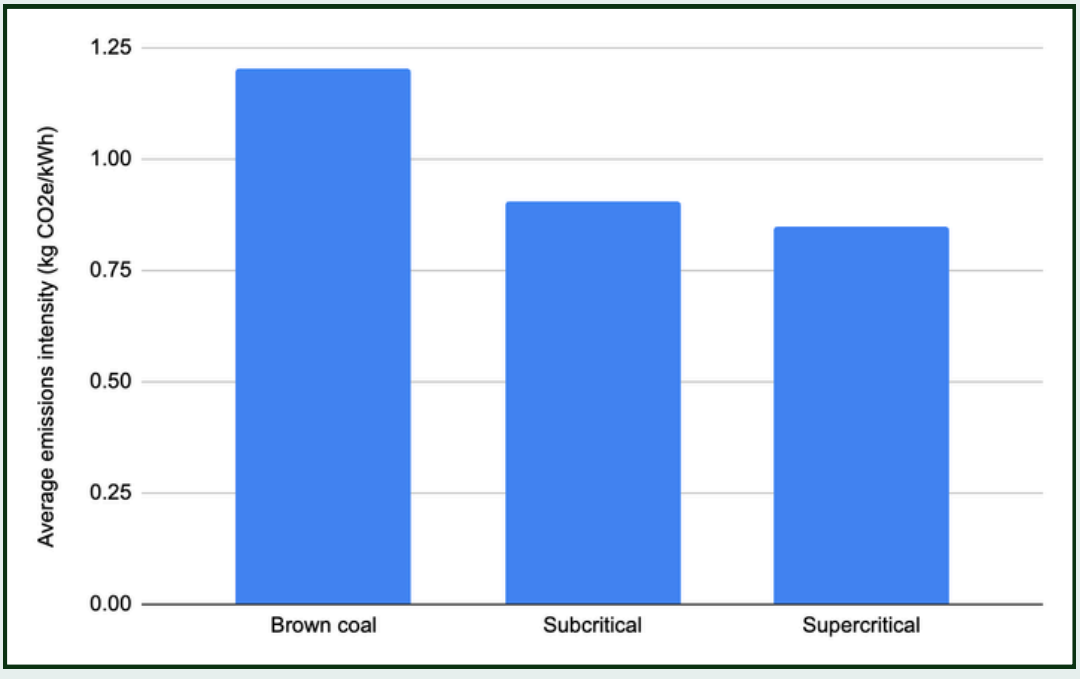
There are still 15 operating coal fired power stations in the National Electricity Market: three in Victoria, four in NSW and eight in Queensland.

Technology

In all coal fired generators, coal is burnt to create steam. At high pressure, this steam turns a turbine which creates the electricity. The steam is then condensed back to water [5]. Most coal fired power stations have several individual turbines, or units, which can operate independently. Across the 15 coal fired power stations in the NEM, there are 44 units. Kogan Creek in Queensland is the only coal fired power station with a single turbine, or unit, and Gladstone has the most, with six units.

Australia's coal fired power stations differ on their fuel and efficiency. Victoria's **brown coal**, or lignite, has low energy density so Victorian coal fired power stations have the highest carbon emissions intensity for the same electricity output. All coal fired power stations in NSW, and the older Queensland stations, are **subcritical**, in which the coal is burnt in a traditional boiler to create steam. Newer coal fired power stations in Queensland are **supercritical**. In these stations, the water is pressurised above a critical point so that the process can be slightly more efficient. Figure 1 shows the emissions created, in carbon dioxide equivalent (CO2e) for every kilowatt hour (kWh) of electricity generated across the three categories.

Figure 1: Emissions intensity of brown coal, subcritical black and supercritical black coal fired power stations in Queensland, NSW and Victoria [6].



Ownership

Almost all coal fired power stations in Australia were built by state government owned corporations. There are only a handful of exceptions. Millmerran in Queensland was fully privately built. Callide C and Tarong North also in Queensland were originally joint public private partnerships although Tarong North has been bought fully back by the Government.

Queensland has retained ownership of most of its power stations. Victoria sold its off in the 1990s and NSW in the 2010s. Victoria's coal fired power stations are now owned entirely by retailers. EnergyAustralia, AGL and Alinta energy own one power station a piece. AGL, EnergyAustralia and retailer Origin own a power station each in NSW as well.

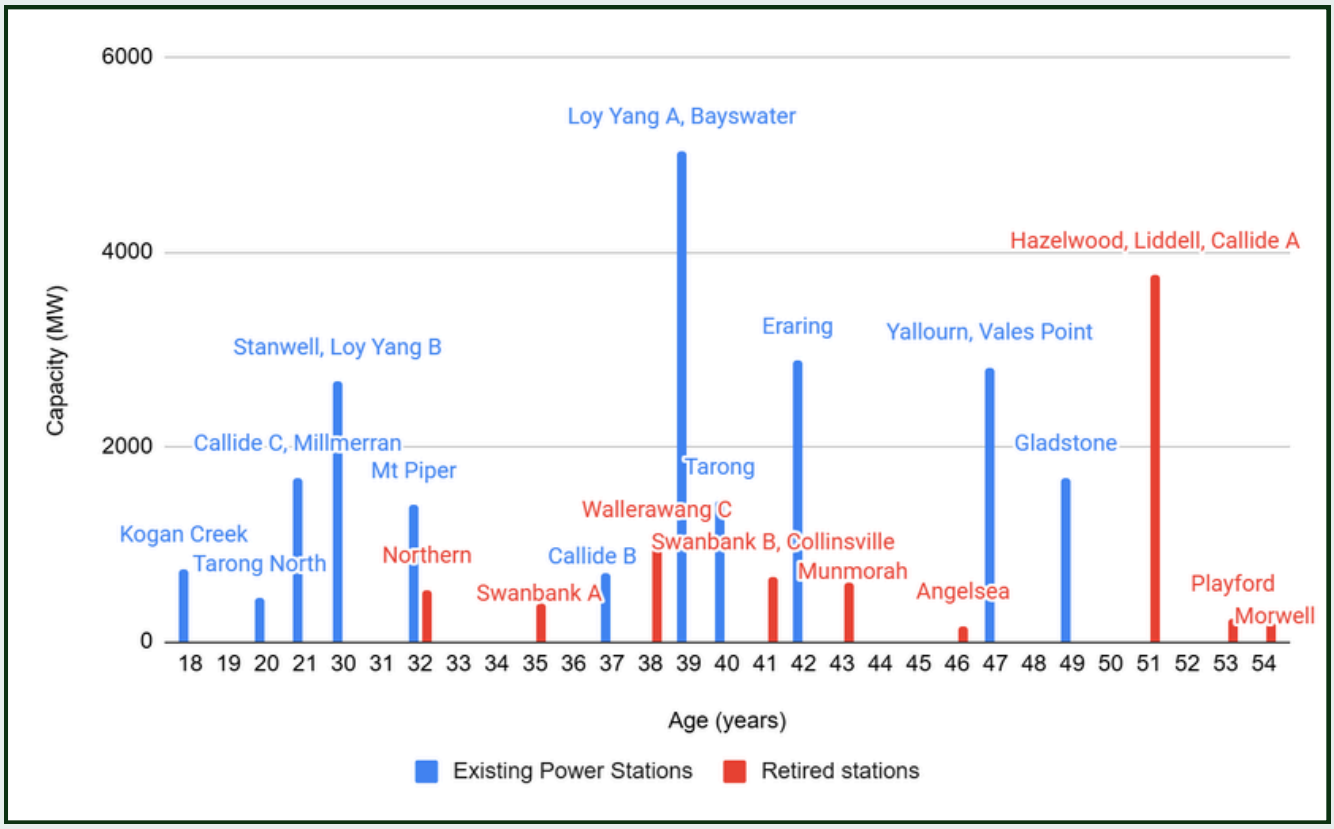
Age

The youngest coal fired power station in the NEM, Kogan Creek in Queensland, was commissioned in 2007. **The average age of power stations in the NEM is 35 years.**

Since 2007, 12 power stations around the NEM have closed, taking 7.3 GW of capacity out of the system. These coal fired power stations were retired at an average age of 45 years*.

Figure 2 shows that many operating coal fired power stations are older than stations that have already retired due to old age.

Figure 2: Coal fired power stations existing and retired since 2007.



**Note that this analysis doesn't include Redbank Power Station which operated for 14 years in NSW and closed due to economics partly driven by unusual coal supply arrangements.*

Reliability

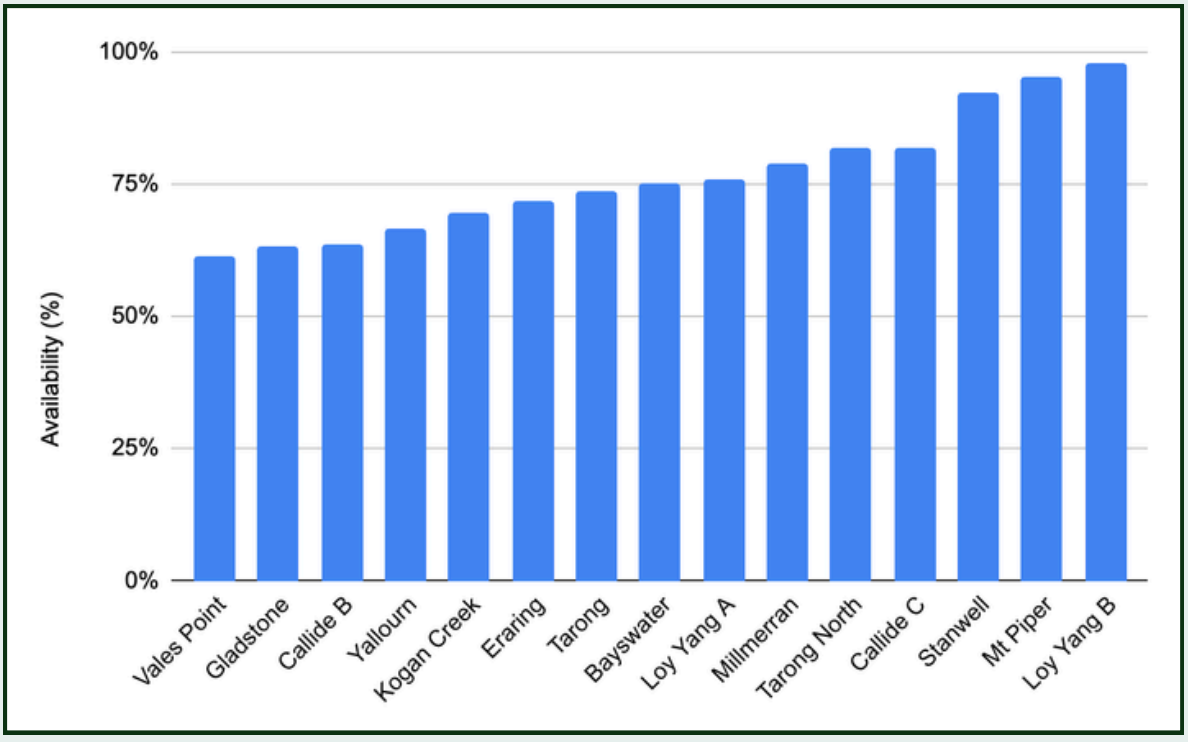
Coal fired power stations tell the Australian Energy Market Operator (AEMO) the amount of capacity they have available to be used by the grid every five minutes. This takes into account any scheduled maintenance or unplanned outages. It also reflects any constraints which limit a unit's output below its maximum capacity. It is common in hot weather, for example, that units are forced to operate to a lower capacity. This is termed *availability*, reported in megawatts (MW). Availability indicates the maximum potential generation of the unit at that time. The generation of the unit, reported in megawatt-hours (MWh) will depend upon demand and price.

Analysing the availability data submitted by coal fired power stations to AEMO provides an overall view of reliability of coal. Coal fired power stations require maintenance to be able to continue to function. AEMO forecasts that breakdowns are likely to result in an equivalent forced outage rate of coal fired power stations in 2024-25 of around 8% for Queensland coal, 9% for Victoria and 12% for NSW [7]. Additionally, scheduled maintenance is forecast to take around 5.5% of the year. Combined this means that coal power stations would be expected to have an average of 14 - 18% capacity offline. However, this should be lower in summer, because maintenance should be scheduled to occur over the shoulder seasons at lower demand in spring and autumn.

From October 2024 to March 2025, however, coal fired power stations around Australia were, on average, offline 23% of the time. This means an average of 5.1 GW of coal fired capacity was unavailable, around 20% of average NEM demand in the period.

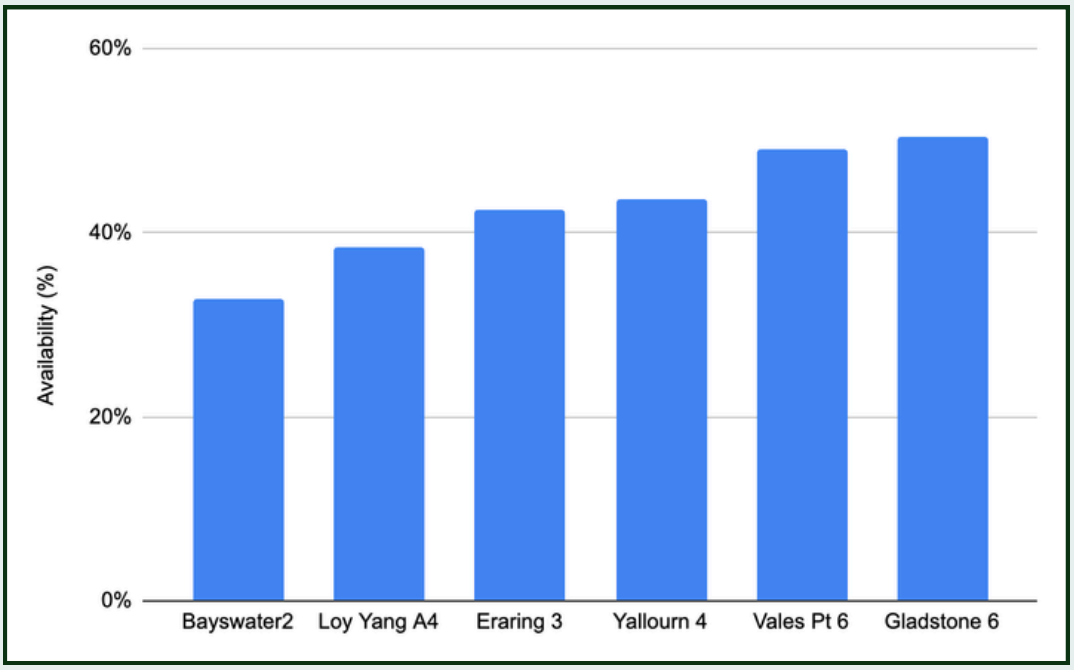
Over this summer, Vales Point had the worst availability at 62% and Loy Yang B the best at 98% as shown below in Figure 3.

Figure 3: Availability by power station October 2024 - March 2025.



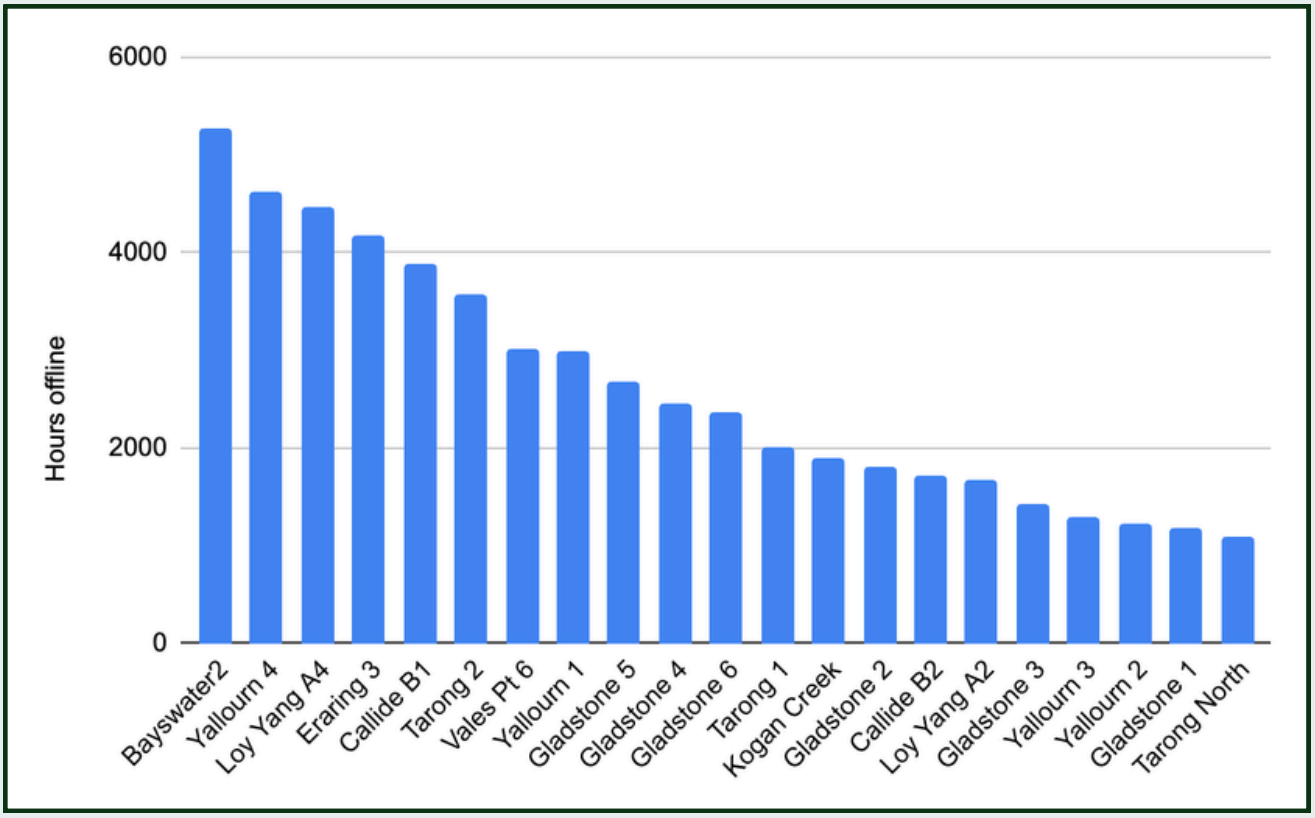
Six individual units at coal fired power stations were available less than half the time (Figure 4).

Figure 4: Worst performing coal units summer 2024-25.



Twenty one units across the coal fired power stations were entirely offline for more than 1000 hours during the reporting period, including all six units at Gladstone.

Figure 5: Coal units offline for more than 1000 hours over October '24 - March '25.



Forecast compared to actual

The generators submit their forecast availability to the Australia Energy Market Operator to create the Medium Term System Adequacy Projection Assessment (MTPASA).

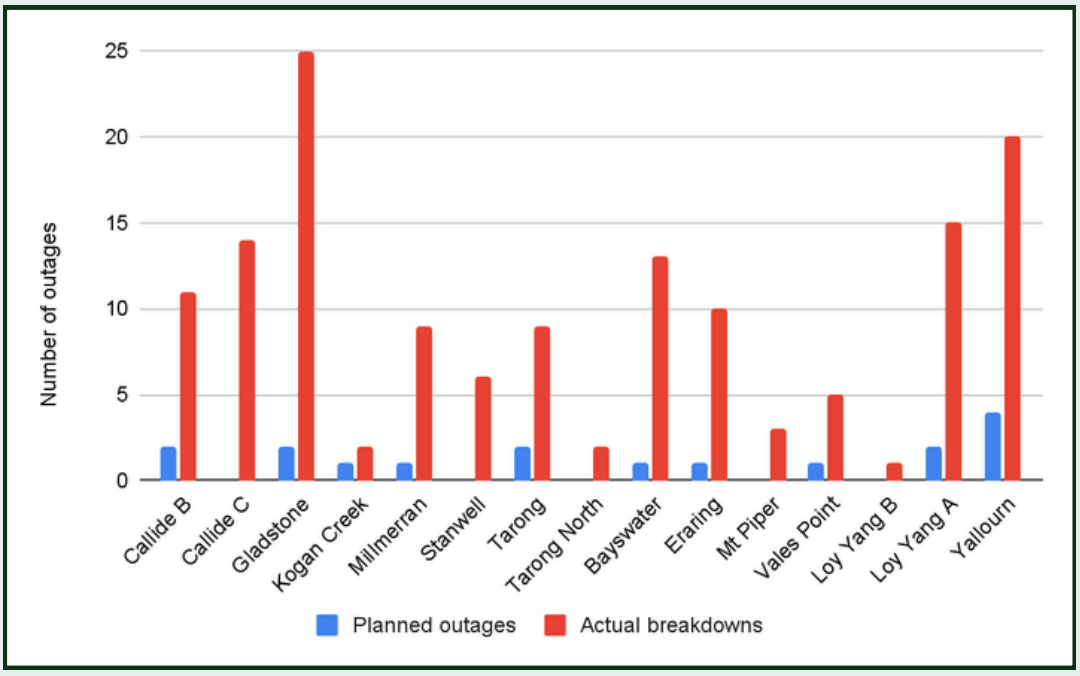
At the beginning of October 2024, the coal fired power stations were forecasting that only 9% of their capacity would be unavailable over the summer period, that is they would have an availability of 91% until the end of March 2025 [8]. This was reflected in AEMO's Summer Readiness Assessment in November 2024 [9], which planned for major outages of nine units as well as eight other minor (around a week long) outages at other units.

However, as discussed above, 23% of coal fired power stations capacity was unavailable over this period. This was due to a combination of derating, where a unit was unable to reach its full capacity, and breakdowns, where the unit was completely offline. To define breakdowns, the availability data submitted to AEMO was analysed to find the periods where coal fired power stations offered no capacity to the market, by submitting a zero availability bid. These periods were then further analysed to filter out instances where a unit is attempting to return to service after a breakdown but doesn't reach full capacity before having to go offline again. This is included in the first breakdown rather than being classed as a second.

This method likely returns a higher number of breakdowns than will be picked up by the Reliability Watch website, which will track in real time when units experience a rapid loss of generation. Slower breakdowns can be picked up in post analysis.

Instead of the 17 outages expected by AEMO, from October 2024 - March 2025 there were actually 145 outages (Figure 6). This is 128 breakdowns in six months. Many of the breakdowns were short-lived, but there is also an increasing trend for scheduled maintenance to overrun predicted time. This summer, the four units at Yallourn exceeded planned maintenance times by an average of nearly 60%.

Figure 6: Planned outages vs actual breakdowns October 2024 - March 2025.



Station investigation

Yallourn

Yallourn was one of the first sites to be developed for coal fired power stations outside of major cities, with the first power station and mine commissioned in 1928. The current Yallourn power station, formally known as Yallourn W, is the sixth station to built on the site. Yallourn's current four units were commissioned between 1973 and 1982, making it on average nearly 15 years older than the other five stations on the site which were decommissioned after an average of 33 years service.

Yallourn town was built to house workers for the power station, then demolished for an expansion of the mine. The Morwell River was diverted around the mine after serious flooding in 2022.

Yallourn is the dirtiest coal fired power station in Australia, with each kWh of electricity generated in 2023-24 releasing 1.29 kg of carbon dioxide equivalent.

After poor availability during the 2022 market suspension period, EnergyAustralia planned a series of remediation works to Yallourn through to January 2025 [10]. At the beginning of October 2024, EnergyAustralia submitted a planned outage schedule to AEMO adding up to 93 days in which one of the four units would be offline. In actuality, Yallourn recorded 195 days with at least one unit offline.

Unit 4 broke down three times before its major outage, which took it offline until 11 Feb, almost 20 days longer than scheduled. There was another breakdown at unit 4 in March.

Yallourn unit 3 started October offline and suffered another 4 breakdowns. Yallourn unit 2 had four breakdowns and unit 1 had six. Yallourn is scheduled to close in 2028.

Loy Yang A

Loy Yang A is the biggest polluter in the NEM, releasing more than 18 million tonnes of carbon dioxide equivalent in 2023-24. Brown coal from the Loy Yang mine, which also supplies Loy Yang B, can't be stockpiled, so has to be mined just in time [11].

During the summer period in 2024-25, Loy Yang A4 was planned to be on maintenance from the beginning of October until 25 November. A two week outage at the beginning of December was also planned at Loy Yang A2. No outages were planned at units A1 or A3.

However, the planned maintenance at Loy Yang A4 took significantly longer than forecast. The unit did not come back online at all until 18 December, more than three weeks after forecast, and was then operated at reduced capacity until 26 January. It suffered another breakdown in January.

Loy Yang A2 suffered 10 breakdowns, while Loy Yang A3 reported one and A2 two breakdowns.

Loy Yang B

Loy Yang B is the youngest Victoria coal fired power station, even though it's thirty years old. It forecast no outages and only had one breakdown at Loy Yang B2. Over summer, it kept submitting availability above forecast reductions to achieve availability of 98%.

Vales Point

Vales Point is located on Lake Macquarie on the central coast of NSW. It is supplied by three coal mines which are also right on the edge of Lake Macquarie. Vales Point is the oldest of the NSW coal fired power stations. Vales Point was also the site of an earlier coal fired power station, with four units, which retired in 1989. The remaining two units are referred to as Vales Point 5 and 6.

In 2015, the NSW Government sold it to coal investors Trevor St Baker and Brian Flannery for $1m. They then revalued it at $722 million in 2017 and have now sold it to Czech coal company Sev.en.

It received an exemption from the NSW Environmental Protection Agency to allow it to exceed nitrous oxide emissions limits under the Clean Air regulations from 2012 to 2024 [12], and there are significant concerns about ash dam contamination of Lake Macquarie [13].

Vales Point achieved the lowest availability of any power station. At the beginning of the summer period, it was forecasting a planned outage of Vales Point 6 from 1 October to 25 November. VP6 actually came back online on 3 December. There were four unscheduled breakdowns at Vales Point 5. The station largely recorded the lowest availability due to persistent partial outages. Both units were routinely offering availability as low as 200 MW when their nameplate capacity is 660 MW.

Mt Piper

Mt Piper is now owned by EnergyAustralia and located north of Lithgow.

It forecast a slightly reduced availability during the summer period but no outages. Mt Piper 2 suffered two breakdowns and more reduced availability than forecast. Mt Piper 1 suffered one breakdown, but overall availability was 95%.

Eraring

Earring is the largest power station in the NEM. It forecast an outage at unit 3 from 1 October to 10 November. Unit 3 didn't come back on until 6 December, and operated at reduced capacity until 28 December 2024. It then suffered a further 4 breakdowns during January - March.

Units 1 and 2 both suffered one complete breakdown and unit 4 had three breakdowns during the six months to March 2025.

Eraring has cut a deal with the NSW Government to stay online until 2027 with the option of government underwriting for up to $450 million over two years.

Bayswater

Bayswater, in the Hunter Valley near Muswellbrook is just smaller than Eraring. It forecast a planned outage of unit 2 from 1 October to 8 December. Unit 2 was actually offline entirely until 21 December. It continued to suffer issues until 19 February, coming back online before breaking down again three times. It did not reach full capacity again until 19 February 2025.

Bayswater 1 suffered one breakdown, BW4 two and BW3 six during the period.

Millmerran

Millmerran is the only privately built power station in the NEM. It is not on a water source so is air cooled and a pipeline was built to move recycled water around 80km from Toowoomba to Millmerran. Recently, it has been plagued by too much water. After the floods in 2022 made it impossible to operate the mine, the power station was trucking coal in from Callide.

Millmerran 1 was coming off a planned outage, due to end 3 October. Reduced availability was forecast at both units during summer. Millmerran 1 came back online as forecast but after five days had to go offline again for a further week. It broke down twice again and Millmerran 2 five times. Both were also severely constrained, to around half of total availability at points during the period.

Kogan Creek

Kogan Creek is the single largest unit in the NEM. It is also air cooled and the newest coal power station in the NEM. However, it has been plagued by unreliability [14]. It forecast a single fortnight-long outage in November. That outage lasted 23 days and it broke down again in December for two weeks.

Tarong

Tarong has had to reduce output during drought in 2007 and again in 2019. In 2012, Tarong units 2 and 4 were entirely shut down due to low demand and a flood of new gas fired generation in Queensland. Unit 2 was returned to service in 2014 and unit 4 in 2016.

Tarong forecast maintenance at unit 2 from 1 October to 29 November, and a shorter outage at unit 1.

Tarong 2 did not come back online until 14 December. It then suffered a further two breakdowns over the summer period. From October, Tarong 1 was offering lower capacity, at 300 MW instead of 350 MW. It went offline as scheduled on 19 October but instead of coming back on 7 November, it did not come back until the 17th. It then broke down again for a short period in December. Tarong 4 had one breakdown over summer and both Tarong 3 and 4 operated at consistently less than capacity.

Tarong North

Tarong North is a supercritical unit but it cannot operate independently from Tarong and does not report emissions separately. It forecast full availability but suffered two breakdowns and often offered less than full capacity.

Callide B

Both Callide B1 and B2 were offline at the beginning of October. Callide B2 was forecast to come back online 18 October and B1 24th October. Callide B2 actually came back online 2 November and B1 on 14 December.

Callide B1 suffered six further breakdowns between December and March. Callide B2 also broke down once in February and twice in March.

Callide C

Callide C has been plagued by outages since blowing up in 2021, a cooling tower collapse in 2022 and now explosion in April 2025.

Over the reporting period, Callide was forecasting half availability at Callide C4 until 19 October, but in reality this persisted until 5 December. C4 broke down 13 times between October and March. C3 broke down once and reduced capacity meant its availability remained low.

Stanwell

Stanwell forecast no outages or availability reductions. Stanwell units 1, 2 and 4 suffered one short breakdown each and Stanwell unit 3 suffered three breakdowns. Due to reduced capacity, the average availability at Stanwell was 92% over the summer.

Gladstone

Gladstone is the oldest power station in the NEM and dirtiest in Qld and NSW. It has six units and can operate reasonably flexibly. It forecast two-week outages at two of its six units. Instead it had 25 breakdowns across the station, and the lowest availability of any Queensland station.

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