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The approaching surge of renewables and storage leaves no space for Eraring

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Key Findings

The Australian government's recently announced expansion of its Capacity Investment Scheme (CIS) will play a key role in achieving its 82% renewable energy target by 2030, supporting the majority of new renewable capacity required.

The first tranche of winning NSW projects under the CIS would be enough to ensure the reliability standard is met after the planned closure of the Eraring coal-fired power plant.

IEEFA/ITP modelling shows that it is not necessary to keep Eraring open beyond its planned closure in 2025, and that propping Eraring up would undermine the financial viability of the remaining coal generators.

Executive summary

IEEFA worked with ITP Renewables using its openCEM energy market modelling tool to analyse new renewable generation capacity requirements, reliability outcomes and coal-power utilisation factors under a number of scenarios.

We found that to achieve the government's 82% renewable energy target by 2030 and minimise overall energy system costs, an additional 36 gigawatts (GW) of new large-scale renewable generation capacity would be needed. This is slightly higher than AEMO's 2022 ISP step change scenario, which found that 30GW of new large-scale renewable generation capacity would result in the National Electricity Market (NEM) reaching 83% renewables by 2030-31.

Under the recently announced expansion of its Capacity Investment Scheme (CIS), the federal government plans to underwrite 23GW of variable renewable generation. This would support the majority – albeit not all – of the new renewable energy capacity required to achieve the government's 82% target.

Another benefit from the CIS is that, once they come online at the end of 2025, the first tranche of winning NSW projects under the scheme would fill the forecast requirements to meet the reliability standard after the planned closure of the Eraring power plant. The projects are targeting commercial operation by December 2025, while Eraring is due to exit in August 2025, so the remaining gap is only a question of months.

Our modelling provides further reassurance. It found that, even in a situation in which no new build (additional to what is committed) is allowed in financial year 2026 – one year after Eraring's planned 2025 exit – reliability would still be maintained within the standard.

Finally, we looked at the impact of renewables deployment on the utilisation rates of coal power stations. We found that, even if emissions constraints were removed and only 67% renewables was achieved by 2030, most coal power stations would see significant decreases in utilisation rate between now and 2030, which would threaten their financial viability.

> **Propping up Eraring is like robbing Peter to pay Paul, with other coal power stations left vulnerable.**

If Eraring's closure was delayed, the impact would be to significantly reduce the utilisation rate of other coal power stations in the state. Essentially, propping up Eraring is like robbing Peter to pay Paul, with other coal power stations left vulnerable. One of the most impacted generators would be Vales Point, for which the capacity factor would drop as low as 9%.

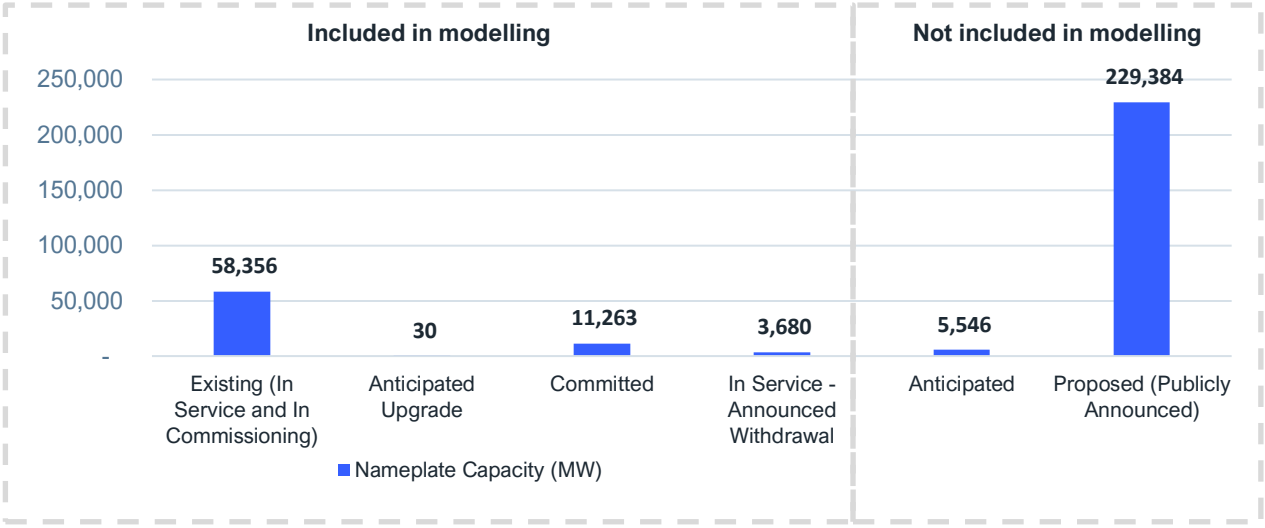
The CIS will go a long way towards helping achieve the 82% renewables target

The federal government on 23 November announced plans to underwrite 23 gigawatts (GW) of variable renewable generation and 9GW of storage by 2030 through the Capacity Investment Scheme (CIS).[1] The expanded scheme will play an important – albeit not complete – role in achieving the government's 82% renewable energy target by 2030 and help to ensure planned coal exits such as the Eraring closure can proceed on time without any disruption to reliability, while keeping power prices contained.

Indeed, the first round of successful projects under the NSW CIS auction should be sufficient to cover any reliability gap left from the exit of the Eraring power station, if they can come online prior to the Eraring exit.

IEEFA worked with ITP Renewables using its openCEM energy market modelling tool to get a view of the capacity expansions expected and required in the National Electricity Market (NEM).[2] It is important to recognise that despite all the discussions around transmission and the planning approval constraints affecting renewable energy projects, 11GW of new large-scale capacity is already committed to come online in the next seven years. This is a huge amount of capacity, split across wind, solar and energy storage – as well as a small amount of open-cycle gas turbine capacity that has been supported by federal government funding.

Development pipeline across the NEM (MW)



Source: AEMO NEM Generation Information. July 2023, IEEFA project status adjustments on 13 projects.

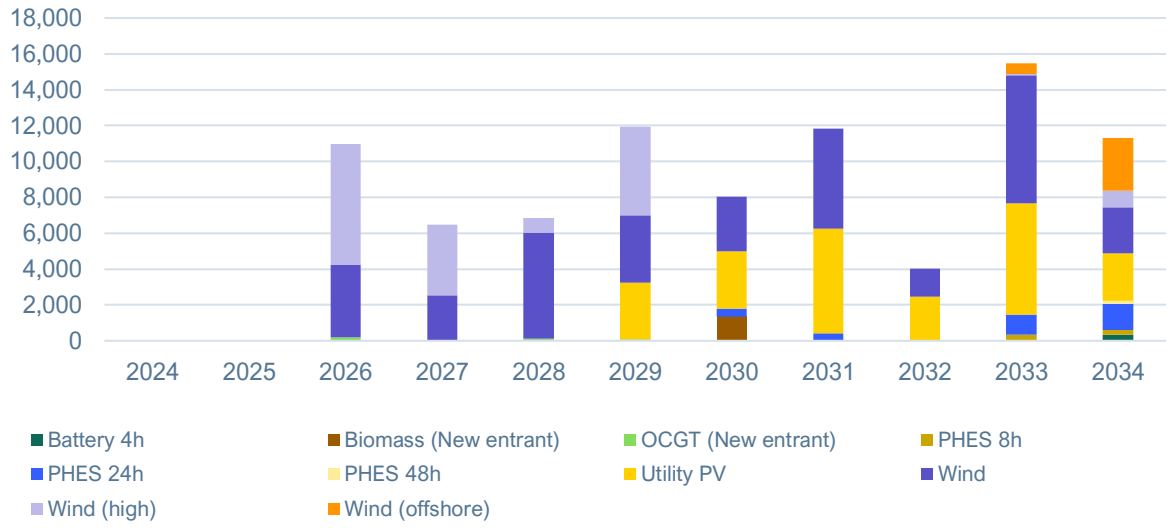
[1] Department of Climate Change, Energy, the Environment and Water. Major expansion of Australia's energy grid capacity announced. 23 November 2023.
[2] ITP Renewables. openCEM – A free, open-source Capacity Expansion Model.

Our modelling was guided by an emissions constraint consistent with the Step Change scenario from the Australian Energy Market Operator (AEMO)'s 2022 Integrated System Plan (ISP). It suggests that if a further 36GW of new large-scale renewable capacity is built, the NEM would reach around 82% renewables by 2030.[3]

If the federal government underwrote 23GW of this using the CIS, there would still be a need for other sources of demand to support the remaining 13GW. This suggests state government initiatives will remain important. For example, the NSW Electricity Infrastructure Roadmap's goal of 12GW of renewables by 2030 would ideally be additional to the CIS. (It is unclear to IEEFA at this stage if the 32GW announcement via the CIS is additional to the NSW Electricity Infrastructure Roadmap target of 12GW.)

The figure below shows the renewable generation capacity added by the model to achieve the 82% renewable target. The volume and timing of new generation capacity are driven by the model's objective of minimising the overall costs of the energy system, rather than maintaining system reliability. For example, as explained in the next section, the modelling found that reliability could be maintained without adding any new capacity in financial year 2026.

New capacity above committed projects – 1.8-degree pathway 82%+ (MW)



Source: ITP modelling using openCEM. Note: years refer to financial years. "Wind" refers to wind with lower capacity factors and "wind (high)" refers to wind with higher capacity factors.

AEMO's 2022 Step Change scenario required less new renewables than our modelling to meet the same target – building around 30GW of new large-scale renewables to reach 83% renewables by 2030-31 (on top of existing and committed projects). AEMO's 2022 ISP figures would indicate that

[3] The modelling reached 81% in financial year 2029, and significantly above 82% in financial year 2030, so financial year 2029 figures have been used as an indicator for what is needed to reach the Federal Government's 82% renewables target.

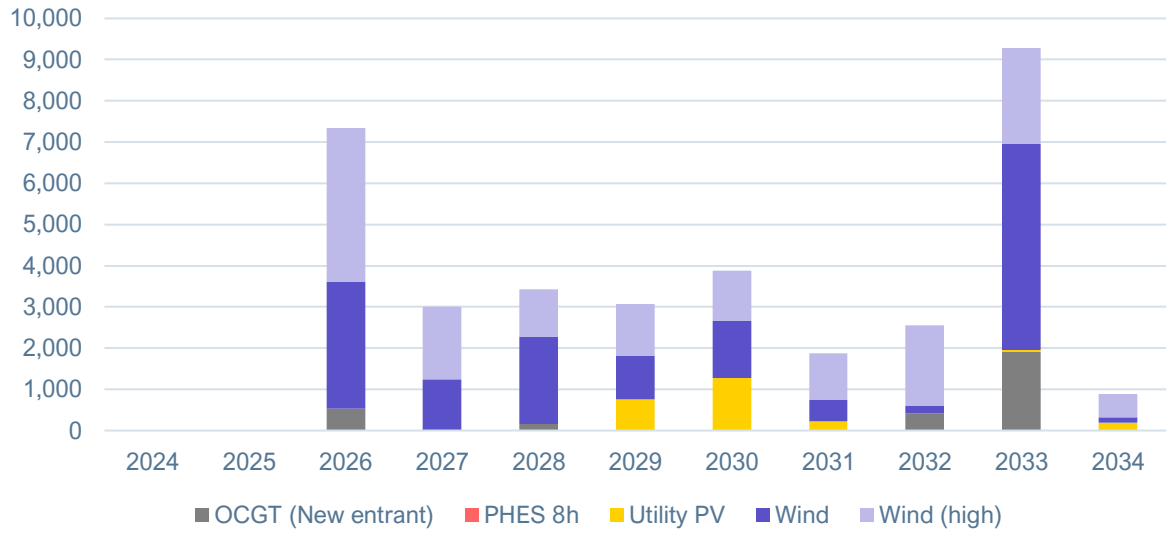
only 7GW of additional large-scale renewables is required on top of the 23GW to hit the ~82% goal. IEEFA notes that various assumptions in the AEMO and openCEM models are different, and the draft 2024 ISP, which is due out on 15 December, will provide a more up-to-date view.

Our analysis from the openCEM capacity expansion model shows that the preferred utility-scale renewable generation build is wind energy. Daytime demand is increasingly being satisfied by customers investing in their own rooftop solar, so utility-scale investments are heavily concentrated in wind, which can also help meet night-time demand.

With the large amount of new renewables build seeing the NEM exceed 82% renewables by 2030, and with coal power stations exiting as per the current schedule, coal capacity would be around 15GW by 2030 (it is currently 21GW). According to their current announcements, the coal power stations exiting before 2030 are Eraring in 2025, Yallourn in 2028, and Callide B in 2028-29, while Stanwell, Tarong and Tarong North will begin shutdown phase two in line with the Queensland Government's plan.

We also examined alternative scenarios using ITP's model examining the impact of removing the emissions constraint. With the emissions constraint absent, the capacity expansion model only builds and runs enough renewables to get to around 67% renewables by 2029-30 – building 20GW of large-scale wind and solar by 2029-30 (on top of what is already under construction, operating or committed to construction).

New capacity above committed projects – Eraring exit 2025, slower renewable energy build (MW)



Source: ITP modelling using openCEM. Note: years refer to financial years. "Wind" refers to wind with lower capacity factors and "wind (high)" refers to wind with higher capacity factors.

The first tranche of CIS projects should alleviate reliability issues in the wake of planned Eraring closure

A big question arising from the government's recent underwriting announcement concerns whether Eraring is still needed among all the new renewable energy and energy storage build that is planned.

AEMO's latest Electricity Statement of Opportunities (ESOO) identifies that, if Eraring were to close as planned, the gap to ensure the reliability standard is met in 2026-27 could be fulfilled by the following options:

- 657MW of two-hour duration storage; OR
- 312MW of four-hour duration storage; OR
- 252MW of eight-hour duration storage; OR
- 477MW of solar paired with 238MW of four-hour duration storage.[4]

This gap appears to filled by the first tranche of winning NSW projects under the CIS, which totalled 980MW/2790MWh of storage capacity (2.8 hours duration) and 95MW of demand response.[5] All projects are targeting commercial operation by December 2025 – however ideally they would come online before August 2025 when Eraring is due to exit to entirely remove the forecast reliability gap.

The modelling by ITP provides further reassurance about reliability. Even if renewables build-out is slower than needed to meet government targets, and the NEM only reaches 67% renewables in 2029-30, the NEM would stay within the reliability standard of 0.002% unserved energy with Eraring closing in 2025. Even in a situation in which no new build (additional to what is committed) is allowed one year after Eraring's 2025 exit, reliability is still maintained within the standard.

NSW unserved energy (%)

Scenario	2024	2025	2026	2027	2028	2029	2030
Eraring exit 2025, no new build for 1 year post exit	0.00000	0.00000	0.00086	0.00000	0.00000	0.00000	0.00000
Eraring exit 2025	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Eraring exit 2026	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Eraring exit 2027	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Eraring exit 2028	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
1.8 degree pathway 82%+	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Source: ITP modelling using openCEM. Note that the reliability standard is 0.002% Unserved Energy.
Note years refer to financial years.

[4] AEMO. Electricity Statement of Opportunities.August 2023.
[5] NSW Government. Capacity Investment Scheme supports NSW to deliver 1 GW of cleaner, cheaper, more reliable energy. 22 November 2023.

Delaying Eraring's closure will only displace other coal power generation

One significant impact of the major uptick in renewable generation coming online is that coal power stations will run a lot less. This will challenge their profitability. As renewables grow and various coal generators remain in the system, average coal capacity factors will reduce dramatically, such that their business case will be significantly challenged. The chart below illustrates capacity factors for coal generators under the scenario that imposes an emissions constraint consistent with government targets.

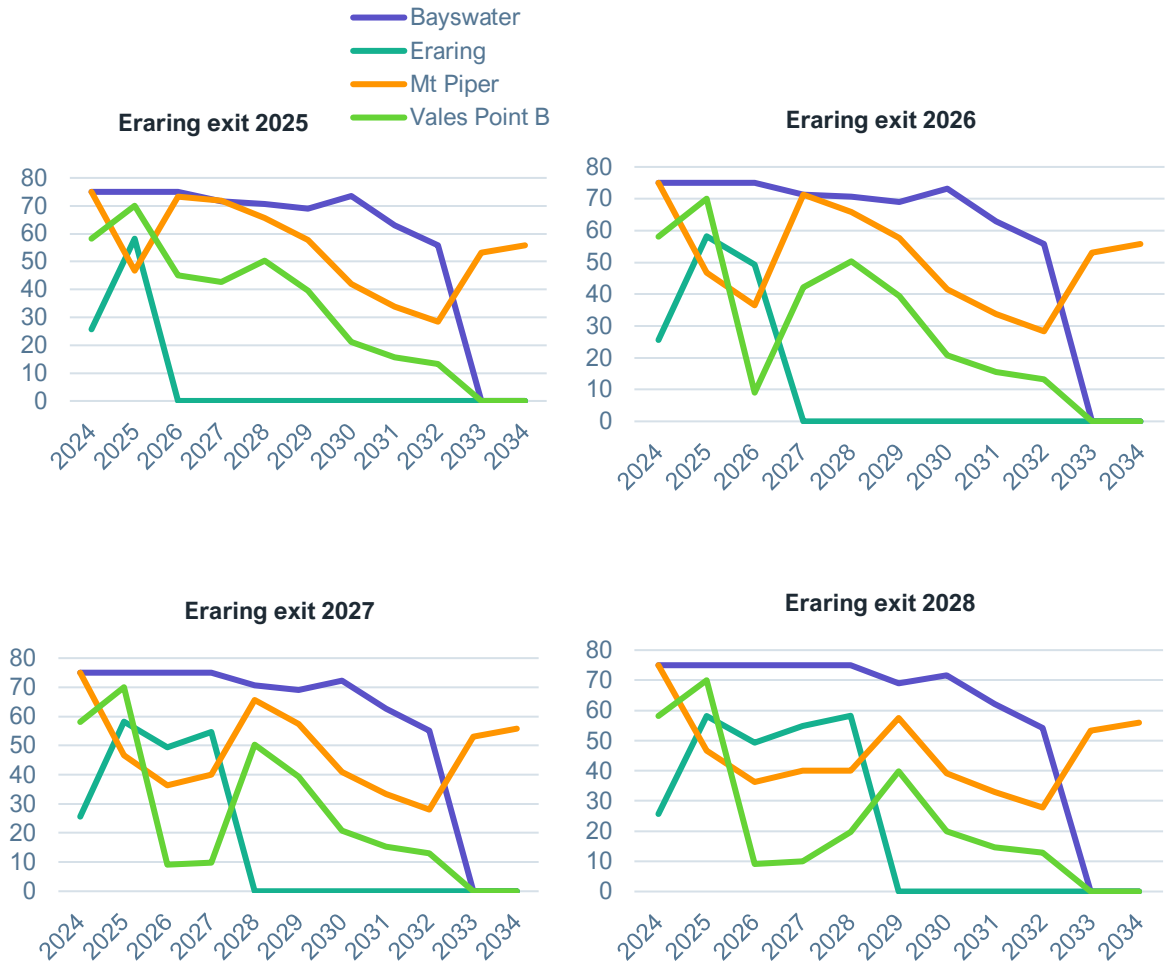
Capacity factors for coal power stations – 1.8-degree pathway 82%+ (%)

Source: ITP modelling using openCEM. Note years refer to financial years.

It should be noted that this model imposes emissions budgets constraints on the NEM – constraints that do not currently apply. While we do have an emissions reduction target, we do not have emissions constraints imposed on the electricity sector.

Nonetheless, what is particularly interesting is that even with the emissions constraint removed, a number of coal power stations would still suffer severely low capacity factors threatening their financial viability, particularly if the NSW Government propped up Eraring to delay its exit. Essentially, propping up Eraring is like robbing Peter to pay Paul, with other coal power stations left vulnerable. One of the most impacted generators is Vales Point, the capacity factor of which would drop as low as 9% in a situation where Eraring's exit is delayed.

Coal power station capacity factors – Slower renewables build reaching 67% by 2030 (%)



Source: ITP modelling using openCEM. Note years refer to financial years.

The large amount of new renewable energy will also put downward pressure on wholesale power prices as Eraring exits. When large power stations exit the market, there is usually an uptick in prices. This could happen post the Eraring closure. Building new capacity can help contain price rises, as can demand-side measures such as energy efficiency, demand flexibility and distributed energy resources (DER) uptake.

What this modelling illustrates is that no matter which way we cut this, there isn't enough space left in the market for Eraring after 2025. It just isn't needed. Given that the first CIS auction was overwhelmed with bids, if the NSW Government wanted some additional insurance to safeguard reliability, it would be better off running another auction as soon as possible. At the same time, it should also look at how to accelerate and expand mechanisms to improve energy efficiency and reduce peak demand.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

About the Author

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Prior to joining IEEFA, Johanna researched distribution networks at CSIRO, worked in the solar energy industry and as a management consultant at Kearney.

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