AEMO 2024 draft ISP
mc² Energy submission
re: Section 6 Storage and gas to firm renewables

Section 6 of the draft 2024 ISP makes a number of assertions that require examination to establish their veracity. Chief among these claims is that Snowy 2.0 will provide 376 GWh of long duration storage. The implication from Figure 19 is that upon completion of Snowy 2.0 presumably in 2029, there is ample long duration storage in place to be able to close all NEM (NSW) coal fired generators (Figure 1) with system security. Here, we examine the veracity of the Snowy 2.0, 376 GWh storage (AEMO 2024 ISP) claim and the implications for system security if the accelerated coal generator closure timetable eventuates.

Figure 19 **Storage installed capacity and energy storage capacity, NEM** (2024-25 to 2049-50, *Step Change*)

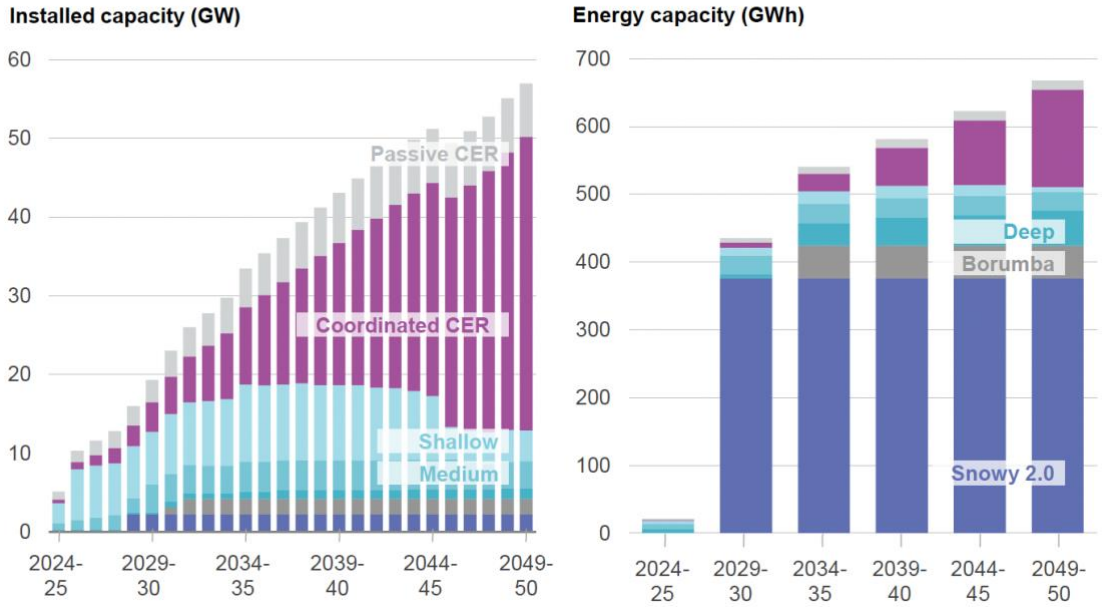
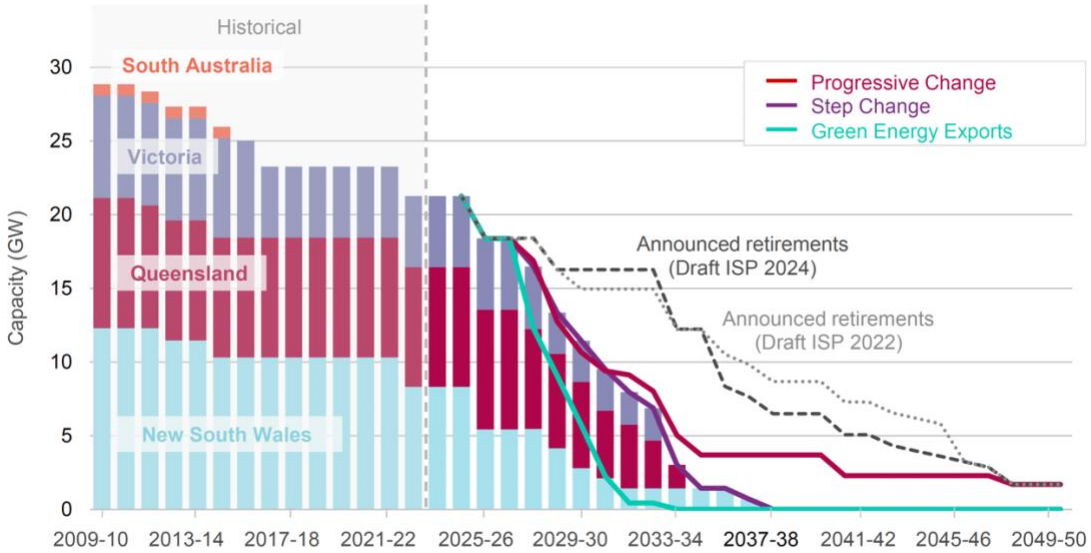


Figure 1 **Coal capacity, NEM** (GW, 2009-10 to 2049-50)



Does Snowy 2.0 have 376 GWh of long duration storage?

The simple answer is no, when taken in conjunction with another claim by Snowy Hydro that Snowy 2.0 will have no net water loss. If Snowy 2.0 does not have 376 GWh of energy storage then how much useable storage does it have? About 40 GWh (see attached schematic diagram).

It is impossible to drain Tantangara's theoretical maximum active storage (240 GL) into Talbingo's active storage[1] (155 GL) without overflow to Jounama pondage and water loss downstream from Snowy 2.0.

The claimed 376 GWh of energy storage capacity (AEMO 2024 ISP) for Snowy 2.0 would require at least 203 GL of water to flow from Tantangara to Talbingo, which also exceeds the active storage of Talbingo (155 GL), also causing overflow.

Using average active water storage in Tantangara and Talbingo, in a closed system[2] (not affecting river flows) a realistic operational energy storage capacity for Snowy 2.0 is around 40 GWh (Tantangara 22[3,4] GL and 680m head).

Snowy 2.0 is an open system[2] pumped hydro scheme. Any extra water retained in Tantangara and Talbingo to operate Snowy 2.0 will not be available for downstream users along the Murrumbidgee River. Under drought conditions Snowy 2.0 real operational energy storage capacity may be significantly less than 40 GWh.

The magnitude of 376 GWh of energy storage was material to Snowy Hydro gaining support for the scheme, and a disincentive for energy storage commercial competitors to challenge the near monopoly of existing flexible on-demand generation (5.5 GW, Hydro, Pumped Hydro and Gas) held by Snowy Hydro. With increasing penetration of variable renewables, monopoly control of NSW & VIC Hydro and Pumped Hydro by Snowy Hydro (6.3 GW) of flexible generation would give further NEM market control of marginal prices with consequent higher consumer electricity prices.

The order of magnitude difference between the claimed 376 GWh and operational 40 GWh of energy storage is now important to recognise for AEMO and the States to plan additional energy storage resources with a realistic operational capability. This is particularly important for long duration energy storage which is required to absorb the excess (solar) variable renewable energy and fill the gaps between VRE and energy demand for NEM security.

The timeline for closure of the remaining coal generators is now about 2035 (Figure 1 AEMO draft 2024 ISP) under the most likely Step Change scenario. This timeline is driven by the uptake of renewables, displacing relatively inflexible coal generators with a poor ramp rate, causing coal generators to run uneconomically. There is a timeline mismatch between the coal generator closures and the building of sufficient energy storage GWh to achieve genuine NEM competition = low consumer prices and guarantee energy security.

If insufficient energy storage (GWh) is built by 2035, existing energy intensive industries such as Tomago Aluminium smelter (12% of NSW power) that require low-cost firm power supply contracts (>90% capacity factor) may close. Future decarbonisation of steel production (1,500MW) is also dependent upon securing low-cost firm power supply contracts. Without sufficient VRE and large capacity energy storage, the attendant decarbonised "Superpower" economy is jeopardised.

1. *Senate Standing Committee on Environment and Communications, Legislation Committee, Answers to questions on notice, Environment and Energy portfolio, SHQoN3, Q3 23 May 2017, Hansard p44.*

2. Science, Water Batteries p386, 26 January 2024 https://www.sciencemagazinedigital.org/sciencemagazine/library/item/26_january_2024/4167342/?Cust_No=41581428

3. Snowy Hydro https://www.snowyhydro.com.au/generation/live-data/lake-levels/

4. An Overview of the Snowy 2.0 Pumped Hydro Energy Storage Scheme, Bowden and Brooking, 29 July 2022 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwieo6m6qayEAxX40DQHHXfPCaUQFnoECDEQAQ&url=https%3A%2F%2Fwww.flickerpower.com%2Fimages%2FSnowy2.0PHES.pdf&usg=AOvVaw3oO3hfT0Bxzf7QNTHu82Qd&opi=89978449

Dr Chris Waring Managing Director

Snowy 2.0 water & energy storage schematic diagram

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