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Energy transition

STORAGE, NOT COAL, IS KING

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Storing power will be a key challenge as traditional generators close – the question is the form it will take, writes Angela McDonald-Smith.

As weather-dependent renewable energy increases and the 24-7 coal power generators of the past gradually shut down, something has to fill in the gaps.

Enter, storage. But the storage of the future will look very different to the mounds of coal that have been piled up next to power stations for the past several decades.

“Coal had built in storage; it was a stockpile next to the generator,” Federal Energy Minister Angus Taylor said, announcing the Technology Investment Road Map, which includes new “stretch targets” for storage and four other priority technologies.

The Australian Energy Market Operator expects utility-scale pumped hydro, largescale storage systems and household batteries will all feature in the estimated 6-19 gigawatts of flexible, dispatchable capacity that is needed by 2040 to back up solar and wind power plants.

The systems will soak up surplus solar energy, in particular, that would otherwise go to waste and save it for use when it’s needed, with the type of plant dependent on how long the gap is that needs to be filled.

“The growth in storage is broadly aligned with timing of coal-fired generation retirements”, AEMO said in its 2020 blueprint for the future power grid, the Integrated Systems Plan.

“The type and depth of storage required will depend on the mix and location of renewable generation, and the ability of existing generators to smooth out shortterm and seasonal renewable variability themselves.”

As the government pointed out in its draft for the road map in May, by 2030 having enough long-duration flexible capacity to keep electricity supply reliable and affordable during periods of low wind and sun is critical to re-establish the country’s advantage in manufacturing.

The problem is that while small household lithium-ion battery systems are taking off in popularity, getting larger systems off the ground that could compensate for a lull of several hours or even days in wind or solar generation is harder.

While several storage projects of up to one or two hours capacity have been developed or proposed over the past several years, the only longer duration one to get the go-ahead is the government-backed Snowy 2.0 mega-project, which falls into the “deep” storage category of more than 24 hours of capacity.

That the road map’s “stretch target” for storage specifies a 6-8 hour period of supply targeting less than \$100 a megawatt-hour implies the focus is somewhere in between the existing grid-scale batteries such as the Tesla Big Battery in South Australia, with its storage of a little over an hour at full strength, and Snowy 2.0, which will be able to power half a million homes for more than a week.

But with no modelling released on the assumptions behind the target, experts such as Grattan Institute’s Tony Wood are uncertain how to assess it.

Certainly, the 6-8 hour sector of the storage market is one that is essentially nonexistent at present, either in Australia or overseas, said Ali Asghar at research firm BloombergNEF in Sydney. He notes the price signals for investment “are just not there”, nor is there any immediate market need.

“Presumably it does make sense later on in the decade and becomes more important with more [coal] generators retiring and more renewables coming online,” Asghar said. Interestingly, it is a part of the market where the biggest competitor is peaking gas-fired generation, which the government also backs.

Grid-scale electricity storage “will be a critical element of Australia’s future electricity system,” the road map says, noting that low-cost storage will enable more solar and wind electricity in the grid and has the potential to reduce Australia’s cumulative emissions by over 700 million tonnes of CO₂ to 2040.

“Storage will also provide system security services and be a source of reliable, dispatchable electricity. It can reduce pressure on electricity prices by meeting peaks in consumer demand.”

According to the road map, the stretch target on pricing would enable firmed wind and solar at pricing at or below today’s average wholesale electricity price.

It points to a mix of storage options that would be needed to meet the needs of Australia’s electricity system. Initially, pumped hydro will likely be the lowest cost storage option, it says, while batteries and solar thermal energy storage become increasingly cost competitive and will be suitable in places where pumped hydro is unavailable or to meet specific industry needs.

Still, several proposed pumped hydro projects have fallen by the wayside over the last 12 months, beaten by uncompetitive costs.

Origin Energy dropped a proposed expansion of its Shoalhaven pumped hydro venture in NSW after finding it would cost as much as \$630 million for another 235MW of storage, which would have 14 hours of generation. rather than the estimated \$250 million.

AGL and partner Hillgrove Resources walked away from a 250MW pumped hydro project at an open-cut copper mine in South Australia, while progress has slowed at EnergyAustralia’s Cultana project in the same state. Genex Power is targeting a go-ahead this year at its delayed Kidston project in north Queensland.

BNEF estimates the levelised cost of storage for pumped hydro in Australia at between \$US125 (\$174) and \$US500 a megawatt-hour, well outside the cost target. While it could potentially reach the targeted cost, the need for costly engineering, transmission and other site-specific requirements makes it difficult, while the turbine technology is mature, Asghar said.

Technologies such as “flow” batteries that have targeted longer duration operations than lithium-ion batteries may also be in the mix, but Asghar expects the use and application of lithium-ion batteries at a scale that is an order of magnitude greater will provide stiff competition.

Solar thermal should also get a look-in at the targeted price, according to Keith Lovegrove at the Australian Solar Thermal Energy Association, who said the technology is one of the most cost-effective renewable energy technologies to meet the need for large-scale, multi-hour storage.

Lovegrove backed the government’s goal of eight hours of renewable energy storage at less than \$100/MWh, describing it as the “critical enabler” in ensuring households and businesses have access to firm, low-cost and low-emission energy at any time.

Still, BNEF’s Asghar said that for lithium-ion systems, the cost target is probably achievable this decade in any case with only incremental improvements in technology, and questioned whether the road map would make any difference.

“It is a reasonable target to reach by 2030, but I don’t think there is anything Australia can particular do to reach it,” he said.

“We will likely get there regardless. Globally these cost improvements are going to be made outside of Australia for the most part.”