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John Kim
Australian Energy Market Commission
Level 15, 60 Castlereagh Street
Sydney NSW 2000

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Dear Mr Kim,

Review of the form of the reliability standard and APC (Review)

Baringa Partners welcomes the opportunity to provide feedback and input into this Review carried out by the Reliability Panel. Baringa Partners is an award-winning consulting firm with offices in the UK, continental Europe, the US, Asia and Australia, supporting clients all around the world.[1] Our Australian team is highly specialised, with a focus on the energy and financial services sectors. We have acted as market advisor in over 100 transactions (buy- and sell-side, and also debt (re)financings) for renewable energy and dispatchable projects (storage and fast-start gas) in the NEM, and provide commercial and strategic advice for client across the sector. Our policy advisory team leverages this commercial and market modelling expertise to ensure we bring an investor-lens to our policy and regulatory insights. We understand how policy design impacts investment, business models and operation. In a market-driven energy system, ensuring that policy design reflects commercial reality is critical to unlocking investment and enabling the energy transition.

Our response focuses on the form of the reliability standard and the MPC/CPT; we are not providing any extensive input on the APC. Our comments on the Review are structured around two themes:

1. *Modelling and other elements of the quantitative analysis*.
   Broadly, we consider the modelling to be appropriate for the specific exercise at hand (i.e., the form of the reliability standard) within the context of the assumptions made, and so have provided brief commentary on this theme.
2. *Implications of this analysis.*
   We consider the implications, or the 'so what?', of this work with a focus on the bankability of storage, and particularly long-duration storage (LDS). LDS is pivotal to mitigating the risk of excess unserved energy in our future energy system, and the form of the reliability standard will have implications for the commercial viability of the LDS projects required to meet this market need.

As with all elements of NEM policy design, it is important that the reliability standard is considered in the context of the investment landscape, and the needs of the market as it delivers the technology mix needed for a sustainable, reliable, secure and affordable energy future.

[1] More details on us can be found at Baringa Management Consulting | Baringa

On the latter, we make the following key points:

- As is generally well-accepted, there is a direct link between the unserved energy modelling results and the implications for the reliability price settings (in particular, the MPC and the CPT)
- Related to the prior point, Sensitivity 3a suggests the second 12 hours of 24-hour (pumped hydro) storage has limited value from a reliability – i.e., unserved energy avoidance – perspective. This prima facie suggests the CPT should be set at c.12 hours at the MPC to ensure sufficient cost recovery – i.e., no missing money – for 12-hr storage. Yet we note the CPT will only rise to 8½ hours at the MPC, from 01 July 2027. As such, there is likely to be missing money for 12hr storage even under the new MPC/CPT settings, unless resolved in other ways.
- There is an urgency to the need to consider further MPC/CPT increases: the modelling is done on the basis of up to 75% VRE penetration, which could be hit as early as the late 2020s given the Commonwealth Government's 82%-by-2030 target.
    - Applying the 5-yr lead time between the modelling demonstrating the need for a CPT increase and the subsequent final rule creates a risk the MPC/CPT doesn't increase in time to manage the reliability risks highlighted by the Review's modelling
    - In turn, this creates the risk of lack of investability and investment in LDS, and long-duration *firming capacity* more generally (i.e., including fast-start gas plants)
- There are other mechanisms to resolve any missing money long-duration firming projects may face if the MPC/CPT can't be increased sufficiently and/or sufficiently quickly – such as the Capacity Investment Scheme and, in NSW, the long-duration LTESA program.

Modelling and other elements of the quantitative analysis

The ongoing transition

The Directions Paper models scenarios with renewable generation meeting 50-75% of demand in a year. We acknowledge that this has, appropriately, been caveated as a scenario modelling exercise rather than any forecast of the NEM. However, it is important to highlight these levels of renewable energy penetration are likely to be achieved in the near-term. As at June 2023, wind and solar account for almost half of total installed capacity, with this share expected to increase as coal generators retire.

Baringa's independent projections for the NEM, embodied within its *NEM Reference Case*,[2] find c.70% variable renewable energy (VRE) penetration achieved by 2030, driven mostly by State renewable energy targets in NSW, Victoria and QLD. Furthermore, the Australian Government is targeting 82% by 2030, to be delivered through the Capacity Investment Scheme. This is important context for considering further changes to the MPC and CPT – in particular it adds urgency to the consideration of any further MPC/CPT increases – given both the c.5yr lead time historically taken to change the reliability price settings.

The potential impact of variable renewable energy on reliability standards

We agree with the Directions Paper that traditional reliability risk in the NEM has been unexpected generator outages during periods of (hot weather-driven) high demand. During forced outage periods, the capacity available to dispatch is lower than total demand. Instead, going forward, the 'at risk' period is likely to shift more into winter, from summer, in the mainland NEM regions, in

[2] More details available at Australia NEM: Wholesale electricity market report | Baringa

particular *Dunkelflaute* periods (or 'dark doldrums' as per the Directions Paper) – given the increasing weather dependency on both the supply- and demand-side of the power system. In this way, the mainland NEM could increasingly resemble Tasmania – a winter-peaking region – albeit without the large reserves provided, at least historically, from Tasmanian hydroelectric capacity.

The form of the reliability standard

Whilst the 'at risk' period may be changing going forward from what it has previously been, it does not necessarily follow the form of the reliability standard needs to change. Instead, how the individual USE scenarios and resulting outcomes are *constructed and weighted* may need to change within the context of AEMO's ESOO, given this is the key planning document on which decisions to procure extra capability for reliability purposes are based (e.g., using the RERT, triggering the RRO, etc.). In particular:

- USE scenario construction: the ESOO currently determines three USE scenarios, based on PoE10, PoE50, and PoE90 demand. It is not clear to Baringa whether the variation between scenarios is solely demand-driven or a mix of demand and supply due, ultimately, to differences in weather conditions between the scenarios. We would recommend the latter given the above comments about the future 'at risk' periods, in turn defining each USE scenario on the basis that a particular 'weather envelope' is exceeded at the corresponding probability level. We would highly recommend the Reliability Panel consider such an approach
- USE scenario weighting; the Panel mentions the growing presence of 'tail risk' in light of the changes to the shape and timing of 'at risk' periods. In principle, we consider the existing framework can accommodate growing 'tail risk' via the weighting of the three USE outcomes in the expected USE calculation. In its ESOO, AEMO currently weights the 10% POE and 50% POE USE outcomes at 30.4% and 39.2% respectively, with these weights determined using a normal (Gaussian) distribution.[3] However, such weights could be set on the basis of a fat-tailed skewed probability distribution, capturing 'tail risk' whilst remaining consistent with the existing expected-USE based form of the reliability standard.

Implications of this analysis: the importance of long-duration firming capacity

To address the variability of wind and solar, there is a clear need for dispatchable capacity to provide reliability (aka the 'firming requirement'). This is well-illustrated in various planning documents, including AEMO's ISP, the NSW Consumer Trustee's IIO report, and the Reliability Panel's Directions Paper. Furthermore, this dispatchable capacity needs to be fast-starting and fast-ramping given the wind and solar PV variability and given the presence of five-minute settlement.

The questions with respect to this firming requirement are:

1. What is the overall requirement?
2. What is the least-system-cost portfolio of technologies to deliver this firming requirement?

Short-duration battery storage has been an important contributor in meeting this firming requirement, especially on an intra-day basis (i.e., shifting energy from low-demand, low-value, middle-of-the-day periods, to higher-demand, higher-value morning and evening peak periods).

[3] The remaining 30.4% weighting is assigned to 90% POE scenario. As this scenario typically has zero USE, given the low demand under this scenario (and greater supply due to less deratings in the presence of benign weather conditions), the expected USE calculation is effectively based on the USE outcomes from the 10% PoE and 50% PoE scenarios.

Baringa's NEM *Reference Case* projects this need for intraday energy shifting to continue to grow going forward, as more wind and solar PV enter the NEM.

However, short-duration storage should not be seen as the *only* element of the firming portfolio. As the Directions Paper *inter alia* highlights, there is also a long-duration firming requirement. The question then is what is the cheapest way (from a system cost perspective) to meet this requirement. In our view, filling this requirement entirely with batteries is likely to be more expensive than a portfolio of solutions that include long-duration capacity, both pumped hydro and fast-start gas.[4]

From our work on the bankability of short- and long-duration storage, we consider solely merchant-funded LDS is uneconomical in the NEM at existing MPC/CPT levels.[5] LDS has very high upfront capital costs and require long lead times to build. The extent to which these projects are able to recover costs in the spot market is largely dependent on the revenue they can generate in high-priced events. As short-duration storage penetration grows, LDS (and long-duration firming capacity more generally) generation becomes increasingly focused into the 'dark doldrum' periods: their generation profile becomes increasingly bi-modal.

Given this changing generation profile, the MPC, and in particular, the CPT are critical to dictating how much money a long-duration firming asset can recover. Hence, there is a direct link between the duration of the CPT as a function of the MPC, and the Directions Paper Sensitivity 3a results: if USE is above the reliability standard for a long-enough period such that 12hr of continuous operation of long-duration firming capacity is required to bring USE down to a level consistent with the reliability standard, then it is likely that prices will need to stay continuously high during this period to provide the incentive to invest in capacity that only runs during these sorts of USE events. Hence the need for the CPT to be set with reference to the duration of the at-risk period.

Financeability/investability implications

However, even if the MPC/CPT were set sufficiently high, the bi-modal nature of long-duration firming capacity's generation profile are likely to see equity-only financed projects. In Baringa's experience, such projects are unlikely to ever arise due to the associated high cost of capital and high hurdle rate. To lower hurdle rates and costs of capital, debt needs to be injected into the project financing, which in turn requires:

1. Existence of contract revenues: selling caps and contracts structured specifically for 'dark doldrum' periods can provide ongoing cashflows that enables debt serviceability and in turn financing. However, such contracts need to be of sufficient duration to ensure the CAPEX can be fully amortised and interest payments made (i.e., ensure sufficient return on and of capital). In Baringa's experience, such contracts do not yet exist in the NEM.
2. Increase in vertical integration: as an extension of 1., 'internal' longer-term contracts between generation and retail arms can serve the purpose of providing upfront and ongoing

[4] For example, a 16GWh firming requirement over eight hours can be met by sixteen 1GW one-hour batteries, each discharging either one after the other at full capacity or at one-eight of their discharge capacity over eight hours, or a 2GW 8-hr pumped hydro facility. Leaving aside considerations such as construction timeframes, the latter is likely to be cheaper given economies of scale.

[5] We are currently investigating whether LDS would also be uneconomic at the MPC/CPT levels under the AEMC's recent Final Rule. As discussed in the main body, the increasing bi-modal nature of LDS's generation profile may still make merchant-only projects non-financeable, even if the MPC/CPT were sufficiently high, given the resulting project financing structure (equity-only).

cashflows (via the wholesale energy procurement price paid by the retail arm to the generation arm) for debt serviceability.

3. Government support payments that provide ongoing cashflows for debt serviceability – and, in the case of MPC/CPT settings not being sufficiently high, also provide the 'missing money' long-duration firming capacity needs. Examples of these schemes include the NSW's Long-Duration LTESA and potentially also the Australian Government's Capacity Investment Scheme (CIS), provided the CIS does not seek to only promote short-duration storage.

In addition, and as an extension of 3. and in light of the above-noted financeability issues, existing LDS has been developed by State and Federal governments as large Government-owned pumped hydro infrastructure. Government ownership will play a key role in delivering further medium- and long-duration storage in the NEM (e.g., Snowy 2.0, Pioneer-Burdekin, and Borumba).

Baringa would be very happy to discuss the above with the AEMC and the Reliability Panel at the appropriate time.

Yours sincerely,

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