Form Energy Response to NSW LDS Consultation

To whom it may concern,,

Form Energy is pleased to submit the following limited response to the ongoing consultation. Form underlines that the proposed revision of the definition of LDS is unwarranted, and hopes the NSW Government will reconsider its approach.

Best regards,

Form Energy Team

About Form Energy

Form Energy, Inc. (“Form”) is a U.S. energy storage technology and manufacturing company that is commercializing a rechargeable, iron-air battery capable of continuously discharging electricity for 100 hours at a system cost less than 1/10th the cost of lithium-ion battery technology. Form’s multi-day battery will enable a clean electric grid that is reliable and cost-effective year-round, even in the face of multi-day weather events. With over 650 employees, Form has offices in Somerville, MA; the San Francisco Bay Area; and the Greater Pittsburgh area.

Form has raised over $820M of venture capital to date and aims to deploy GWs of energy storage by 2030. Form’s team is actively pursuing partners for projects to come online in 2026 and 2027. Form’s first full-scale battery manufacturing facility, sited in Weirton, West Virginia, will come online in 2024 ramping to an expected annual capacity of up to 500 MW / 50 GWh. With a target operational date in 2024, Form’s first commercial project will be deployed in Minnesota with our utility partner Great River Energy, and this demonstration will be followed by a series of additional commercial projects in 2025 and 2026, including two deployments with Xcel Energy, one with Dominion Energy, and one with Georgia Power. Form has also been awarded funding from the state of California and New York for demonstration projects, with operations anticipated in 2025 and 2026 respectively.

Q1: What is an appropriate minimum duration for long duration storage infrastructure in NSW for 2030? Please outline why.

Form understands that, based on the analysis provided by AEMO, the NSW Government is minded to reduce the minimum duration for LDES technologies from 8 hours to 4 hours. However, Form believes that the analysis is not sufficient to make such a decision, and overlooks a number of risks which could stem from lowering the minimum duration.

Insufficient clarity on methodology and granularity: In order to model highly renewable, weather based systems, it is necessary to implement state-of-the-art methodologies which fully represent generation and demand across a calendar year, modeled hourly. This approach has been repeatedly validated by academic literature, with the counterfactual leading to an underestimation of storage needs.[1] There is insufficient information within AEMO's study to understand the exact methodology used, but it does appear that rather than modeling 8,760 hours across a calendar year, sample days were used to extrapolate overall storage needs. This will underestimate the value of LDS for reasons outlined in the following points.

Outages assessed simplistically: The paper draws what appears to be a reasonable conclusion: the vast majority of unserved energy events (USEs) are shorter than eight hours, therefore eight hours of storage is unnecessary to provide reliability. However, this overlooks a range of interconnected dynamics.

Firstly, potential USEs commonly happen back-to-back.[2] This means a shorter duration resource (e.g. four hours) may not have time to recharge to meet the second USE. The relationship between charge and discharge cycles, in combination with energy over/undersupply events, is generally poorly represented in a model which only samples days across a year and doesn't assess the trends between them.

Secondly, the marginal value of a four or eight hour storage in this case could be quite low. The marginal asset would essentially have zero reliability benefit in all hours except for the last gaps, because it implicitly would need to retain a state of charge level ready for a USE. In contrast, a longer duration storage asset could replace the need for many MWs of other storage. Such an asset could reduce volatility through arbitrage, capture and time-shift large volumes of otherwise curtailed energy, and still reserve bulk amounts of energy to meet reliability events.

Discussed limitations: AEMO acknowledges that the study does not consider a range of circumstances which could affect system operation, including outages, unplanned retirements and extended renewable lulls. Form notes that in each of these circumstances, duration takes on an increased importance.

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[1] Jenkins et al, *Establishing best practices for modeling long duration energy storage in deeply decarbonized energy systems [pre-publication], available at* https://arxiv.org/html/2404.17474v1

[2] Add footnote

Longer-term: Form acknowledges that the scope of the study was to understand storage needs until 2030. However, it is essential that signals sent today are aligned with the goal of a decarbonised power system in the medium-term future. Such a system will require much longer storage durations to be present in the market, and at scale. While near-term risks, and the need to deliver customer value, should take priority, it is essential that new storage classes capable of durations 8 hours and above are already deployed.

Furthermore, it is important to highlight the limited outlook of the analysis, especially when forecast thermal exits are taken into account. Form draws attention to the expected closure dates used in the latest Electricity Statement of Opportunities Update:

- Eraring (2.9GW) – 2027
- Bayswater (2.6GW) – 2033
- Vales Point (1.3GW) – 2033
- Mt Piper (1.4GW) – 2040

Should the exits of Bayswater and Vales Point in particular be considered, perhaps under a 2035 target, then the resulting analysis would highlight very different reliability targets.

Finally, as the system becomes more weather dependent, the duration of events will continue to evolve. Analysis undertaken by LCP Delta for the United Kingdom has found that "of GB's total energy shortfalls/excess in 2035, over 50% of TWhs occur in shortfall/excess events lasting more than 24 hours, and over 25% in periods lasting more than 48 hours." While similar analysis would need to be undertaken for the Australian system to understand exactly the same trends, the drivers behind the UK's increasing imbalance are fully present within Australia. It is important that planning already accounts for these in order to best accommodate growing renewable shares.

International alignment: Form notes that globally, a definition of 8 hours has been used by numerous relevant bodies, and is endorsed by the Long-Duration Energy Storage Council. Furthermore, some bodies have considered differentiating within LDES, including the State of Michigan which has explicitly legislated a definition of Multi-Day Storage. In SB 271 they include the following: ""Multiday energy storage system" means an energy storage system capable of continuously discharging electricity at its full rated capacity for more than 24 hours".

The risk of undervaluing reliability: It is worth underlining that an approach which takes shortcuts to reliability, such as that suggested by the wrongheaded assessment of USEs put forward, can lead to significant costs and imperil lives. This was borne out in Texas during Storm Uri in 2021, the cost of which was put at USD300 billion by the American Society of Civil Engineers (ASCE) and in which there were numerous fatalities. Discussing whether the market alone was enough to drive investment in resilience to avoid such disasters, the report underlined that there was "the "hope" that potential periodic scarcity premiums would be sufficient to

incentivize long-term reliability investments. There is ample evidence that this hope is unfounded."

Conclusions: On the basis of the above points, Form argues that lowering the definition of long-duration storage is insufficiently evidenced, does not fulfill the objectives of the policy and endangers the system's decarbonization trajectory. As such, Form believes it would be a mistake to lower the defined minimum duration of longer duration storage.

Q2: Should the Minister have regulation making powers to change the minimum duration of long duration storage infrastructure over time? Please outline why or why not.

Form does not have a specific position on the empowerment of the Minister, but would like to caution against an overly flexible definition of LDS. Given the limited time needed to deliver substantial changes to the power sector, it is essential that consistency is given to both market operators and those responsible for system operation, such as AEMO. Excessive flexibility leads to a risk of, for example, the definition of LDS being changed in order to achieve targets. While it is impossible to precisely predict exactly which technology mix will deliver a decarbonized power system, the principle of duration is a technology neutral, fixed definition which addresses specific characteristics of our grids. By clearly identifying it as a desirable trait with immutable characteristics, the Government will incentivise developers and technology suppliers to invest in developing assets.

Q3: How can the infrastructure objectives and LDS tenders be improved to support a diverse range of long duration storage projects?

Not answered

Q4: Should the NSW Government introduce amendments to the LDS definition to clarify it can include the aggregated LDS infrastructure across multiple-sites? Should aggregated LDS infrastructure need to register on AEMO's NEM Registration and Exemption List and participate in central dispatch? Please outline why or why not.

Not answered