Stakeholder Feedback

Organisation: Hydrostor Australia Pty Ltd.

Contact name: Greg Allen

Contact details (email / phone): greg.allen@hydrostor.ca, +61 439 090 706

As a provider of an innovative large-scale, long-duration storage solution that can be flexibly sited, Hydrostor appreciates the opportunity to provide comments on the "Emerging Generation and Energy Storage in the NEM" stakeholder paper.

Introduction

Hydrostor is a technology provider, project developer and delivery agent for Advanced-Compressed Air Energy Storage (A-CAES), which it believes will be an important storage technology pathway well-suited to Australia. A-CAES is a scalable (50-500+ MW), fuel-free/emissions-free, and long-duration (4-24+ hours) energy storage solution that is uniquely suited to the replacement of fossil generation at scale and support grid reliability through its synchronous generation and operating characteristics, that are similar to conventional gas turbines. Unlike other long-duration energy storage technologies, such as pumped storage hydro and traditional compressed air energy storage, A-CAES can be flexibly sited where the grid requires it (i.e. it does not require pre-existing topology/caverns or salt cavern formations). It is also a resource with 30+ years of operability and long-duration capability, unlike more commonly deployed lithium-ion batteries. Of further note, A-CAES is immediately available and based entirely on proven and bankable technologies, including standard mechanical equipment from Tier 1 Original Equipment Manufacturers with decades of service history.

Questions		Feedback
Section 2 – Energy Storage System (ESS) definition		
1	Referring to Section 2.3, are there any other issues with the current arrangements for ESS?	Hydrostor would add that the uncertainty associated with fees, recovery, TUoS, and non-energy recovery are more pronounced at the distribution level, where ESS could provide significant benefits with respect to deferral or avoidance of distribution augmentation and supporting the high penetration of rooftop solar. Hydrostor's interaction to date with South Australian Power Networks (SAPN) has highlighted a disjoint between the benefits of ESS and its treatment in relation to DUoS. SAPN has not taken the approach of treating charging load as 'auxiliary' load in relation to DUoS. Hydrostor

Questions		Feedback
		believes that, like the proposal for TUoS, ESS devices should be exempt from DUoS for charging. Hydrostor would also suggest the addition of the issue related to the insufficient price signals and mechanisms in the NER to support investment required to achieve the level of ESS capacity identified in the ISP. The Neutral ISP planning scenario projects an ESS resource of 17GW and 90GWh as part of the portfolio of resources. Standalone ESS effectively provides a firming function by providing capacity but typically relies on the purchase of electricity from the NEM (i.e. its fuel) at off peak times as its primary input. In effectively an energy only NEM, limited depth associated with remuneration of other functions of ESS, combined with a lack of acknowledgement of the differing characteristics of generation types, will create an issue in securing the long-term investment required to achieve the level of ESS capacity identified in the ISP. Consideration should be given to introducing a mechanism in the NER that enables an ESS to derive a dual revenue stream on a prescribed and contestable basis. This mechanism would maximise the benefit to the NEM associated with ESS that can provide energy and/or ancillary services on a contestable basis as well as prescribed services that minimise any impact on transmission infrastructure and has the potential to provide non-wires alternatives for network support and augmentation. As it stands there is no well accepted cost allocation approach across the NEM. A mechanism in the NER needs to be introduced to ensure the full benefit of a consolidated ESS can be ascribed to the network, by aggregating regulated and non-regulated revenues, for providing both regulated and non-regulated services. A consolidated ESS has the benefit of being able to provide prescribed services as well as providing energy and/or ancillary services on a contestable basis via the wholesale market and the contestable ancillary services market. This is likely to lower the costs of the ESS that would need to be recovered from electricity customers via prescribed transmission charges.

Questions		Feedback
2	Do you have any views on whether a definition of ESS should be included in the National Electricity Rules (NER)?	For the reasons stated by AEMO, Hydrostor is a strong advocate for including a definition of ESS in the NER.
3	Do you have any views on whether a definition of ESS should be generic and encompass technologies other than batteries, for example, pumped hydro?	Hydrostor is strong in its view that ESS should be generic and should not biased to a particular ESS technology. Technologies such as pumped hydro and Hydrostor's Advanced Compressed Air Energy Storage (A-CAES) technology have generator characteristics that differentiate them from inverter based batteries and improve system strength. It's likely that the ESS capacity identified in the ISP will need relatively long durations to facilitate the time shifting of significant volumes low cost wind and solar generation which pumped hydro and A-CAES can achieve more cost effectively than batteries. Moreover, the flexibility to site A-CAES means it is not restricted by topography like pumped hydro, so it can be sited to maximise its benefit to the NEM, minimise any impact on transmission infrastructure and, potentially, provide non-wires alternatives for network support and augmentation.
4	Do you have any views on AEMO's suggested definition of ESS?	Hydrostor suggests that the definition should be simplified by removing the reference to Customer and site. The intricacies of Customer and site could be addressed in specific clauses in the NER. This would align the NER definition more closely with that of UK- OFGEM and USA- FERC, making it more universal and avoid complicating the definition by trying to define its physical location of connection. The performance and technical characteristics of the ESS and its associated impact on the NEM can be addressed via the PSS/E modelling, GPS and SCADA interface aspects of the NER, instead of complicating the definition of ESS. Hydrostor also does not believe that it is necessary to restrict the definition of ESS to include only resources that export stored energy to either the grid or a Customer (as defined by the NER) and suggests that the definition be broadened to include any resources that store imported energy for later delivery to any grid or user of electricity. This would ensure that resources that deliver the stored energy to large industrial users who may not be

Questions		Feedback
		registered as Customers (e.g., those holding contracts for energy supply with a retailer) would still be captured by the definition.
Section 2 – Integrating ESS		
5	Do you have any views on the appropriate participation model for integrating ESS into the NEM?	Hydrostor considers the most appropriate participation model is the Bi-directional Resources Provider described in Option 2a. This model would allow Hydrostor to register and operate efficiently and it accommodates ESS only; ESS and generating unit/system; ESS market load; Market load and generation; and ESS, generating unit/system and market load.
6	Would the proposed aggregation model meet your future needs, both in terms of participating in the NEM with an individual ESS or where multiple resources (e.g. ESS and generating units) are to be aggregated? AEMO is particularly interested to understand the additional benefit that you would derive from aggregating hybrid systems and offering them to the market as a single resource that is not available by separately offering the components to the market.	Hydrostor sees additional benefit from being able to aggregate hybrid systems and offer them to the NEM as a single resource. This will enable the Market Participant to optimise the operation of the hybrid system up to the point of connection and bidding and transferring electricity to the NEM on an aggregate basis.
7	Do you have any views on AEMO's proposed approach to implement a single participation model to integrate ESS and other 'new' business models into the NEM?	Hydrostor's views are aligned with AEMO's in relation to the single participation model.
8	Do you have any views on the key requirements AEMO has identified for an ESS participation model?	Hydrostor's views are generally aligned with AEMO's in relation to the proposed key requirements AEMO has identified for an ESS participation model. However, there could be benefit from a system operation and control perspective to include additional inputs such as real and reactive power capacities and limits. A-CAES has the ability to operate as a synchronous condenser, therefore, to maximise its benefits in relation to system strength there would be advantages in specifying the capacity of such characteristics at any point in the charge and discharge cycle.
Section 2 – NER recovery mechanisms		

Questions		Feedback
9	Do you have any views on how to integrate ESS into the NEM's recovery mechanisms? If so, please provide them.	Hydrostor's views are aligned with AEMO's in relation to NER Recovery Mechanisms. As referred to in the response to Question 1, under "Energy Storage Systed (ESS) definition", consideration should be given to treatment of cost allocation of distributed energy resources capable of providing both regulated and unregulated services is the NEM.
Section 3.1 – The application of performance standards to a generating system or load in an exempt network		
10	Are there other options to address the issue identified for connecting plant in an exempt network?	Hydrostor has not identified any other options to address the issue identified for connecting a plant in an exempt network.
11	Are there other costs, risks and benefits associated with the options presented? If so, please indicate what these are.	None identified.
12	Which option to address the issue is your preferred option? Why?	Hydrostor's preference is Option 1 (Amend the NER to ensure that relevant clauses of Chapter 5 and rule 4.14 apply) as it ensures all appropriate technical requirements under Chapter 5 are applicable to a plant connecting in exempt network; and there's no need to be a Registered Participant for the network.
Section 3.2 – Providing NEM information to project developers		
13	Should a person intending to develop or build a generating system or ESS (and not subsequently register as a Generator) be allowed to register as an Intending Participant?	Hydrostor feels that the NER should allow AEMO to provide people with access to the information they need to develop or build grid-scale ESS resources if they satisfy AEMO that this is their intent.
14	What is the market benefit associated with allowing a person intending to develop or build a generating system (and not subsequently register as a Generator) to be an Intending Participant?	Considering the projection of portfolio resources, including solar (28GW), wind (10.5 GW) and storage (17 GW and 90 GWh), complemented by 500 MW of flexible gas plant identified under AEMO's Neutral ISP planning scenario, ensuring project developers can access NEM information will enable the solicitation of a wide range of solutions and maximise competition and therefore market benefit.

Questions		Feedback
15	Referring to section 3.5.3, are there other options to provide a person intending to develop or build a generating system (and not subsequently register as a Generator) with the necessary NEM data?	Hydrostor has not identified any other options
16	Are there other costs, risks and benefits associated with the options presented? If so, please indicate what these are.	None identified.
Section 3.3 – Separation of operational and financial responsibility		
17	What is the market benefit associated with allowing the separation of operational and financial responsibilities?	Considering the projection of portfolio resources, including solar (28GW), wind (10.5 GW) and storage (17 GW and 90 GWh), complemented by 500 MW of flexible gas plant identified under AEMO's Neutral ISP planning scenario, Hydrostor believes that allowing the disaggregation of operational and financial responsibilities for a single generating system, or ESS, will open the market to new investment models that provide a business and market benefit.
18	What are the risks associated with allowing the separation of operational and financial responsibilities?	The risk of decoupling operational and financial responsibility leaves AEMO to rely on the commercial arrangements between the parties responsible.
19	Are there other models of separate operational and financial responsibilities that should be considered?	None identified.
Section 3.4 – Logical metering arrangements		
20	What is the market benefit associated with using logical metering arrangements?	Hydrostor feels that this matter would benefit from a more comprehensive review from a broad range of stakeholders on the risks and market benefits of using logical metering installations to consider whether these changes are likely to meet the NEO before being pursued. Anecdotally, the benefit does not appear to be commensurate with the relatively low cost of metering associated with utility scale project and the risk of disputes and litigation due to meter discrepancies. Moreover, it's likely that financiers will mandate a requirement for compliant metering.

Questions		Feedback
21	What are the risks associated with allowing the use of logical metering arrangements?	Disputes and litigation, plus limitations in relation to financing.
22	If logical metering arrangements are permitted to be used instead of a NEM compliant metering installation, who should pay for this? Please identify any cost recovery arrangements that you consider appropriate.	The project owner or developer.
Other Comments		
23	Do you have any further comments?	Overall, Hydrostor believes it is important to keep the definition of ESS generic and keep the market open to ensure the inclusion of all energy storage technologies. Since no technology is perfectly suited to every application, variety is required. The absence of storage diversity and overexposure to one technology source will, prima facie, result in systemic performance risks and long-term operating cost risks associated with that form of technology.