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Australian Energy Market Operator  
530 Collins St,  
Melbourne VIC 3000

Submitted electronically: [eges@aemo.com.au](mailto:eges@aemo.com.au)

### **Emerging Generation and Energy Storage in the NEM Stakeholder Paper**

Snowy Hydro Limited welcomes the opportunity to comment on matters raised in the Stakeholder Paper from the Australian Energy Market Operator (AEMO) on the Emerging Generation and Energy Storage.

Snowy Hydro Limited is a producer, supplier, trader and retailer of energy in the National Electricity Market ('NEM') and a leading provider of risk management financial hedge contracts. We are an integrated energy company with more than 5,500 megawatts (MW) of generating capacity. We are one of Australia's largest renewable generators, the third largest generator by capacity and the fourth largest retailer in the NEM through our award-winning retail energy companies - Red Energy and Lumo Energy.

#### **We support AEMO's conclusion that Pump Hydro Energy Storage should not pay TUOS**

Pump Hydro Energy Storage (PHES) has been connected to the grid since NEM start, providing energy and system support services, and will continue to play a critical role in meeting the challenges arising from the increased take-up of intermittent renewables. Snowy Hydro understands AEMO's intent through the proposed definition for Energy Storage System (ESS) to improve the understanding of storage through clear NER obligations, fees, charges and non energy recovery. However we are concerned that there is still a significant amount of work that needs to be undertaken to achieve this. The current environment may not be appropriate to implement a new registration category.

Snowy Hydro supports AEMO's view that where energy storage is a scheduled resource and can be constrained off, it should not be required to pay TUoS charges and that a permanent approach is needed for TUoS charging arrangements. Our position is for future PHES plant to be treated in the same way as existing PHES plant such as Tumut 3. This would mean generation and pumping intentions are known (ie. scheduled in central dispatch) and the PHES is not required to pay TUoS. As outlined in the body of this submission, to charge TUoS on PHES would be inefficient, distortionary, and deter investment in this technology at a time when the NEM needs this technology to ensure a secure and reliable system.

We understand AEMO's preference is for a new ESS definition rather redefining the purpose and allocation of TUoS charges in the existing rule. AEMO's believes this new definition would be broad enough to cater for new energy storage and business models. However, PHES is a mature and well known technology. For this reason Snowy Hydro believes that pump hydro energy storage must be exempt from paying TUoS with consideration of a specific exemption for paying TUoS for such participants. We advocate that AEMO propose redefining the purpose and allocation of TUoS charges from "those who are supplied electricity by means of the grid" to "those who end-consume the electricity provided by the grid."

Existing PHES arrangements should also be grandfathered from potential new regulatory requirements as a result of AEMO's ESS workstream.

Snowy Hydro appreciates the opportunity to respond to the Stakeholder Paper. Any questions about this submission should be addressed to Panos Priftakis, Regulation Manager, by e-mail to [panos.priftakis@snowyhydro.com.au](mailto:panos.priftakis@snowyhydro.com.au).

Yours sincerely,

A handwritten signature in black ink, appearing to read 'K Ly', with a stylized flourish underneath.

Kevin Ly  
Head of Wholesale Regulation  
Snowy Hydro



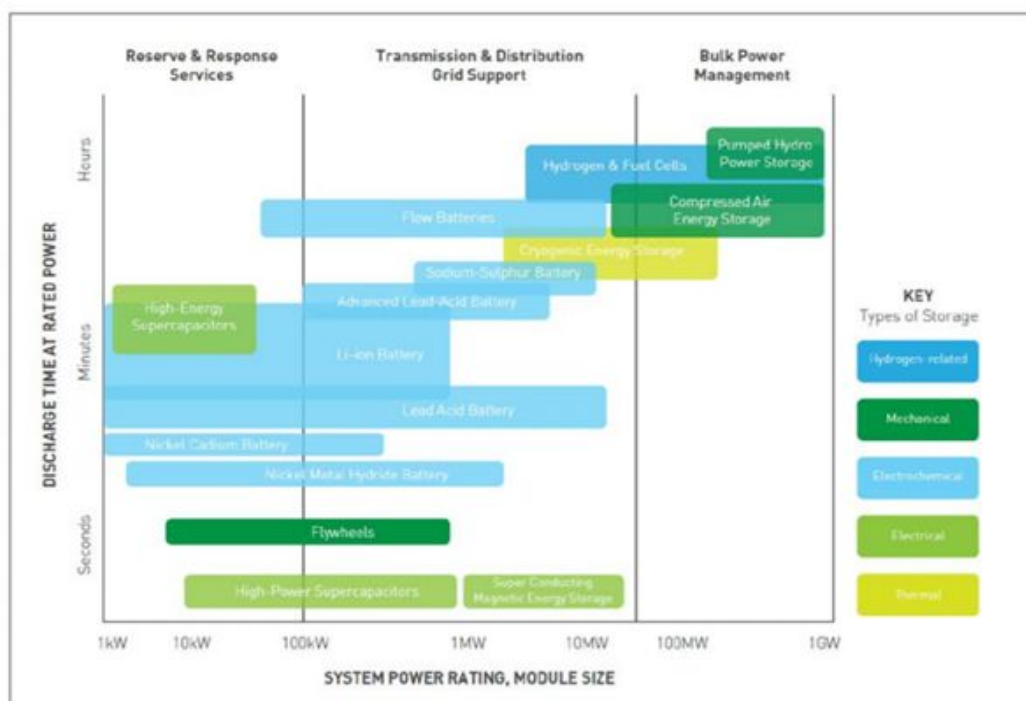
## DETAILED SUBMISSION

### Pumped Hydro Energy Storage

Snowy Hydro welcomes AEMO’s focus on potential strategic improvements to the NEM and how to better integrate grid-scale Energy Storage Systems (ESS) into the NEM. As AEMO highlights PHES has been connected to the grid since NEM start with the role in the power system to provide energy and system support service expected to grow.

A variety of energy storage technologies could be deployed in Australia. They include PHES, battery technologies (such as lithium ion), compressed air storage, molten salts and chillers (as shown in Figure 1)<sup>1</sup>. PHES and battery storage technologies however are the two most common and viable technologies in the NEM.

**Figure 1: Comparison of the effectiveness of storage technologies<sup>2</sup>**



Pumped storage of all the storage technologies is the most mature storage technology currently in use. The efficiency of the cycle is typically about 70 per cent (meaning that for every 1 MWh of pumping the amount of generation that results is 0.7 MWh).<sup>3</sup>

The proposed Snowy 2.0 scheme would consist of 2,000 MW of pumped-hydro storage that can supply energy over seven consecutive days without the need to pump water. Snowy 2.0 is proposed to have a cycle efficiency of 76 per cent. In addition, PHES may be expected to operate over a 40–60 year lifetime according to recent work from Marsden Jacob<sup>4</sup>.

The development of a strong NEM and helping the integration of renewable power sources especially wind and solar requires PHES technologies to reach high penetration of renewable

<sup>1</sup> Marsden Jacob Associates, 2018, “NEM outlook and Snowy 2.0”, Report prepared for Snowy Hydro Limited

<sup>2</sup> Marsden Jacob Associates, 2018, “NEM outlook and Snowy 2.0”, Report prepared for Snowy Hydro Limited

<sup>3</sup> Marsden Jacob Associates, 2018, “NEM outlook and Snowy 2.0”, Report prepared for Snowy Hydro Limited

<sup>4</sup> Marsden Jacob Associates, 2018, “NEM outlook and Snowy 2.0”, Report prepared for Snowy Hydro Limited

energies in the power system. This will stabilise the power grid, lower consumer prices and firming intermittent generation, supporting the economics of existing coal-fired generation, and enhancing competition in the electricity value chain.

### **Is a definition needed for Energy Storage System (ESS) in the current environment?**

Snowy Hydro understands AEMO's proposed definition for ESS will improve understanding through clear NER obligations, fees, charges and non energy recovery. We agree that it reduces the risk of dispatching both generating unit and load and allows for more improved market information for better decision-making. However we are concerned that there is still a significant amount of work that needs to be undertaken to achieve this and the current environment may not be appropriate to implement a new registration category.

Unlike the countries identified in the AEMO report, the NEM has operated with electricity storage classified as generation. PHES has not been classified as an "end-user" of electricity instead playing a critical role in meeting the challenges arising from the increased take-up of intermittent renewables. Our concern with a new definition for ESS is that in the current environment it is not appropriate to group all storage technologies.

AEMO's definition for ESS needs to be future proof as it could easily become outdated causing unintended consequences for existing technologies. Snowy Hydro believes a number of technologies are trying to find their position in the market and understanding the flexibility they can provide. For example, PHES and battery storage have very different characteristics and will have complementary roles in the future mix of flexibility assets. Both can provide a range of benefits including improved system operability, reduced network congestion costs, reduced CO2 emissions and improved security of supply. PHES however as a mature technology can be deployed at scale, has a long operating life and is particularly well suited to applications requiring longer discharge times. Snowy Hydro understands it likely that the optimal future mix will involve significantly more pumped storage capacity than is available at present and, if overall system costs are to be minimised, it will be important to focus on removing barriers to both battery and PHES.

AEMO identified that the ESS proposal could lead to more efficient bidding process and reduce the risk of dispatching both generating unit and load<sup>5</sup>. Snowy Hydro however is concerned that battery bidding alone could also lead to complexities while the reduction in the risk of dispatching for unit and load could lead to other unintended consequences. In the current environment the ESS definition may not be required.

### **Storage and Transmission Charging Arrangements (TUOS)**

AEMO noted their concerns around the uncertainty regarding the application of fees, recovery, TUoS, and non-energy recovery as a key issue for ESS proponents<sup>6</sup>. Snowy Hydro agrees with AEMO's views that a scheduled resource that can be constrained off should not be required to pay TUoS charges and that a permanent approach is needed for TUoS charging arrangements for ESS<sup>7</sup>. We however believe this may not be in the form of a new ESS definition rather redefining the purpose and allocation of TUoS charges in the existing rule.

The current cost recovery regime for prescribed and common transmission services collectively TUoS was put in place on the basis that application of sunk costs to consumers is unlikely to impact

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<sup>5</sup> Australian Energy Market Operator, 2018, "Emerging Generation and Energy Storage in the NEM"

<sup>6</sup> Australian Energy Market Operator, 2018, "Emerging Generation and Energy Storage in the NEM", pp18

<sup>7</sup> Australian Energy Market Operator, 2018, "Emerging Generation and Energy Storage in the NEM", pp29-30

consumption and utilisation of the network whereas the same charge applied to upstream market participants would distort efficient energy consumption and dispatch. Upstream market participants include all entities engaged in the wholesale electricity market including generators, and pump hydro energy storage.

Previous consultations on charging TUOS charges to markets generators have clearly shown how detrimental they can be to the market. These arguments against charging generators for TUoS were described in the 1999 ACCC transmission and distribution network pricing review and the 2006 Australian Energy Market Commission (AEMC) transmission pricing for prescribed transmission services rule. These same arguments not to impose TUOS are applicable to PHES as an upstream market participant.

Snowy Hydro submits that TUOS charges are sunk costs of the transmission networks which cannot be reversed or avoided and the recovery of these costs should not affect or impact future decisions with respect to upstream asset use (ie. both generation and pump storage hydro). The recovery of sunk costs from customers leads to an economically efficient outcome because the regulated wires businesses can structure their tariffs using a combination of fixed and variable charges so as to minimise the distortions to network usage. Snowy Hydro already contribute to the variable costs of transmission through marginal losses, the risk of being constrained-off without compensation and the risk of creating a new pricing region.

Imposing TUoS charges to PHES will likely distort regional spot prices and give economically incorrect signals to market participants. Snowy Hydro argues that the likely result of requiring PHES generators to pay for the sunk network would be that the costs would be a distortion on the uptake of PHES investment, if an investment is made then there would be potential distortions on the level of pumping, and finally any TUoS costs imposed on PHES would be passed through to customers via higher spot prices. Hence the recovery of sunk network costs from PHES generators can potentially lead to distortions in investment/retirement decisions and generation dispatch.

In 2006 the AEMC did not believe there was a case for requiring generators to pay ongoing charges in respect of prescribed TUoS Services<sup>8</sup>. The AEMC noted that the time that it would represent a profound shift from the existing arrangements and was not clear whether it would be worthwhile. Generator TUoS charges would most likely be ultimately passed on to loads, potentially distorting bidding and dispatch in the process<sup>9</sup>.

In 1999, the NGF noted that current arrangements represent the economically efficient approach that, by definition, minimises the distortions from the recovery of the residual sunk costs of the network<sup>10</sup>. The report found that the imposition of charges for sunk cost recovery on generators is not theoretically sound and that there is no credible case that such an arrangement will create a demonstrable net benefit for the market as a whole<sup>11</sup>. The paper noted that distortions could include and are not limited to:

- early retirement or mothballing of peak generators;
- deferral of market entry by potential new entrants; and

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<sup>8</sup> AEMC 2006, Proposed National Electricity Amendment (Pricing of Prescribed Transmission Services) Rule 2006, Rule Proposal Report, 24 August 2006, Sydney.

<sup>9</sup> *ibid*

<sup>10</sup> National Generator Forum (NGF), 2018, "Transmission and Distribution Network Pricing Review Issues: Submission to ACCC"

<sup>11</sup> *ibid*

- uneconomic location of generation at load centres in order to avoid TUOS charges<sup>12</sup>.

The recovery of these TUoS costs from end use customers was found to least distort decisions with respect to network use.

There is a strong case that can be made that PHES is only temporarily storing the energy before it is transmitted to the final consumer, and therefore the TUoS charges should be applied only to the final consumer of the power and not ‘double charging’ for the same units of electricity. We advocate for redefining the purpose and allocation of TUoS charges from “those who are supplied electricity by means of the grid” to “those who end-consume the electricity provided by the grid.”

EnergyAustralia noted the impact on a 250MW pumped Hydro project could equate to approximately \$15 million per annum<sup>13</sup>. The Australian Renewable Energy Agency (ARENA) paper noted that a strong case can be made that the pumped hydro is only temporarily storing the energy before it is transmitted to the final consumer, and therefore the TUoS charges should be applied only to the final consumer of the power, otherwise there would be ‘double charging’ for the same units of electricity.

If PHES is also required to pay TUOS charges as well it may deter new entry entirely because it is unable to compete on a level playing field with other forms of generation.

Finally, if a PHES must be registered as a market customer, it can be constrained off if there is congestion – it is inefficient and unfair to make PHES pay TUoS charges when this can occur because there is no explicit right to use the network.

Given that storage and generators are not end users of electricity, and are connected to the network primarily for the purposes of providing flexibility and energy services, there is no rationale for them to contribute to both the generator connection costs and shared network TUoS charges.

In summary, Snowy Hydro believes the following are valid and economically efficient reasons why PHES should not be required to pay for TUOS charges<sup>14</sup> :

1. It would disincentivise investments in large scale energy storage and potentially render projects commercially unviable. This would be a perverse outcome at a time when there is a need to promote the uptake of energy storage in the NEM.
2. Pump hydro energy storage systems provide valuable system services. Payment of TUOS charges would disincentivise storage providers to provide these services.
3. Pump hydro energy storage systems are not ‘customers’ in the way that end use residential or business consumers are.
4. Pump hydro energy storage systems do not drive transmission investment.
5. If the pumped hydro energy storage system is registered as a scheduled load, it can be constrained off if there is congestion. This would be unfair to make PHES pay TUOS charges when this can occur and there is no explicit right to charge.

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<sup>12</sup> ibid

<sup>13</sup> ARENA, 2017, “Cultana Pumped Hydro Project - Knowledge Sharing Report”, << [https://arena.gov.au/assets/2017/09/Cultana-Pumped-Hydro-Project-\\_-Public-FINAL-150917.pdf](https://arena.gov.au/assets/2017/09/Cultana-Pumped-Hydro-Project-_-Public-FINAL-150917.pdf) >>

<sup>14</sup> AEMC 2018, Coordination of generation and transmission investment, Options paper, 21 September 2018, Sydney, pp108-112

For all the reasons outlined above, PHES must be exempt from paying TUOS.

### **Participation and operation**

Snowy Hydro welcomes AEMO's work to identify options to facilitate the participation of grid-scale ESS and to integrate new business models into the NEM. AEMO is facing complexities in including new and different combinations of technologies however we believe that the participation models do not meet the future needs, as discussed recently in the AEMO stakeholder forum, with stakeholders still requiring a greater understanding of the proponents behind the models. PHES has participated in the NEM from the start and there have not been any material issues.

Technologies are ever changing and we are unclear if these participation models will be up to date. Snowy Hydro does not have significant concerns with the proposed information requirements able to be provided by ESS proponents but believe these are more focused to batteries rather than PHES which already provides a significant amount of this data.

### **Grandfathered rights**

PHES provides essential support to the NEM with all stations registered participants in the market. Snowy Hydro therefore supports a condition that should would grandfather existing pumped hydro, batteries and hybrid facilities should the ESS definition by AEMO proceed to a rule change. The grandfathering rights will avoid the need for generators who are already registered to re-register adding unnecessary costs and requiring changes to the current processes at a time when these generators are implementing other procedure changes such as 5 minute settlement.

Snowy Hydro believes the grandfathering rights would avoid the unnecessary additional time to transition to the new registration and minimise any potential impact on the NEM.

