FLUENCE
A Siemens and AES Company

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October 13th, 2020
To: Australian Energy Market Commission GPO Box 2603 Sydney NSW 2001

RE: ERC0280 - Integrating energy storage systems into the NEM

Dear AEMC Team,

Fluence is a global energy storage technology solutions and services company, and a joint venture of the U.S.-headquartered AES Corporation and Germany-headquartered Siemens AG. Our solutions are built on the foundation of industry-leading technology platforms that are optimized for different application groupings, and Fluence leads the energy storage industry with over 2,200 MW of projects deployed or awarded in 22 countries and territories.

Fluence also offers a comprehensive services suite to ensure customers are staying ahead of the market. From early-stage feasibility and cost-benefit analysis that stand up in the real world, to ensuring optimal performance of storage assets, Fluence provides expert advice and services to propel customers' projects forward.

Fluence is an active player in deploying battery-based energy storage systems (BESS) in the Australian market, having delivered our 30 MW/30 MWh solution for AusNet Services at the Ballarat Terminal Station in Victoria. In addition, Fluence recently acquired AMS – the NEM's leading supplier of algorithmic bidding software for semi-scheduled renewable generators and scheduled ESS, with 1.7 GW of capacity currently trading in the NEM.

Energy storage is an essential need for the market in Australia to help achieve renewable energy (RE) targets across the states and to transition to a carbon-free grid. Existing BESS deployments were connected to the grid, but through a very involved process of registration and alignment with AEMO. The value-add of energy storage has been clear and appreciated by the market, but the risks and cumbersome process of obtaining connection have continued to be a hurdle to BESS deployment. Developers and investors have identified commercial structures to make a viable business case to invest, but the lack of timely connection processes, difficulty of registration and uncertainty of success creates a large disincentive. Fluence would like to acknowledge & appreciate all the stakeholders including AEMC & AEMO for envisaging proposed solutions to tackle the challenge of integration of energy storage system into the NEM & for further providing Fluence an opportunity to contribute to the consultation process.

Relevant organization information & experience is enclosed in this submission along with Fluence's comments/responses to questions in the consultation. We have addressed some of the questions below,

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but would be able to go deeper on any of the topics outlined. Fluence would be happy to support further engagement and discussion on this topic.

Please direct any inquiries pertaining to enclosed submission to me at my contact details below, or my colleague Jaad Clifford-Bolt at jaad.clifford-bolt@fluenceenergy.com or + 61 448 884 954.

Sincerely,

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ORGANISATIONAL INFORMATION

	Response
Trading Name	Fluence Energy Pty Ltd.
Registered Name	Fluence Energy Pty Ltd.
ACN	627 071 461
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	Response
Project name	Ballarat Terminal BESS for AusNet Services
Location	Ballarat Terminal Station, Warrenheip, VIC, Australia
Project description	Fluence's 13-year history of delivering and operating grid-scale energy storage technology solutions ensured that it was the partner of choice for AusNet Services, the owner and operator of Victoria's transmission network, leading energy retailer EnergyAustralia, and engineering, procurement and construction company Spotless/Downer in deploying an integrated battery storage solution to address certain issues facing Victoria's electricity grid. The project was a successful applicant for the Victorian Government's Energy Storage Initiative as well as grant funding from the Australian Renewable Energy Agency (ARENA). Fluence supplied a 30 MW/30 MWh Advancion BESS that was installed in the Ballarat Terminal Station. The BESS is owned by AusNet Services but is operated by EnergyAustralia, which uses it to provide a number of market and grid benefits, including: a) flexible peaking capacity to respond to periods of high load; b) ancillary frequency control services The layering of these services enables the BESS to deliver maximum value to the benefit of all customers in the region.

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Commencement and completion	Commencement of installation: January 2018 Completion and commissioning: December 2018 First year results: ○ Provided 7,312 MWh of service to the Victorian grid in the energy and Frequency Control & Ancillary Services (FCAS) markets – injecting power to meet peak needs, and providing FCAS to ensure reliability. ○ Despite only representing a small fraction (~0.3%) of Victoria's installed electricity generating capacity – in relative terms the Ballarat project has been providing significant contingency FCAS services and regulation FCAS service, participating in all 8 FCAS markets *and providing over 1/4 of Victoria's contingency FCAS needs*. ○ AEMO shared in its Q1 2019 Quarterly Energy Dynamics report that FCAS provided by Ballarat "displaced higher-priced supply from other technologies, largely coal." ○ The Ballarat System achieved $6.07M in revenue for its first year of operations. While returns on the primary business case for EnergyAustralia - energy arbitrage and capacity - met expectations, revenue from FCAS markets exceeded expectations due to the higher penetration of renewable energy, in turn requiring greater procurement of FCAS services.

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Partnership organisational structure	The Ballarat Terminal BESS project was delivered by a consortium comprised of Spotless (as EPC contractor), AusNet Services (as owner), EnergyAustralia (as operator) and Fluence (as energy storage technology supplier). The Ballarat Terminal BESS Project was commissioned by the Victorian Government and was partly funded by the Australian Renewable Energy Agency.

Questions		Feedback
Chapter 1 – Introduction		
▪ **Question 1: Proposed assessment framework (p. 5)**		
1	Do you agree with the proposed assessment framework or are there any additional assessment criteria the Commission should use when assessing identified issues and possible solutions?	In general, Fluence agrees with the proposed assessment framework.
Chapter 2 – The threshold question: should storage be defined in the NER?		
▪ **Question 2: Current issues caused by the treatment of storage (and hybrids) under the NER (p. 14)**		
1	Do you agree with AEMO that there are currently significant issues for storage units and hybrid facilities being caused by the rules not including a	Yes, there are significant issues for storage and hybrid facilities to be connected. - Registration is enormously costly, risky, and technically demanding -- amongst the most difficult in the world in our experience, working in 22 countries and territories to

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Questions		Feedback
	storage definition? Why, or why not?	date -- and is a significant disincentive for developers and projects; also distorts engagement with solution providers. - All successful BESS projects in the NEM to date have involved clear, established project partnerships and agreements which allow all parties to focus intently on the grid connection process. This adds complication and cost to development and contracting of projects. - The significant and unmitigable risk involved with grid connections now means that developers seek to allocate risk to 3rd parties – either EPCs, which resulted in highly detrimental outcomes for the industry including RCR Tomlinson going out of business and several other players exiting the industry, or OEMs, extremely few of which are equipped to tackle this challenge at all, let alone be successful. As a result, this attempt to reallocate risk has often become a poison pill. ○ The net effect is higher pricing, higher risk, less successful projects, and a litany of business failures, which acts as a major disincentive for future investments. ○ Further, this arguably has not resulted in better outcomes, as demonstrated in Victoria's West Murray region. - Specifically, the unified control of hybrid assets is a highly challenging field in its own right, and made inexorably so by having to also comply with a GPS. Inclusion of a definition of hybrid and/or storage assets in the rules is useful if *specific*, *realistically achievable* and *logical* rules are applicable to those assets to enable their proliferation. The *capabilities and characteristics* should be captured in the NER – not the specifics. The two-sided market approach

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Questions		Feedback
		achieves this. This is because codifying what a storage/hybrid asset is and is not creates risks of: • immediately being obsolete (i.e., technology moving far faster than rule changes); • biasing and/or penalising certain technologies/OEMs/solution arrangements – the NER should not be picking winners, but enabling the market to bring solutions that meet the needed characteristics and capabilities. • Both being too broad (not specific enough to be useful) and too narrow (too restrictive to allow for innovation).
2	Has AEMO identified all the current issues for storage and hybrid facilities that arise from its primary issue that the NER does not recognise and adequately define storage? If not, what are the other issues?	• Battery storage is considered a highly flexible, "Swiss Army knife" technology with a variety of jobs it can provide for. With this there are difficulties in allowing new markets, applications that can be provided to better support the grid to meet requirements of security and reliability (Fast Frequency Response or synthetic inertia, for example). • Consideration also should be given to the use of storage as "virtual transmission," where battery-based assets are used to mimic transmission line flows and reduce congestion or add capacity on lines operating near their limits. • Allowing VRE generators to store energy without incurring charges, transfer the energy from a constrained region, during periods of low load flow, to a non-constrained region storage for use during peak demand. This would create dispatchable VRE. • Very complex assessments required for ride-through, contingency responses and other GPS-related issues. This makes obtaining a GPS letter an order of magnitude more difficult. • Inability for one part of the hybrid to handle one type of performance/response/capability, and another to cover a different type of response.

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Questions		Feedback
▪ **Question 3: Implications for storage forecasts (p. 21)**		
1	Do you agree that storage and hybrid facilities are likely to play a significant role in the future market? If so, do you agree that this indicates that the issues AEMO has identified in its rule change request, arising from the current treatment of storage under the NER, are likely to become worse over time? Why, or why not?	We believe that the Australian market, grid and consumer will overall benefit from a higher penetration of energy storage. This is why the private sector and public sector both are deeply interested in energy storage deployments. To achieve a zero-carbon future/grid, energy storage will be an integral part of the solution. Therefore yes, we agree energy storage will play a significant role in the future of the market to support flexibility, grid security and reliability. Yes, over time these issues and others will only worsen and impede any transition of the NEM to a carbon-free grid. Currently many customers we speak to are already discouraged from investing in Australia due to significant development risks and cumbersome processes. Globally, countries are finding ways to encourage more investment by the private sector, and a market as attractive as Australia is discouraging participation by not acting faster to resolve the situation.
Chapter 3 – Registration issues for storage units and hybrid facilities		
▪ **Question 7: Understanding the interest in registering hybrid facilities and the challenges that exist (p. 35)**		
1	Why would you consider aggregating different technologies together in a hybrid facility? Which technologies do new participants propose to combine in hybrid facilities?	Different technologies can in some case supplement each other's deficiency. For example, solar & wind generation supplement each other. Another example is a combination of batteries & ultracapacitors, where batteries cater to energy requirements & ultracapacitors cater to power requirements. It is difficult to list all the technologies to combine in hybrid facilities. We suggest that a flexible approach should be considered in this regard, where hybrid solutions be seriously considered and any hurdles be addressed and removed. In

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		keeping a flexible approach and showing acceptance of ideas and innovation, the private sector will help create solutions that can increase efficiency of the NEM. Today, solar paired with storage is the cheapest peaker available to any grid. Utilizing hybrids can help transition to a zero-carbon grid quicker as displacement of higher-cost, carbon-emitting resources will be more achievable.
2	Are you considering using storage to minimise causer-pays liabilities by balancing the output of your units across multiple connection points under the current NER? What are the challenges of this approach?	Utilizing battery storage for this is possible and we have seen discussions for this in the market. We believe before this approach is supported, it is critical that a pay-for-performance approach is utilized in the market to increase the grid efficiency, security and reliability. Currently mandatory primary frequency response (PFR) by all generators is adding inefficiencies to the grid and not allowing those assets that can support the grid more efficiently and economically to be rewarded. Therefore the overall cost to the system in supporting the frequency of the grid is higher and will remain higher. Fluence is happy to share more details if needed. We have previously highlighted this approach to reduce overall system cost in a previous consultation.
3	Would you prefer to balance output and consumption across multiple connection points or combine technologies behind an individual connection point?	Fluence believes both approaches should be supported and in order to facilitate efficient integration of battery storage to maximize benefits: • Utilizing fleet management software will enable output and consumption across multiple points of operation. Such fleet management ability is commercially available already and rules should be designed to support utilization of fleet management for operation. • To combine technologies behind an individual connection point, an overarching power plant controller would be needed. We encourage making it easier to have a master controller become NEM-

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		compliant and then in the future having a master controller recognized as NEM-compliant enable easier and faster integration.
4	Are you considering aggregating renewable plant and batteries together as a scheduled generating unit under the current rules? What regulatory challenges do you see with this approach?	Several of our customers are considering aggregating renewable plants and batteries together as scheduled generation, but are finding it extremely difficult. We encourage that a dialogue with solar and wind developers will assist here to remove roadblocks. Fluence will be happy to participate.
5	Do you consider that the lack of clarity in the NER on whether different technologies can be aggregated is a significant issue for registering hybrid facilities? If so, why?	From Fluence's view, the interpretation and implementation of the NER rules is the area that needs more clarity. The following areas need more transparency and clarity: 1. Harmonic allocations at point of connection. Clear and transparent methodology shall be available to the proponents substantiated by supporting measurement data. 2. Co-located plants with physically different but electrically same points of connection.
Question 8: Registration process issues (p. 36)		
1	What are your experiences with the current registration categories for storage projects and hybrid facilities?	Fluence has first-hand and detailed experience given our installation in the NEM. We believe the process is one of the most complex, challenging, resource intensive, risky grid connection process in the world. Uncertainty around upcoming new rules and a blind race to secure the available fault level for connection makes registration a very difficult process.
2	Do you agree the existing approach imposes	Yes, we agree that administrative and financial costs are high and creating very large barriers to entry – notably, large consulting fees, risk premiums and design costs. As

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	high administrative and financial costs for participants registering storage units and hybrid facilities or create barriers to entry?	commented earlier, and with the above costs, this results in project delays and further creating a view that Australia is a difficult market. Some of the issues this results in: - Getting alignment of all parties involved to work expeditiously to an outcome is very difficult. - Conflicts of interest: Some consultants are reluctant to challenge AEMO on connection issues due to also receiving consulting work from AEMO. - Markets move and opportunities are consequently lost in the time it takes to register assets. - Consideration shall be made that simulations are only mathematical representation of the actual performance under specific operating circumstances. Achieving accuracy in order of milliseconds may or may not be possible. Ensuring that all access standards meet automatic standards may or may not be suitable for all point of connections.
3	Do you consider that the NER should set out how participants with storage units and hybrid facilities should register and participate in the market, rather than AEMO guides? Or have AEMO's guides and fact sheets now solved the identified registration issues for storage and hybrid facilities?	AEMO's guides have made the process clearer, but unfortunately these have not made things easier or faster. Rules to make the process itself easier is imperative.
4	Do you consider the registration issues AEMO has raised in its rule change request will become worse in	Fluence agrees. As mentioned above, this will certainly be a disincentive to investors and OEMs, which will in turn make it

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	the future if the current NER are retained?	slower and more difficult for the market to transition and meet its RE goals.
5	Are there other registration issues for intending participants with storage and hybrid facilities that arise from the fact that the NER do not fully consider these technologies, which are not detailed in AEMO's rule change?	Fluence would like to flag two additional registration issues for consideration: • Commissioning "chicken and egg" problems for storage – need energy to commission, cannot commission until registered, cannot register until commissioned. • AEMO insisting that all BESS units are "separate" and "separately dispatched," and therefore visible and dispatchable, creates big issues. This means proponents cannot install a BESS behind-the-meter for better performance without AEMO forcing it to be a separate connection. This triggers 539s and therefore is a disincentive.
Question 10: Proposed approach to registration categories and classifications (p. 43)		
1	Do you consider that AEMO's proposed solution will make the registration process simpler and less expensive for intending participants seeking to classify storage units and hybrid facilities?	If participants are still beholden to the Sched Generation and Load GPS rules, then there unfortunately is no real change.
2	In relation to the registration of hybrid facilities, do you agree that the NER should provide that participants cannot aggregate units with different classifications or different technology types	Participants should be allowed in the NER to aggregate units with different classifications or technology types, subject to security of grid operation.

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Questions		Feedback
	(unless AEMO approves it on a case-by-case basis)?	
Question 12: Proposed approach for transitional arrangements (p. 44)		
1	Would participants with storage that are currently registered as a Market Generator and Market Customer want to transition to AEMO's new category and classification? If so, what advantages would it offer?	This would need to be evaluated based on the new category. We encourage this is something that can be done if desired, given there would be admin costs for owners and OEMs. The advantage of supporting this type of approach for AEMO would be in providing a quick learning curve for existing assets, to remove kinks in the process before new systems are developed and come online.
2	Should owners/operators of existing standalone storage units be grandfathered, i.e. permitted to remain on their current registration and classification arrangements?	Owners/operators of existing standalone storage systems should be given flexibility whether to be grandfathered in or pursue re-registration. As mentioned above, no one would like to incur additional costs involved in any processing.
Chapter 4 – Technical and operational challenges relating to utility scale storage and hybrid facilities		
▪ **Question 16: Bidding in scheduled storage facilities (p. 54)**		
1	How complex are the current arrangements for bidding for a scheduled storage facility compared to bidding for a scheduled generator or load?	The current arrangements for bidding for a scheduled energy storage facility are necessarily more complex, compared to bidding for a traditional scheduled generator or traditional scheduled load. However, this complexity is not a reflection of any shortcoming in the NEM's existing bid submission frameworks, but rather a reflection of the complexity of

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		energy storage itself, relative to a traditional scheduled generator or a traditional scheduled load. Being highly energy constrained but also highly flexible and able to respond dynamically to changing price signals, energy storage facility operators must continuously consider a number of variables when forming bids and rebids. These variables include price forecasts (calculating revenue opportunities and opportunity costs), SOC management across a multi-hour ahead horizon (which is often a function of system frequency and regulation FCAS utilisation) and contractual and operational constraints (including any contractual positions, and warranty limitations relating to the use of the plant). For this reason, most of the NEM's scheduled storage facilities have turned to rules-based or software-based trading tools to assist operators with calculating, formulating, and submitting bids that are both economically optimal (maximally responsive to the NEM's price signals) and compliant with the NER. Today, the NEM has multiple suppliers of bidding software operating in the market, offering software solutions to assist storage operators with the bidding process. These trading tools are supplied by a number of parties, including: hardware OEMs, systems integrators, independent vendors, and in-house teams. Regardless of the outcome of this rule change request (i.e. whether bi-directional resources become defined in the NER, or not), we expect the bidding software market to continue to mature and diversify in the years ahead, and: 1) we expect that most scheduled storage facilities will continue to leverage software-based tools to engage with the bidding process.

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		2) the complexity of bidding a scheduled storage facility will remain unchanged. Storage operators will still need to plan when they want to charge and discharge (by considering a number of dynamic variables) and communicate those "plans" to AEMO in the form of price/quantity pairs contained in a bid file. Whether those "plans" are communicated in a single bid file with two columns for charge/discharge (AEMO's proposal, utilising a single DUID), or two bid files with a single column each (the status quo, utilising two DUIDs) is immaterial. The same information must be calculated and compiled by the storage operator; the only difference is the format in which the outputs are packaged and presented to AEMO. Since most scheduled storage facilities will be using logic-driven software tools assist with bid formation, there is no material difference between – or reduction in complexity from - submitting one bid file, or two. The fact that the status-quo arrangements for bidding has worked for the NEM's first five scheduled storage facilities since 2017 suggests that the status quo does not constitute a barrier to entry in and of itself. If the goal of AEMO's rule change were to simply (and narrowly) lower barriers to entry for storage operators by reducing the complexity of the bidding process, the proposed rule change would fail to achieve that goal.
2	If available and if you had storage facilities, would you opt to change from the existing arrangements to a single DUID model, with 10 price bands rather than 20?	Switching from a regime with 20 (effective) price bands to 10 price bands could be considered a retrograde change by some participants. Because bidding complexity is not materially reduced under the single DUID model (as explained above, the format of the outputs simply changes),

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		we anticipate that some participants will elect to utilise (or continue utilising) the legacy structure. As suggested in the AEMC's consultation paper – a separate rule change to allow participants to dynamically update their price bands (or to do away with the concept of price bands altogether) would alleviate this concern, and may be worthy of separate consideration.
▪ **Question 17: Dispatch conflicts (p. 55)**		
1	How often these conflicts occur in relation to energy and FCAS, and how material are they for the operators of scheduled storage units and other market participants?	On the market participant side – dispatch conflicts are easily prevented through the use of bidding software tools that include simple validations preventing conflicting bids to be sent to AEMO. Where a dispatch conflict does arise, any storage facility using AGC for dispatch receives a single energy target from the AGC, thus mitigating the operational impact of receiving two targets. On the AEMO/NEMDE side, where co-optimisation of energy & FCAS is resulting in a storage facility receiving conflicting dispatch targets – this situation would need to be remediated by employing additional logic in NEMDE.
2	To what extent can these conflicts be, or to what extent have they already been, remediated through experience and through improved bidding systems?	Please see answer to Question 17-1.
3	Would moving to a single DUID model be an appropriate and proportionate response?	While moving to a single DUID model is likely to prevent dispatch conflicts, the 'problem' of dispatch conflicts is not material enough to warrant a change purely to address it. In that sense, it would not be a proportional response.

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Question 18: Aggregation and ramp rates (p. 57)		
1	What problems arise under the current arrangements in relation to the application of minimum ramp rates?	The problems are well described in AEMO's rule change request. If the AEMC does elect to pursue minor changes to the NER instead of formally defining a bi-directional participant class, the AEMC could explore whether the minimum ramp rate calculations, obligations, and definitions for market loads and market generators are able to be brought closer together through simple rewordings of existing NER clauses.
2	Do you agree with AEMO's proposal to rely on the aggregation approach set out in Chapter 3 of the NER (rather than the one set out in Chapter 2 of the NER)?	Yes, Fluence agrees with the proposal.
Question 19: Forecasting and energy availability (p. 60)		
1	Are there problems arising from energy-limited plant not being reflected in forecasts?	The challenges AEMO faces in incorporating storage facilities into its forecasting processes are well described in AEMO's rule change request, and the AEMC's consultation paper.
2	Could this problem be addressed by requiring storage facilities to provide additional information on energy limits in their bids, as proposed by AEMO?	The proposed rule change by itself is unlikely to remediate these challenges. It is likely that AEMO's PASA and pre-dispatch tools and processes will require complementary changes, in order to ensure they remain relevant and useful (to AEMO, and to participants) in the future NEM. This is because energy storage technologies are the most flexible assets currently participating in the NEM: an energy

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		storage facility might update its plans every five minutes, as its energy constraints (state of charge, or SOC) change and as market conditions change – in this way, storage facilities can be dynamically responsive to the price signals the NEM is sending, and deliver their limited energy at the highest value time. A battery's future energy availability (SOC and power) is a function of many factors, including forecasted prices (perhaps across a ~24h ahead horizon), actual prices (resulting in dispatch) and variables that are difficult or impossible to forecast, such as regulation and contingency FCAS utilisation. As a result of these constantly changing variables, many of the NEM's existing scheduled storage facilities rebid every five minutes – 288 times per day. In doing so, the storage facility is ensuring it is responding as fully as possible to the price signals the NEM is sending across its planning horizon, subject to its operational constraints. In contrast, AEMO's forecasting responsibilities and PASA processes were designed during the era of 'traditional' synchronous generation, which typically had long unit commitment times, considerable minimum run times, and few energy/fuel constraints – which enabled AEMO to make confident estimates of how much capacity would 'definitely' be available at future point in time. The dynamic nature of energy storage – where a facility's "plan" (i.e., when it plans to charge and discharge, as signalled through its bids) can change significantly intra-day and intra-hour – may not lend itself well to AEMO's existing PASA tools and processes – which attempt to capture of snapshot of how much capacity will "definitely" be available at a point in time in the future. All storage facility operators are likely to have a view of where they expect their facility's energy availability (SOC) to

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		be during future dispatch intervals – and that information could conceivably be continuously conveyed to AEMO in real time through any number of methods (including the bidding process) – but, in addition to the potential for adding cost to participants, we question whether such information is useful to AEMO for its planning purposes under today's PASA regime, since a storage facility's "plan" may continuously change as market conditions and grid conditions change. Further, AEMO's proposed rule seems to only envisage that "a MW capacity profile" be signalled to AEMO during the bidding process. We suggest that a timeseries of MW values are of limited value to AEMO, and that if AEMO wants to form a view of a storage facility's true availability in future intervals, it should require the provision of some information in MWh, or some indication of which dispatch intervals the unit plans to charge/discharge in, along with the quantity of expected energy. Storage facilities could conceivably produce and convey such forecast information to AEMO, if AEMO's PASA systems and processes were redesigned to incorporate such information in a useful manner.
Chapter 5 – Issues with fees and charges		
Question 24: Issues with TUOS and DUOS charging arrangements (p. 76)		
1	Do you agree that there is ambiguity and uncertainty around how transmission and distribution network businesses calculate and charge TUOS and DUOS for battery systems?	Fluence agrees. TUOS is levied on loads and not generators, while a BESS can be both. Currently the TUOS charge is a major barrier to the business case for energy storage. We believe the charge should be levied on *net energy used* (i.e.,

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		round-trip efficiency losses), not net load as is currently defined. DUOS demand charges remain a very large disincentive for BESS deployments at the distribution level and we highly discourage this charge on BESS charging. Batteries have a net benefit just from existing, which can be increased by adding markets and services for additional functions (voltage regulation, Fast Frequency Response).
2	Does this ambiguity and uncertainty create a material issue for investment in battery storage projects now, or in the future as the number of energy storage projects increase across the NEM?	Yes, we see this ambiguity and uncertainty as creating a material and economically significant disincentive. It creates regulatory uncertainty & possible non-uniform interpretation by NSPs.
3	What are the pros and cons to allowing each NSP discretion in developing and applying TUOS and DUOS charges? On balance, should the approach and method to applying TUOS and DUOS charges be harmonised among NSPs?	Allowing each NSP direction creates the conditions for NSP-specific decisions to impact national problems. Further, this case-by-case approach does not feed into a coordinated, aligned outcome in the national market. For example, NSPs may unintentionally exert their natural monopoly on solutions (i.e., using TUOS or DUOS charges as incentives or disincentives).
4	Is there a regulatory risk when NSPs interpret how to apply the current rules to battery systems?	Yes, allowing NSPs to interpret how to apply the current rules to battery systems opens up the risk of a lack of consistency.

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Questions		Feedback
Question 25: Solutions for clarifying the application of TUOS and DUOS charging (p. 79)		
1	Do you agree with AEMO's proposal to exempt all energy storage systems from TUOS charges? If you agree with an exemption, should the exemption of TUOS charges also apply to energy used on site (auxiliary load) i.e. energy that is not stored and sent out into the network?	Yes, TUOS charges should be exempt, barring the energy used on site.
2	If battery systems are exempt from TUOS charges does this: a. create a subsidy for battery technology and therefore an advantage over other generation technologies? b. remove the ability to provide an efficient location and/or price signal to potential battery system proponents, and therefore impact on the efficient entry and location of new battery system participants?	a. TUOS charges on net energy consumed by an energy storage system will not create a subsidy for battery technology. In doing so, the disincentive to BESS will be removed and allow BESS solutions to participate on a level playing field as other technologies. b. We agree this is a risk, but without removing hurdles the potential uptake of BESS will not occur in the NEM. Without such a step, BESS deployment will be limited and consequently hamper RE penetration in the market. Over time, such exemptions can be revisited.

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3	If battery systems are not exempt from TUOS charging does this: a. create double charging of TUOS /DUOS for end use customers? b. distort investment signals and not align with the need for significantly more storage investment across the NEM?	a. Battery-based energy storage not being exempt from TUOS charges will create double charging of TUOS/DUOS. b. Not being exempt from TUOS charges will distort investment in energy storage, providing a massive disincentive.
4	How should TUOS and DUOS charges apply to hybrid facilities? Should TUOS and DUOS charges be based on metered data at the network connection point, or another option? Are there technical or implementation issues with this?	TUOS charges should be based on net energy consumed by the storage system, whereas DUOS charges should be based on energy consumed and not based on peak demand.
5	Do you agree that battery systems should pay DUOS charges for consumed energy? Please explain why or why not.	Please see answer to Question 25-4.
Question 26: Alternative solutions for issues with TUOS and DUOS charging (p. 82)		
1	How would charging all Market Participants TUOS and DUOS, based on the services received by participants	Typically, a BESS is deployed such that the network becomes more efficient. For example, during network congestion, battery helps to relieve congestion & vice versa. Therefore,

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	(energy consumed) rather than based on the asset type, impact participants' behaviour and market outcomes? This would mean that all Market Participants would be liable for TUOS and DUOS charges for the energy that is consumed at their network connection point.	TUOS charges should only be applicable for net consumed energy by the energy storage system.
2	If all Market Participants were charged TUOS and DUOS, would this have any impact on existing external arrangements?	Yes, there will be impacts if TUOS & DUOS charged for all market participants: operational & regulatory changes will require resource investment without generating equivalent benefits from undertaking such an exercise.
3	Is a definition for storage technologies needed to clarify TUOS and DUOS charging, or could AEMO's proposed solution or an alternate solution be implemented using the existing Market Participant categories, such as a scheduled load?	[Intentionally left blank]
4	Are there technical issues or complications with implementing AEMO's proposed solution or an alternative solution?	[Intentionally left blank]
5	Do stakeholders consider there is an inconsistency in	Every NSP has its own tariff schedule, methodologies, and there are no standardised approaches, such that anyone

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	the approach NSPs use to calculate network prices? If yes, would a more harmonised approach to network pricing provide clearer investment signals across the NEM and reduce costs for battery system proponents?	trying to create an Australia-wide tariff schedule/guide finds it extremely difficult. Incentives for BESS should exist, but absent a unified or coordinated framework, the NSPs are therefore responsible for any incentives.
6	Does the introduction of LMP and FTRs as contemplated through transmission access reform impact whether storage should face TUOS?	[Intentionally left blank]
7	Are there any other approaches that could be considered to address the issues raised by AEMO?	[Intentionally left blank]
Chapter 6 – Storage and hybrid integration drafting and other issues		
▪ **Question 27: Technology specific drafting in the NER – issues (p. 88)**		
1	Are you concerned that the terms relating to load and generation, or other terms in the NER, are not sufficiently technologically neutral? If so why?	The terms 'generation' & 'load' were conceived in a unidirectional power flow environment. With growing adoption of bi-directional resources, these terms have become inadequate descriptors. A "load" in the current definition of the rules assumes that the energy is "consumed" and not able to be returned to the grid. Any energy provided to the grid is assumed to be new generation (i.e., a primary generator). The concept of storing and redispatching energy is not captured in these terms.
2	Do you consider key terms in the NER such as 'generation' and 'load' are ambiguous	Please see answer to Question 27-1.

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	when applied to storage and hybrids? If so, why?	
▪ **Question 28: Technology specific drafting in the NER – proposed solution (p. 91)**		
1	Would AEMO's proposed changes to these key terms in the NER assist with the effective integration of storage and hybrids in the NER? Are there other terms or definitions that are more appropriate than those suggested by AEMO?	We believe it is important to streamline the registration and on-market arrangements of these assets, as well as the technical standards. If the changes to the key terms in the NER are not accompanied with an appropriate, streamlined standards and registration framework, the change is simply cosmetic.
2	Do you think the benefits of this proposed drafting solution would likely outweigh the costs, given the scale of the changes?	Yes, energy storage adoption can be accelerated towards 2025, to add overall benefit to the market and lower costs for consumers in the NEM. A new set of rules would provide certainty across the board, rather than resolving registration and participation on a case-by-case basis, raising the costs of storage adoption or hampering it entirely, leading to a less efficient market than is possible given the existing commercial viability of BESS today.
3	Would changes to these fundamental terms in the NER affect related external documents such as contracts, procedures and guidelines (other than AEMO's), and if so would the changes cause you to incur costs or other difficulties? What implementation period would be needed to address these issues?	Any additional costs or difficulties incurred would depend somewhat on the standards and compliance required, and on which projects these changes are applied to (i.e., completely new projects, projects already in grid connection discussions, and/or operational/registered projects). If relevant to a project, changes to these terms in the NER would require re-drafting of some contracts and, at worst, reopening of registration for some projects if no grandfathering was applied. Reopening of registration carries significant costs, risks and disincentives for the industry. Renegotiating contracts will have some financial impact, but if assistance is provided to help fast-track such projects, the cost can be offset.

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Question 32: RRO – issues (p. 100)		
1	Is it appropriate for the electricity imported from the grid for the purposes of energy storage to form part of a liable entity's liable load under the RRO?	Energy storage forming part of a liable entity's liable load under the RRO is only appropriate if it is collocated with load different than that of the energy storage system.
2	Should operators of storage assets be liable entities under the RRO?	Again, an operator of an energy storage asset should only be liable if that asset is collocated with load different than that of the energy storage system. As pointed out by AEMO, an energy storage system generally increases reliability by charging during low load & vice versa. Only in very rare instances does an energy storage system charge during a reliability gap.
Question 33: RRO – solutions (p. 100)		
1	Do stakeholders agree with AEMO that the RRO should apply to storage only when the storage system is co-located with a separate load in a hybrid facility (this does not refer to the battery's own load)?	Yes, this requirement/provision prevents a perverse use case.
2	Would alternative or additional changes to the application of the RRO to load for storage be more appropriate?	[Intentionally left blank]

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Question 34: RRO – storage contribution to reliability issues (p. 101)		
1	What are your views on the issues which relate to whether or not storage contribute to reliability issues?	Energy storage systems, in principle, increase system reliability through the flexibility their presence provides to the system.
2	Are there any other issues to consider when evaluating the treatment of load used for storage under the RRO?	[Intentionally left blank]
Question 35: RRO – implementation issues (p. 101)		
1	Should RRO liabilities for hybrid facilities continue be calculated at the connection point? If not, where?	One possible solution would be to measure the net liability load at both the connection point & the battery connection point.
Question 37: Marginal loss factors – issues (p. 103)		
1	Are the current arrangements for calculating and applying MLFs to storage and hybrids appropriate in light of the increasing numbers of these facilities in the NEM? If not, what changes do you consider are required?	On an MLF basis, other projects receive a benefit from BESS assets being located nearby. This benefit is not captured currently and if it could be it would significantly improve the business case for battery-based energy storage systems, but also improve grid operation.
Question 38: Marginal loss factors – solution (p. 103)		
1	Do you agree with AEMO's proposed solution of applying the existing arrangements for applying	We believe this would not be as simple as implied given the bi-directional nature of battery-based energy storage systems. There should be a benefit for BESS assets optimising charging to reduce MLF. We would suggest this be tabled as a

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	MLFs to its proposed new market participant category (if this category were to be established)?	topic to be evaluated in detail once further steps are taken in this consultation.
Question 39: Reliability Panel representation (p. 104)		
1	Is it appropriate to require that the Reliability Panel include a member to specifically represent storage and hybrid asset proponents, or are the current mandatory and discretionary membership provisions adequate?	Yes, representation on the Reliability Panel should be mandatory for storage & hybrid asset proponents, as new market participants are increasingly of storage or hybrid asset classes.