



# Integrating Energy Storage into the NEM Response

Maoneng Australia

## Integrating storage – consultation paper: stakeholder feedback template

The template below has been developed to assist stakeholders in providing their feedback on the questions posed in this paper and any other issues that they would like to provide feedback on. The AEMC encourages stakeholders to use this template to assist it to consider the views expressed by stakeholders on each issue. Stakeholders should not feel obliged to answer each question, but rather address those issues of particular interest or concern. Further context for the questions can be found in the consultation paper.

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Questions		Feedback
<b>Chapter 2 – The threshold question: should storage be defined in the NER?</b>		
<b>Question 2: Current issues caused by the treatment of storage (and hybrids) under the NER (p. 14)</b>		
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 storage definition? Why, or why not?	Maoneng Australia (Maoneng) agrees that it is problematic that energy storage systems are not defined in the National Electricity Rules (NER). Requiring storage assets to register as both generators and market customers creates regulatory uncertainty and places additional operational burdens, registration requirements, and costs on storage assets than any other type of asset registering to participate in the NEM. This creates barriers to integrating energy storage systems into the NEM, and in turn, impacts on investment in storage assets.
<b>Question 3: Implications for storage forecasts (p. 21)</b>		
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?	It is clear that storage and hybrid facilities are likely to play an important role in the future of the market. It is widely forecasted that there will be a significant uptake of renewable energies, such solar and wind, in the NEM in the coming years. Energy storage systems will be valuable during this uptake as either standalone assets providing system security services to the network or by providing reliable scheduled capabilities to renewable hybrid facilities.

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		Maoneng believes that the issues AEMO identified arising from the current treatment of storage under the NER will not necessarily worsen if flexibility and clarity in respect of registration, bidding and dispatch are incorporated as a priority in the new rules framework.
<b>Question 4: AEMO's rationale for defining storage and hybrids in the NER (p. 25)</b>		
1	Do you agree with AEMO that there is a strong rationale for defining storage and hybrid facilities in the NER (as different to load and generation)? Why or why not?	<p>Maoneng supports AEMO's proposal to define storage facilities in the NER.</p> <p>However, Maoneng does not support the proposed reduction in price bands from 20 bands to 10 bands in respect of scheduled storage facilities. This is covered in more detail below.</p> <p>Further, Maoneng has concerns in relation to the ambiguity of AEMO's hybrid facilities registration model. It is unclear whether a hybrid facility (for example, a facility consisting of a solar farm and a storage asset) will be forced to register as a scheduled generator or a semi-scheduled generator. It would be inappropriate to require hybrid facilities to register as scheduled generators as there are various instances where the scheduled capability of the facility may be unavailable. For example, if the storage asset is experiencing an outage or goes offline for a period of time, then the hybrid facility could no longer supply dispatches in line with its dispatch targets as a scheduled generator.</p> <p>Further information is required in relation to how a hybrid facility would be required to register and the implications of this requirement.</p>
<b>Question 6: Alternative to AEMO's proposed solution to integration issues for storage (p. 29)</b>		
1	<p>In light of the alignment issues between AEMO's rule change request and the direction the ESB's two-sided market reforms are taking, which of the following approaches do you support and why?</p> <p>a. Waiting for the implementation of the two-sided market reforms to address</p>	Maoneng supports introducing AEMO's rule change proposal as an interim step prior to the implementation of the two-sided market reforms. Maoneng believes that this is the most time and cost efficient pathway to improving storage integration into the NEM in the years prior to implementing the two-sided market reforms.

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	<p>the integration issues facing storage and hybrid facilities</p> <p>b. Introducing AEMO's rule change proposal as an interim step prior to the implementation of the two-sided market reforms</p> <p>c. Implementing certain aspects of the two-sided market reforms through this rule change project, such as combining the different types of market participants and imposing obligations based on services rather than assets</p> <p>d. Taking an alternative approach - please specify.</p>	
<p><b>Chapter 3 – Registration issues for storage units and hybrid facilities</b></p>		
<p><b>Question 7: Understanding the interest in registering hybrid facilities and the challenges that exist (p. 35)</b></p>		
1	<p>Why would you consider aggregating different technologies together in a hybrid facility? Which technologies do new participants propose to combine in hybrid facilities?</p>	<p>For renewable energy developers, a significant benefit of aggregating storage units and renewable plants such as solar farms is to avoid curtailment of the renewable plant's output due to grid constraints. Shifting electricity to the storage unit creates more options for the hybrid facility to deal with excess generation, and is a better outcome than curtailment.</p>
2	<p>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?</p>	<p>Maoneng considers that minimising causer-pays liabilities may be a useful by-product of using a storage facility. However, the difficulty of balancing or smoothing the output of units across multiple connection points is that the availability of a storage facility to dispatch the required load or generation to smooth output is not always predictable. Given this unreliability, minimising causer-pays liabilities would not be the main purpose of using a storage facility.</p>

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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?	<p>Maoneng does not anticipate aggregating renewable plants and batteries together as a scheduled generating unit due to the perceived risk of the aggregated facility being unable to comply with its dispatch targets.</p> <p>Due to the inherently variable nature of renewable plants, there is difficulty classifying such an aggregated facility as a scheduled generating unit under the current rules and system constraints. This is particularly true in instances where the battery is dependant on the semi-scheduled renewable generator to charge.</p> <p>Even in circumstances where the battery is able to charge from the network, the scheduled capabilities of the battery may be unavailable from time to time if the battery has an outage, is offline, or is fully discharged. This may lead to the aggregated scheduled generating unit failing to comply with its dispatch targets.</p>
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?	<p>Currently there is no clear pathway in the NER to register hybrid facilities.</p> <p>Intending participants may apply to AEMO to include a storage facility in a semi-scheduled generator's Generator Performance Standards but it is unclear how AEMO will treat this type of application, and if successful, whether the aggregated facility will be registered as a scheduled or semi-scheduled unit.</p> <p>This creates uncertainty for developers and investors about the risks, liabilities and rights of hybrid facilities, which in turn creates a barrier to integration of hybrid facilities in the NEM.</p>
<b>Question 8: Registration process issues (p. 36)</b>		
2	Do you agree the existing approach imposes high administrative and financial costs for participants registering storage units and hybrid facilities or create barriers to entry?	Participants registering storage units are subject to particularly high administrative and financial costs because these units must register as both Market Generators and Market Customers. Storage units are often subject to double the fees than other participants.
4	Do you consider the registration issues AEMO has raised in its rule change request will	Maoneng believes that the issues AEMO identified in its rule change request will worsen if the current NER are retained. It should be emphasised that flexibility and clarity in respect of registration, bidding and dispatch with a view to increase a participant's control over how their energy is integrated into the NEM must be incorporated as a priority in the new rules framework.

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	become worse in the future if the current NER are retained?	
<b>Question 10: Proposed approach to registration categories and classifications (p. 43)</b>		
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?	Yes.
<b>Question 12: Proposed approach for transitional arrangements (p. 44)</b>		
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?	Maoneng supports AEMO's new proposed category and classification except to the extent that the number of price bands available to scheduled storage facilities are reduced from 20 bands to 10 bands, and the ambiguity remains in relation to whether hybrid facilities must register as scheduled generators.
<b>Chapter 4 – Technical and operational challenges relating to utility scale storage and hybrid facilities</b>		
<b>Question 16: Bidding in scheduled storage facilities (p. 54)</b>		
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?	Maoneng does not support AEMO's proposal to reduce the number of price bands available to scheduled storage facilities from 20 bands to 10 bands.  The proposed reduction in price bands represents a significant loss in bidding flexibility, which in turn will diminish a storage facility's ability to optimise their load and generation bids. Whereas 20 price bands allows a storage facility to achieve an asymmetrical maximum availability for its load and generation (E.g. 20MW load and 40MW generation), 10 price bands would force a symmetrical maximum availability for its load and generation (E.g. 20MW load and 20 MW generation). This will impact the abilities for storage facilities to generate revenue and provide system security services by way of participation in FCAS Markets.

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<b>Question 19: Forecasting and energy availability (p. 60)</b>		
1	Are there problems arising from energy-limited plant not being reflected in forecasts?	Maoneng does not perceive a problem with energy-limited plants not being reflected in forecasts.
2	Could this problem be addressed by requiring storage facilities to provide additional information on energy limits in their bids, as proposed by AEMO?	Maoneng does not perceive a problem with energy-limited plants not being reflected in forecasts.
<b>Chapter 5 – Issues with fees and charges</b>		
<b>Question 24: Issues with TUOS and DUOS charging arrangements (p. 76)</b>		
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?	Maoneng agrees that there is significant ambiguity and uncertainty around how TUOS and DUOS are charged for battery systems. Distribution network service providers (“DNSPs”) in particular have a lack of clarity on how DUOS and TUOS are charged to battery systems as their pricing structure focuses on more traditional load use categorised into small to large customers. Battery systems are relatively new in the electricity network and do not have a framework to apply pricing structures under the current regime.
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?	<p>The ambiguity and uncertainty outlined by AEMO have a significant impact on the investment in battery storage projects. As part of the development due diligence process a financial model is developed to determine if a project is viable. Currently DUOS and TUOS charges do not account for the unique way a battery can operate in the electricity network as a load and generator. Bluntly applying the existing pricing structure suited towards traditional projects/customers leads to estimates for TUOS and DUOS that are exorbitant and make the financial model of a project unviable.</p> <p>As network service providers (“NSPs”) have significant discretion on how to apply DUOS and TUOS charges to battery systems it is difficult to get an understanding of how they will apply the charges to a battery project that is in its early development phase. Many NSPs determine pricing and charges during the contracting stage after a connection application has been assessed. For a developer to reach that stage of the development process, a significant amount of capital would have been spent on the project. The NSP may then determine an unviable fee structure to be applied to the battery project. This uncertainty</p>

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		ultimately means that developers will be less inclined to start the development phase of a project due to uncertainty around DUOS and TUOS.
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?	<p>From a NSPs perspective it may be beneficial to have discretion over how TUOS and DUOS charges are developed and applied. As each NSP has different network layouts (with associated strengths and weaknesses) with different customer use patterns, having discretion on DUOS and TUOS charges can support NSPs in maintaining a balanced electricity network.</p> <p>The lack of consistency and clarity between NSPs for charging DUOS and TUOS leads to significant drawbacks. As highlighted in Maoneng's response to Q.24.2, the inconsistency and lack of transparency on the process of charging DUOS and TUOS prevents developers from starting battery projects due to a lack of certainty in forming a viable financial model. Battery systems provide significant benefit to the electricity network, in particular they can alleviate the issues being faced as the network becomes decentralised with non-scheduled renewable generators. Therefore, the significant impact the TUOS/DUOS uncertainty has on project development clearly outweighs the benefit NSPs may believe they have in having discretion over these charges. A harmonised and consistent framework for applying these charges will remove a significant uncertainty in developing battery projects and lead to a more stable and reliable electricity network which benefits NSPs, consumers and other stakeholders.</p>
<b>Question 25: Solutions for clarifying the application of TUOS and DUOS charging (p. 79)</b>		
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?	<p>Maoneng believes that energy storage systems should be exempt from TUOS charges. Any TUOS charges would be a double-charge (importing energy to store, then exporting that energy to consumers). This is a disincentive for battery systems in the NEM and contradicts the NEO as it leads to higher cost electricity for consumers.</p> <p>Energy consumption by auxiliary load should be exempted from TUOS charges as the consumption would be minimal during idling period.</p>

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2	<p>If battery systems are exempt from TUOS charges does this:</p> <ol style="list-style-type: none"> <li>create a subsidy for battery technology and therefore an advantage over other generation technologies?</li> <li>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?</li> </ol>	<p>An exemption for battery systems from TUOS would not be a subsidy for the technology. It would be a change from the current situation of a disincentive of double-charging which just like a subsidy is inconsistent with the principle of a fair and competitive market.</p> <p>Exemptions from TUOS charges would not make location selection less efficient due to a lack of a pricing signal. The current regime is not transparent enough to determine the charges that apply to a project and therefore do not act as a price signal for location selection. In determining a project's location there are many significant criteria that already apply including environmental planning constraints, system strength, thermal limits and other network issues. A difference in TUOS charges would not be a major factor in choosing a location from an already limited amount of options (due to the criteria mentioned). Most significantly the current pricing regime stops battery projects from developing which is a much larger issue than any potential insignificant price signal that variations in TUOS charges may send.</p>
3	<p>If battery systems are not exempt from TUOS charging does this:</p> <ol style="list-style-type: none"> <li>create double charging of TUOS /DUOS for end use customers?</li> <li>distort investment signals and not align with the need for significantly more storage investment across the NEM?</li> </ol>	<p>Charging TUOS on battery systems does lead to a double charge, resulting in unnecessary higher prices for consumers inconsistent with the NEO. It significantly distorts investment due to the uncertainty it creates around a financial model for a project, unnecessarily impeding battery projects. The risk of not introducing more storage into the NEM to balance the significant increase in decentralised non-scheduled generators is fundamentally more important than having a one size TUOS/DUOS fee structure that was developed based on the legacy of a pre-renewable and battery NEM.</p>
4	<p>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?</p>	<p>No, this will complicate the charges. Metered points would be the most accurate way to determine energy used to calculate TUOS and DUOS. However, this can become complex when BESS and other loads are connected to renewable generators at the same connection point in the case of hybrid facilities.</p>
5	<p>Do you agree that battery systems should pay DUOS charges for consumed energy? Please explain why or why not.</p>	<p>Battery systems should be charged a DUOS fee in the context of AEMO's proposal where TUOS and discharging DUOS are not charged. However, it is absolutely critical that there is consistency and</p>

Questions		Feedback
		transparency to how it would apply and be calculated by NSPs. This will prevent the current uncertainty that has been created around developing a viable financial model for a battery project.
<b>Question 26: Alternative solutions for issues with TUOS and DUOS charging (p. 82)</b>		
1	How would charging all Market Participants TUOS and DUOS, based on the services received by participants (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.	If the changes to the market occur whereby participants are not defined based on generation technology/type it may be fair to charge TUOS and DUOS at the connection point for electricity consumed (in the case of battery systems). However, if the market intends to be more consistent and technology neutral in how it defines participants, transparency and consistency should also apply to how TUOS and DUOS are calculated. To summarise, consistency and transparency need to be applied across all sections of regulation and not in an ad hoc manner to individual aspects of market regulation.
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?	A definition for storage technologies does need to be implemented in the absence of significant two sided market reforms. The DUOS and TUOS framework was developed before decentralised storage solutions were a possibility in the NEM. Therefore, applying these charges to battery systems that do not fundamentally match any existing definitions is inefficient at best.
4	Are there technical issues or complications with implementing AEMO's proposed solution or an alternative solution?	The main issue as highlighted in the consultation paper is determining how to calculate charges for hybrid facilities and the technical requirements to make a fee structure possible to implement.
5	Do stakeholders consider there is an inconsistency in the approach NSPs use to calculate network prices? If yes, would a more harmonised approach to network pricing provide clearer investment signals across the	There is significant inconsistency in how NSPs approach network prices. Comparing the network charges between NSPs (in particular DNSPs) is near impossible as the terminology, units of measurement, daily and yearly peak periods and customer types are all completely different. Additionally, some NSPs provide a breakdown of each of their fees (TUOS, DUOS and JUOS components) while most do not. This makes it

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	NEM and reduce costs for battery system proponents?	<p>impossible to get an estimate of what DUOS charges may apply, even if AEMOs rule changes to only charge DUOS consumption costs for battery systems.</p> <p>A harmonised and consistent system would make it easier for developers to navigate the network pricing that will apply to a potential battery project and therefore decrease the uncertainty that would lead to greater development costs.</p>
6	Does the introduction of LMP and FTRs as contemplated through transmission access reform impact whether storage should face TUOS?	In either case storage should not face TUOS charges. If the purpose of implementing transmission access reform is to create a more efficient market, applying legacy TUOS charges would simply distort the market.
7	Are there any other approaches that could be considered to address the issues raised by AEMO?	The AEMO proposal is much needed reform so that regulation can catch up to the technological innovation that is already impacting the NEM. The AEMO proposal is a good balance of implementing changes required for storage technology without radically altering the entire regulatory framework.
<b>Chapter 6 – Storage and hybrid integration drafting and other issues</b>		
<b>Question 27: Technology specific drafting in the NER – issues (p. 88)</b>		
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 need to be updated to reflect new technology with new capabilities. For example, a BESS when charging is not strictly a load in a conventional sense. The charge rate can be varied at a granular level, and it can stop and start discharging. A conventional load is not able to control its energy consumption to this granular level. A traditional load cannot also ride through certain voltage collapse, a battery load can. Therefore, it is important that the NER reflects the reality of the technology that is participating in the NEM.
1	Do you consider key terms in the NER such as 'generation' and 'load' are ambiguous when applied to storage and hybrids? If so, why?	As outlined in the response to the previous question, the rigidity of the existing 'generation' and 'load' categories does not consider the complex ways in which battery systems are able to operate when compared to traditional loads or generators.

Questions		Feedback
<b>Question 28: Technology specific drafting in the NER – proposed solution (p. 91)</b>		
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?	AEMO's proposed changes will be effective in assisting the integration of storage and hybrids in the NEM.  Virtual power plants (VPP) and how they will be defined is something to be considered. For example, a VPP is not semi-scheduled as some households may make a last-minute decision not to participate. This may lead to aggregated VPPs and other consumers being penalised.
2	Do you think the benefits of this proposed drafting solution would likely outweigh the costs, given the scale of the changes?	Yes.
<b>Question 29: Technology specific drafting in the NER – other options (p. 91)</b>		
2	What are some other drafting approaches which could be used to make the NER more technology neutral?	To make terminology technology neutral, definitions should focus on the capabilities of the technology rather than the technology type itself. There will be other technologies in the future that will have similar capabilities to battery systems. By drafting from a viewpoint of capability it will prevent unnecessary restrictions on future technology.