5 November 2015

Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
Sydney South NSW 1235

Dear Mr Pierce,

RE: AEMC Discussion Paper – Integration of Energy Storage: Regulatory Implications

The NSW Distribution Network Service Providers, Ausgrid, Endeavour Energy and Essential Energy (the NSW DNSPs) welcome the opportunity to respond to the AEMC's discussion paper regarding the regulatory implications of integrating energy storage in the electricity supply chain.

We consider the AEMC's discussion paper has identified the key areas for consideration in enabling storage technologies. The National Electricity Objective (NEO) will best be achieved through a regulatory framework that promotes efficient investment and innovation in a technologically neutral manner.

We consider the existing regulatory arrangements, including the remaining Power of Choice reforms, sufficiently accommodate the integration of storage. It would be appropriate to adopt a cautious approach to implementing any further substantive regulatory amendments without proper consideration of the costs and benefits of doing so. This would allow for the Power of Choice reforms to take effect whilst also providing time for the necessary development of storage technologies to become more readily available and viable to customers.

In saying this, the NSW DNSPs accept that clarifications from the AEMC or minor rule amendments may be required to ensure the integration of storage is optimised. Our positions on the key topic areas identified by the AEMC are detailed in this response (including attachments) and are summarised as follows:

- Connections: Our connection requirements and agreements are subject to consultation and AER approval through the regulatory determination process. We do not consider there is any evidence to suggest we impose anti-competitive or onerous requirements that represent a barrier to the development of the market. The existing arrangements for micro embedded generators will accommodate battery storage.
- Registration: we support the AEMC's preliminary view that a new category of registered participant is not required and there may be value in AEMO reviewing the relevant technical standards, registration thresholds and charging implications.
- Technical requirements: we consider networks should be afforded the discretion to manage network risks in order to satisfy regulatory and license obligations. Requirements, such as AS 4777, are prudent measures to ensure the safe and reliable operation of the network. Standards Australia is the independent body responsible for standard development and is the appropriate channel through which to review, amend or develop new standards as required.
- Control: our load control programs and tariffs are voluntary in nature and simply enable customers to manage their usage and lower their costs whilst also providing a network benefit. The introduction of standardised control functions will allow various parties to provide load control services and improve a customer's choice and ability to create value.
- Classification: principally, service classification should be determined based on the service provided rather than the location of the asset. A collaborative approach is required to resolve the differing views of the AEMC and AER regarding behind-the-meter solutions. It will be important to have certainty and to ensure market participants are not prevented from pursuing efficient solutions.

- Ownership: the extent of any ring-fencing arrangements should be assessed in the context of the existing regulatory framework, including cost allocation, the shared asset guideline and service classification which promote efficient outcomes. An evidence based approach is required in determining the extent to which networks can materially impact the storage market by leveraging their monopoly assets. We do not consider that there is sufficient evidence to justify imposing stringent ring-fencing provisions on DNSP's. To impose onerous regulatory requirements where there is no evidence to demonstrate the potential for a market failure to warrant additional regulation, and without undertaking a review to determine whether existing mechanisms already address the AEMC's concerns will result in outcomes contrary to the NEO as it will impose unnecessary costs, stifle innovation and inhibit competition to the detriment of consumers.

We support the establishment of a competitively neutral market for storage. However, it is important that in creating a level playing field that natural cost advantages are not conflated with competition barriers. Eliminating natural cost advantages will reduce the value and availability of the market to customers. Further, network connection requirements should not be assumed to be competitive barriers. These requirements ensure an effective, cost reflective and safe market is established that mitigates the occurrence of network issues which result in network cross-subsidies.

The NSW DNSPs have investigated and deployed storage technologies through trials and various network solutions over recent years and consider their viability and value to both customers and networks will continue to improve in the future. It will be important that networks are able to continue to deploy network storage solutions and participate in any competitive storage market in order to provide the most value to customers without compromising the safety and reliability of our networks.

We would appreciate an indicative project timeline as part of the Commission's ensuing paper on this topic to understand the extent to which there will be further opportunities for consultation. Whilst we have endeavoured to provide a comprehensive response to the discussion paper, we note the consultation period of less than four weeks. Further, as identified in Appendix A of the discussion paper there are several related projects underway (or recently completed). A consultative approach will be required to ensure a clear and consistent solution is developed that achieves the strategic direction provided by the COAG and Clean Energy Council projects, and is complemented by the various AER and AEMO projects.

If you have any queries or wish to discuss further please contact Murray Chandler, Group Manager Network Technology & Innovation at Networks NSW on (02) 9249 7210 or via email at murray.chandler@ausgrid.com.au.

Yours sincerely,

J. Hardwick

John Hardwick
Group Executive Network Strategy
Ausgrid, Endeavour Energy and Essential Energy

NSW DNSPs Detailed Response

Connection and registration requirements

The directions paper seeks views on the extent to which the existing connection and registration requirements accommodate storage or whether amendments are required. The NSW DNSPs agree with the AEMC's preliminary view that the existing connection process under the NER for micro-embedded generation appears to accommodate a consumer seeking to install storage behind the meter. We consider the connection costs and requirements for storage should be no different to those which already apply to other forms of micro embedded generation.

We do not support the AEMC's view that there may be value in requiring DNSPs to have a basic connection offering that separately addresses the connection of storage capability. This is because a storage device is both a load and a generator. There are existing rules, standards, guidelines and processes for both connecting load (e.g. NSW Service and Installation Rules) and connecting micro-generation and both should be followed for a storage device.

An additional basic connection offering for a specific form of micro embedded generation would be duplicative. The intended outcome could be more readily and simply achieved by clearly articulating the applicability of existing offerings to storage and educating customers. For instance, Ausgrid is in the process of updating its connection application forms to add an extra category for battery as a type of generation system, as currently batteries are categorised under "other". Applications for battery systems using the existing connection processes are already being received and accepted without any negative feedback or customer issues arising to date.

In addition to the appropriateness of the existing connection agreements the AEMC also examine the technical requirements contained therein. The AEMC seeks views from stakeholders on whether these requirements represent a barrier to the development of the storage market. The NSW DNSPs consider the requirements and standards referred to in our connection agreements do not represent a barrier to the market. These standards are designed to promote customer choice without compromising safety and are better characterised as an enabler rather than barrier in our view. These requirements are largely developed by independent authorities and the connection agreements more broadly are subject to AER approval. We discuss this issue in further detail in the following section.

In regards to registration, we support the AEMC's preliminary view that a new category of registered participant is not required. We also support the recommendation to investigate whether the existing registration category of small generator aggregator is suited to behind-the-meter storage.

Technical Requirements and Network Load Control

The NSW DNSPs support customer choice and have always sought to facilitate their ability to manage their consumption. It is in a networks interest for these markets to develop as it relieves investment needs and can reduce costs, provided it is utilised in an effective and safe manner. The AEMC's directions paper appears to have a differing view of the nature and extent of network control in posing the question:

> *Does the ongoing degree of control that is being required by distribution businesses for consumer- or retailer-controlled storage represent a genuine safety, security or reliability need, or is it more appropriately a network interest that should be negotiated or signalled through prices?*[1]

[1] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 65

It is not clear what the AEMC is referring to regarding the "ongoing degree of control that is being required." As we understand the issue, there may be two forms of control being referred to in the directions paper:

1. Industry standards, other technical requirements contained in connection agreements; and
2. Load control provided by a network as part of a negotiated service and tariff offering with a customer.

Industry standards and technical requirements

In respect of the first form of control identified above we consider it is entirely appropriate that networks be provided with the ability to ensure one customer's choice does not negatively impact another customer's service. Technical standards are prudent and necessary for the safe and reliable operation of the electricity network. Networks have various obligations to all users of their network regarding reliability and power quality. It is important that networks have the ability to manage any potential network issues.

The requirements referred to in the directions paper are governed by independent regulating authorities such as Standards Australia. Our connection requirements mainly refer to these standards, such as AS 4777, which address matters of safety and reliability. Networks typically do not impose any additional restrictions to these standards unless specific network circumstances warrant.

Comparatively, we consider AS4777 is significantly less than what is legislated in other jurisdictions. For example, in Germany, since 2012 it has been a requirement for new connections to allow the utility to remotely control the output of PV systems larger than 100kW (export limitation) and provide current output levels. Between 30kW and 100kW is similar without the requirement to provide current output levels. Whilst below 30kW systems are required to provide control as well as limiting the maximal output to a 70% rating. This has been driven by high rates of installed PV which has created issues around capacity constraints and balancing supply demand.

The Australian standards are not overly burdensome or problematic in our view. We consider they are uncontroversial and simply required to ensure the products manufactured are safe and functional by reference to certain standards for both customers and installers. Further, these agreements are largely controlled by the NER and reviewed and approved by the AER.

We consider these standards preserve the long term interests of customers as they provide a safeguard against network issues which create costs to be borne by all customers. The AEMC touch on this tension in the directions paper as follows:

> *While there are valid safety, security and reliability reasons for a DNSP to want to control these devices such control may present a barrier to the development of business models that also rely on a degree of control over the operation of the storage device. We note that this issue is not unique to storage capability – any energy system connected via a grid-connected inverter may need to be compliant with the revised AS4777 and may therefore be subject to a level of control over the inverter by the DNSP…*
>
> *…the control of storage devices is a key issue given the potential for multiple value streams from this one asset. Any standard that precludes the appropriate valuation of these revenue streams will impact the competitive market.*[2]

We consider a broader perspective is required where the integrity and safety of the network is a priority. A technical requirement for storage is not a competing or off-setting issue to the development of a competitive market. DNSPs need to exert a degree of "control" (i.e. technical requirements in this context) over certain devices to meet their obligations and to

[2] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 20

prevent customer battery storage devices from adversely impacting power quality and voltage for other customers on the network. Attachment A of our submission outlines in more detail some of the issues that can arise from the integration of battery storage devices on a DNSP's network, which necessitate the need for technical standards.

The absence of appropriate technical requirements will preclude an accurate valuation of the potential revenue streams from deploying battery storage devices. Safety standards are a necessary and cost-reflective component of establishing a functional, effective market. The inefficient utilisation of battery storage or installation of deficient technology could result in numerous network issues. A suboptimal market design could reduce its availability to customers, the scope of benefits achievable and result in other customers cross subsidising the network costs created by the inefficient operation of the market through higher network charges.

Whilst we support the need for standards we accept that it may be necessary to review the different approaches adopted by distributors in different regions for behind-the-meter storage. However, we note that any concerns arising from any reviews should be addressed by consulting with the Standards committee rather than through amendments to the NER or the creation of duplicative guidelines.

Load control

The NSW DNSPs note that AS 4777 has recently been redrafted (AS 4777.2 published October 2015) to assist in the integration of inverter energy systems into the grid by providing standard technical and safety requirements. Specifically, the updated standard introduced a new demand response mode (DRM0) that:

- provides an inter-trip function (for larger systems) to enable an external command to disconnect an inverter to maintain safety on the grid even where inverters from multiple manufacturers are used within a single installation.
- describes additional optional demand response functionality that is available for any party to use provided the inverter is equipped with the capability
- allows for the functionality to be provided via an external device or integrated into the inverter – this flexibility to use an external device ensures inverters without an AS 4755 interface are not excluded from the market

We consider this standard does not provide DNSPs with an unreasonable degree of control. Rather the standardisation of technical requirements provides benefits to DNSPs and customers as it: 1) has the potential to result in more streamlined connections of battery storage devices, as DNSPs will have confidence that the integration of the device on its network will not result in adverse safety and reliability impacts; and 2) provides opportunities for customers to more effectively manage their energy usage and reduce their network bill.

This means that in addition to the safety and reliability matters the standard now provides standard control functionality that is mostly optional in nature and not limited to use by networks. This raises the second form of control listed above, that being load control.

Unlike standards or technical requirements, load control is generally voluntary in nature and enables customers to access programs or tariffs which reduce their prices whilst also providing a network benefit. By way of example, networks have been able to offer customers lower off-peak prices through hot-water load control to the benefit of both the customer and the network on a large scale. More recently various networks, including the NSW DNSPs, have been able to utilise the optional demand response modes introduced through AS 4755.3.1 which has been incorporated into certain models of air conditioners. This has enabled the development of programs lowering costs for customers.

We consider standards like AS 4777 and AS 4755 do not give networks too much control but rather benefit customers by providing certainty and optionality. In accessing a control program customers are able to negotiate with networks, retailers and aggregators. This standardisation may also provide additional value to customers who comply with the standard as they can

"sell" back network support services directly to the network or through their aggregator or retailer.

Overall, these standards should be viewed as akin to the minimum functional specification developed as part of the metering competition rule change. These standards simply provide a baseline level of functionality and assurance with many of the aspects of these requirements being optional and subject to negotiation and agreement from customers. This enables customers to access additional value streams and an opportunity in the same manner a relay device enables an off-peak service or interval meter enables a demand tariff. Further, they do not preclude other service providers from developing and offering more niche, sophisticated methods of controlling storage devices. The customer will be able to decide what level or form of control they value and are willing to accept.

Benefits

Generally, the NSW DNSPs support the AEMC's position that:

> *The NEM's current framework is built on the idea that market-based outcomes tend to be the most efficient. Control of storage devices should therefore, in all but a narrow band of circumstances related to system security and safety, be based on market-based price signals.*[3]

Ideally, a market-led approach and efficient distribution pricing would result in the efficient development and utilisation of battery storage. However, in this circumstance we consider there are barriers which exist that may prevent the efficient operation of market-based price signals. The benefit of certain network controls is that they may remove these barriers. For example, a standardisation of minimum functions that might allow remote control of batteries will enable various providers to control the device in standardised ways.

Broadly, we consider technical requirements and network control provide the following benefits:

- Provide networks an effective means for capital augmentation, power quality control and maintaining reliability resulting in more efficient prices for all network customers;
- Enable customers to access additional energy services or voluntary tariff options that provide value (e.g. off-peak hot water); and
- provide the customer and network with surety as to the safety, performance and reliability of the devices installed and avoid costs associated with faulty, poor quality equipment.

The value of technical standards and network load control can also be measured in both the costs avoided (or benefits accrued) by customers and networks. Various case studies and analysis suggest that network control can enhance the benefits realised by these emergent technologies. By way of example, a study examining the impact of control of Photo Voltaic (PV) inverters in Switzerland found that the control of inverters (both power and power factor) enhanced the use of PV rather than inhibit it:

> *…..most distribution system operators (DSO) use ripple control systems to control specific loads, such as water heaters, washing machines, electrical heating systems or public lighting. With only minor modifications a ripple control system can be used to control photovoltaic (PV) power plants and thus to increase the PV hosting capacity of an electrical power system.*
>
> *…..This paper shows that such a system can be both cost effective and efficient in operation, given that the control target is limited to voltage stability in accordance with EN 50160.*[4]

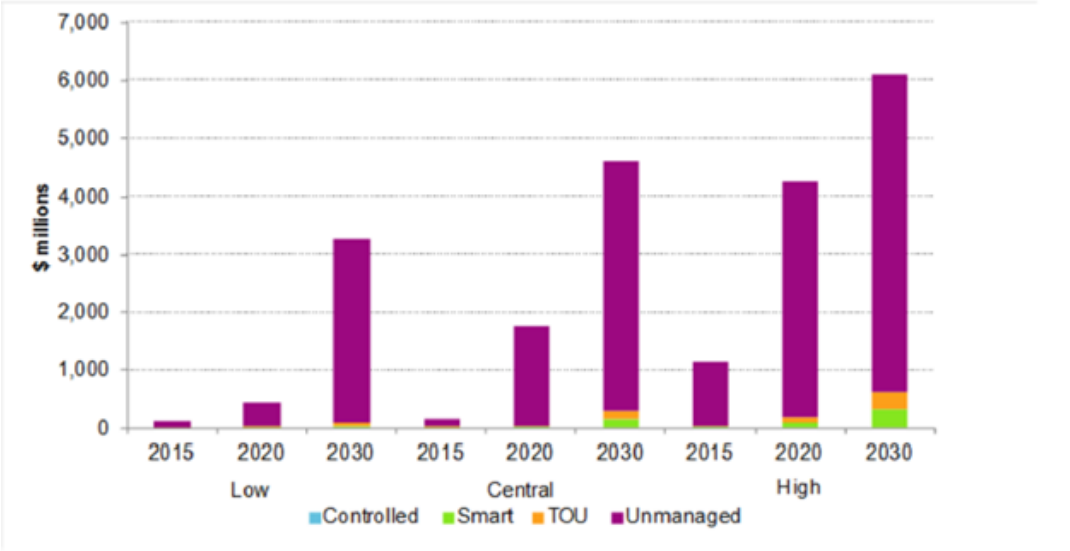
[3] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 65

[4] Dr C. Bucher, U. Schuster, D. Müller, A. Toller, Ripple control based control system for decentralised photovoltaic power plants, 18 September 2015, p1

This finding is line with our expectation that where networks control the power factor and outage then more customers can access the service and remain in operation to realise the benefits.

It is also likely that batteries will be used to curtail energy consumption during peak periods and charged during off-peak periods. This re-charging may coincide with existing off-peak services or potential services such as Electric Vehicles (EV). This may result in the creation of an artificial peak period resulting in network augmentation. An AECOM report examining the potential impact of unmanaged charging found the following[5]:

Figure 33: Estimated cost (for both generation and network upgrades) of additional peak demand in NEM ($ millions undiscounted)



Source: AECOM

Table 31: Estimated cost to meet additional system peak demand in the NEM

	Estimated cost to meet additional system peak demand ($)	
Charge management option	2020	2030
Unmanaged	1.8 billion	4.6 billion
Time of use	45 million	284 million
Smart charging	23 million	142 million
Controlled charging	0	0

Source: AECOM

It is critical that networks are able to effectively participate in these emerging markets and manage the potential impacts as required. In addition to the artificial peak issue, Attachment A to this response provides an overview of other network issues that may arise from the unmanaged use of storage technology. The attachment is not an exhaustive list but simply illustrative of some the issues networks may face in the future.

As outlined in Attachment A, some networks are already experiencing issues from synchronised events caused by battery storage and generation devices. Networks like Ergon Energy have developed tailored solutions to manage these issues. Essential Energy is also beginning to more frequently experience voltage rise issues on feeders with high penetration of PV. Ultimately, efficient distribution pricing may be able to address these issues by providing customers with efficient price signals to alter behaviour. However, this measure

[5] AECOM, Impact of electric vehicles and natural gas vehicles on the energy markets, 15 May 2012, p 65

cannot be solely relied upon as networks are still in the process of transitioning to more efficient tariffs which will also be contingent on the roll out of enabling metering technology. Therefore, at least in the interim, the NSW DNSPs consider that networks should maintain the ability to implement more direct forms of control if or when these unique issues arise.

Outside of special safety or reliability circumstances we consider the existing technical requirements (as recently modified) and voluntary load control programs are appropriate and will continue to facilitate the development of battery storage.

Service Classification

The NSW DNSPs agree with the AEMC that there is scope for the AER to classify storage for use by network businesses under existing service classifications. We accept the AEMC's broad categorisation of storage based services[6]:

Table 3.1 Potential functions provided by energy storage devices

	Function	Description
1	Network support	Services used by network businesses as an alternative to network augmentation to address network capacity or constraint issues. A storage asset could be used to address peak demand in a constrained transmission or distribution network by charging during times of low demand and discharging during peak demand events, thereby avoiding the need to upgrade existing network assets.
2	Quality and reliability of supply (NSCAS)	Network businesses must comply with the power system performance and quality of supply standards set out in schedule 5.1 of the NER.[37] Energy storage may assist with managing voltage imbalance, power factor correction, and various other power quality functions.
3	Market ancillary services	Services used by AEMO to manage the power system safely, securely and reliably. Frequency control ancillary services (FCAS) are market ancillary services, and are acquired by AEMO on a competitive basis as part of the spot market.[38]
4	Energy trading	The provision of electricity into the NEM. This can be thought of as similar to services provided by generators, except energy storage would draw energy from the grid during low price periods and discharge energy into the NEM during periods of high price.

We also support the AEMC's view that storage used to provide 'network support' and/or 'quality reliability of supply' services are likely to be classified as standard control services whilst 'market ancillary services' and 'energy trading' are more likely to be unclassified.[7] This is a technologically neutral approach to service classification that examines the service provided rather than the underlying technology.

However, there appears to be uncertainty as to the appropriate treatment of storage solutions between the AEMC and AER. The AER's recent Framework and Approach decision for the Victorian DNSPs addressed the issue of non-traditional investment with respect to a request from United Energy. In this instance, the AER automatically classified behind-the-meter services as standard control as the assets installed in the customers' premises would form part of a 'distribution system'. The AEMC considers this conclusion is not self-evident and

[6] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 24
[7] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 33

there is ambiguity under the NER.[8] It will be important for the AER and AEMC to consult on this issue and form a consistent and clear view in order to provide stakeholders sufficient certainty to invest in these solutions.

The NSW DNSPs do not consider there is ambiguity within the distribution service classification framework that requires clarification. The guiding principles contained under clause 6.2.2(c) of the NER are appropriate. In forming a view, it appears the AEMC has placed significant weight on clause 6.2.2(c)(1) which requires the AER to consider the potential for development of competition in the relevant market and how the classification might influence that potential. A key issue identified in the direction paper is whether:

> *allowing the network business to finance a storage business from the regulatory asset base was likely to impede the development of competitive storage market, e.g., in customer-facing applications, or in the wholesale market.*[9]

The AEMC's preliminary view is:

> *that the provision of storage behind the meter is a contestable service and should therefore be unclassified. Networks should not be able to install storage behind the meter unless they do so through a ring-fenced business. Where storage behind the meter would be useful for providing network support, these services must be contracted from a third party or ring-fenced business. Storage used to provide services on the network would be subject to the AER's usual service classification.*[10]

This position is contradictory to the views outlined above regarding network support and quality and reliability of supply services. We consider this approach is narrow and inconsistent with the classification of services regulatory principles as it is not technologically neutral. Classifying a service by reference to the underlying technology or physical location of an asset is arbitrary and may prevent DNSPs from pursuing least cost options in addressing network needs. Such an outcome would be contrary to the long term interests of customers and the NEO.

The NSW DNSPs consider the principles in the NER should be applied in a technologically neutral manner as intended. It is the services contained in table 3.1 of the discussions paper (see above) that should be subject to AER classification. In circumstances where a storage solution is providing energy trading or a market ancillary service then it should be an unregulated activity. In applying clause 6.2.2(c)(1) of the NER the relevant "market" to consider is the market for network support and quality and reliability of supply services. We consider these services provide a shared distribution service and are not contestable; therefore these are standard control services. Behind-the-meter storage would only be categorically contestable if network support and quality and reliability of supply services were re-classified as contestable, which is unlikely in the near future.

Ownership

The AEMC considers various modes of control for the roll-out of storage technology and potential behaviours which could threaten competitive neutrality to the detriment of customers. Broadly, the AEMC considers the following issues require safeguards:

1. *The network business is able to cross-subsidise a competitive service from its regulated activities. A cross-subsidy may impede competition in the competitive market.*
2. *In the course of performing its regulated activities, the network business acquires commercially sensitive information that may provide it with an advantage in a competitive market. Metering data or load profile data are examples.*

[8] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 31
[9] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 31
[10] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 59

3. *The network business is able to restrict competition in a competitive market by restricting access to infrastructure or providing access on less favourable terms than to its affiliate.*[11]

In order to promote fair competition in storage technology and to prevent these issues from arising the AEMC considers ring-fencing is required:

> *It will be very important that strict ring-fencing provisions are in place for network businesses looking to set up separate entities to install storage behind the meter. These provisions must prevent any ability of the network to favour affiliated businesses or provide advantage to the affiliate in areas like connection processes. Strong enforcement and compliance obligations will also be required to give the market confidence that a level playing field is being maintained.*[12]

The NSW DNSPs consider that ring fencing may have a role to play in ensuring a level playing field is maintained and that DNSPs do not cross subsidise or use their influence as a monopoly in the market to unfairly disadvantage competitors. However, the potential for this to occur does not in itself automatically justify the imposition of prescriptive ring fencing requirements. Rather, the requirements should be proportionate to the issue having regard to whether any existing mechanisms address the behaviour the AEMC is concerned might occur. It is inappropriate to advocate for prescriptive regulation without proper analysis of whether existing mechanisms address or in part address the issue of a DNSP improperly using its market power in competitive markets to the detriment of other participants. This is because the imposition of regulation is by its very nature intrusive and costly. To impose prescriptive regulation where there is no demonstrated need for such a level of prescription will result in outcomes contrary to the NEO, as it may result in duplicative obligations, distort efficient investment and is likely to stifle innovation.

We consider that ring fencing should not preclude DNSPs from being able to deploy battery storage behind-the-meter, where it is for the purpose of providing a network service (otherwise it should be ring-fenced), as it is unlikely that this will interfere with the competitive market. As discussed above, the location of a solution should not determine the service classification or the ring-fencing provisions to apply.

An evidence based approach is required to determine whether storage technology is dependent on monopoly assets and whether anti-competitive behaviour by networks inappropriately leveraging their monopoly assets could impact storage solutions. The costs involved in establishing ring-fencing arrangements, including the potential loss of integration benefits and efficiencies should also be assessed to ensure a proportional response is adopted.

In our view, there is no evidence to suggest networks have, under current arrangements, exerted improper control over storage solutions to the detriment of the market. Rather, we consider local experiences and international examples demonstrate that electricity distributors play a key role in developing alternative technologies and are often incentivised to do so by regulatory authorities.

Further, the existing regulatory framework contains sufficient measures to address the three potential issues raised by the AEMC quoted above. Specifically:

1. Cross subsidisation: The cost-allocation methodology and shared asset guideline prevents networks from cross-subsidising unregulated activities and/or unfairly profiting from its regulated activities and assets.
2. Information advantage: It is unclear what “commercially sensitive information” networks could unfairly obtain and use. Recent rule changes ensure that customers, or their agents, can obtain metering information. Networks are also required to provide zone substation data on request and publicly disclose various demand

[11] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 66
[12] AEMC , Integration of Storage: Regulatory Implications, Draft report, 9 October 2015, p 59

forecasts and load information in regulatory proposals, RINs and Planning Reports. Under the NSW DNSP ring fencing guideline the issue of sensitive information being used by the DNSP's contestable business (and previously when the NSW DNSPs were vertically integrated with Retail businesses) has been successfully addressed through the establishment of "Chinese walls" arrangements for IT and physical separation rather than the imposition of more stringent ring fencing requirements.

3. Restricting network access: Connection agreements and offers are subject to AER approval. The regulatory investment test process also provides stakeholders an opportunity to submit alternative network solutions which DNSPs must consider.

The NSW DNSPs consider the need for ring-fencing of battery storage technology should be explored further. It will be important that the AEMC and AER consult on this issue further before any recommendation is made. The NSW DNSPs consider that ring fencing guidelines are likely to be most effective if they are well targeted and represent a proportionate response to the potential for DNSPs to exert monopoly power in a competitive market to the detriment of other competitors. Given the recent reforms to metering and trends for emerging technologies and services the best way for ring fencing to achieve this objective would be through a principle based rather than a prescriptive approach. A principled approach to ring fencing guidelines would ensure that the guidelines were appropriately focused at addressing the issue and would be flexible enough to deal with emerging market issues. This would also allow appropriate time for the market to develop without unnecessary regulatory interference.

An inappropriate application of ring-fencing will be anti-competitive in imposing costs on networks and restrict their ability to participate in the market. This outcome would not be in the long term interests of customers nor promote the achievement of the NEO.

Consultation Questions

See attachment B to this response for the NSW DNSPs response to the AEMC's consultation questions.

Attachment A: Examples of potential network issues in integrating storage

This attachment provides a high level outline of three potential issues networks may face in integrating energy storage. In order to satisfy their obligations, networks are required to manage such issues where they could impact the quality and reliability of supply. The three potential issues discussed below are:

- Power Quality issues due to control of battery storage and PV
- Treatment of Energy storage (e.g. as a generator)
- Aggregation of Energy storage

Power Quality issue due to control of Battery Storage and PV

There is concern that combined battery storage and PV systems controlled for the purpose of load/generation levelling, where the charge/discharge of the batteries in relation to PV output is ramped directly proportional to the PV output, that control loop lag will cause a delay in the battery charger ramping down in synchronism with the PV ramp down rate. This difference will cause a Point of Common Coupling (PCC) import spike directly proportional to the charge rate before the PV step change. Such step changes of demand are known to cause significant power quality issues on the network, such as flicker, with the impact magnified on weak networks due to the high source impedance.

It is expected the lag (control loop response) will vary between units (inverters) but it is predicted cloud cover will synchronise each lag event (small or large, dependent on control loop response) with other nearby units. This generates concern for residential energy storage and combined PV units controlled for load/generation levelling, with accumulative units potentially causing significant power quality issues on the surrounding network.

For a premise with PV only (i.e. no battery storage), the connection point varies between the existing site load with no PV (maximum import) and the maximum output of the PV with no load (maximum export). Introducing a battery storage system and control for load/generation levelling with a control loop lag results in the connection point (PCC) import magnitude increasing, with a demand variance up the battery storage maximum charge rate and site load (maximum import) to the maximum PV output (maximum export) at no load, effectively doubling the power quality impact where the max charge/discharge control of the batteries matches the PV maximum output.

Error! Reference source not found. presents the worst case scenario where the battery control system does not respond until the solar output has reduced to zero, causing an import spike at the Point of Common Coupling (PCC) equal to the battery charging rate, followed by the solar output ramping back to maximum output when the battery charger remains at zero resulting in an export spike equal to the solar maximum output. It should be noted that with high density units connected to the local network, the presented import and export spike may constructively add between units resulting in significant power quality issues.

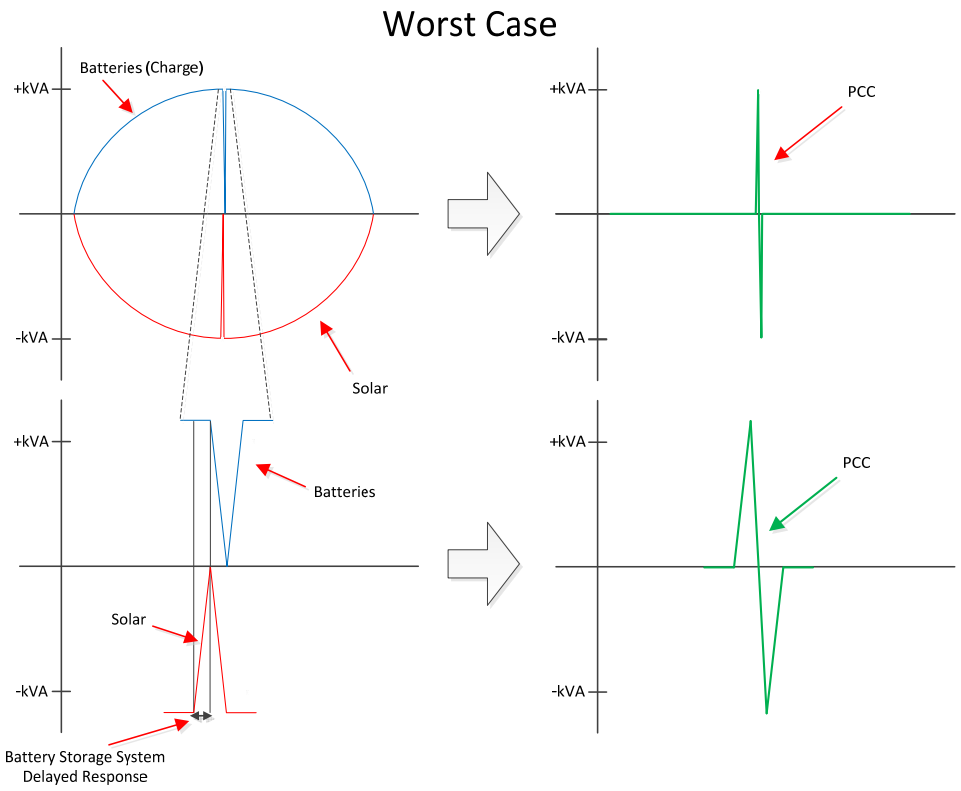


Figure 1: Worst Case - Battery Control Delay Causing Import & Export Equal to the Solar Output

Figure 2 presents the best case scenario, where the battery charger matches the solar output with no import/export spikes measured at the PCC.

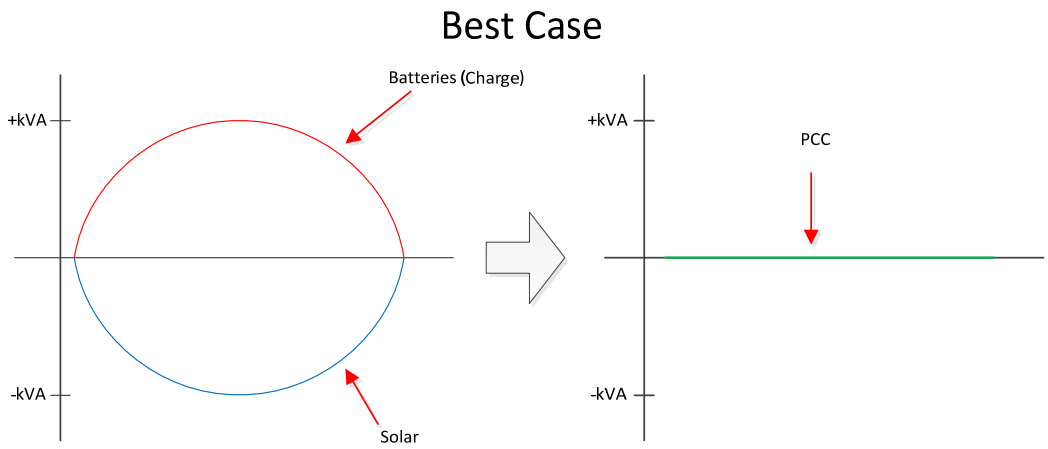


Figure 2: Best Case - Battery Charging Matches Solar Output

An example of combined PV (6kW) + battery storage (5kW) controlled for load/generation levelling with a control loop lag is presented in the figure below. 6kW of PV now added with 5kW of battery storage can result in 11kW variance due to lag of the control loop.

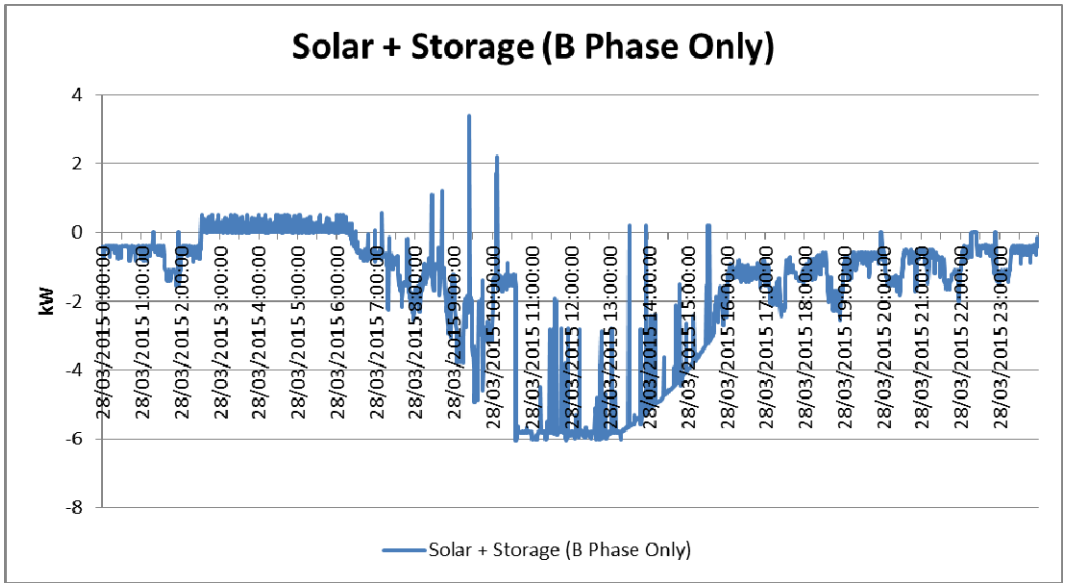


Figure 3: Example of Battery Storage and PV Controlled for Load Leveling

Treatment of Energy Storage

Figure 4, Figure 5, and Figure 6 present various premise configurations with equal voltage swing (ΔV) at the PCC. It should be noted that equal source impedance and underlying load (No Load) was used to calculate the voltage swing at each premise.

- Figure 4 presents the maximum voltage swing experienced at a premise with 3kW of PV installed. It is evident that the premise experiences a voltage rise at the PCC with reference to zero export.
- Figure 5 presents the maximum voltage swing experienced at a premise with a 1.5kW BESS installed. It is evident that the premise experiences both a voltage rise and voltage drop at the PCC with reference to max export (BESS Discharging) and max import (BESS Charging) capabilities of the premise.
- Figure 6 presents the maximum voltage swing experienced at a premise with 1kW of PV installed and a 1kW BESS. It is evident that the premise experiences both a voltage rise and voltage drop at the PCC with reference to max export (BESS Discharging + PV Generation) and max import (BESS Charging) capabilities of the premise.

Therefore a premise with a BESS produces twice the network voltage swing at the PCC compared to a premise with PV (rating equal to the BESS) only. Furthermore, a premise with both PV and a BESS produces a voltage swing on the network three times that experienced at a premise with PV (rating equal to the BESS) only.

Installation Type	Rated Output for equal voltage swing (ΔV)
PV only	3kW
BESS only	1.5kW
PV and BESS	1kW and 1kW

For voltage constrained networks a BESS should not be treated as the equivalent of a generator or load, however a BESS can be treated as the equivalent of a generator and load.

Voltage Swing and Network Capacity

The network voltage swing (ΔV) at the PCC is proportional to the change in load current and source impedance. Therefore larger voltage swings are experienced on high impedance networks (weak networks), such as long radial feeders and/or networks built with high ohm/km conductor (i.e. steel) with the same load current compared to mesh networks and/or shorter length feeders. Voltage swing is typically the limiting factor determining the supply capacity of high impedance networks, while for low impedance networks the limiting factor is typically the physical thermal rating of the conductor.

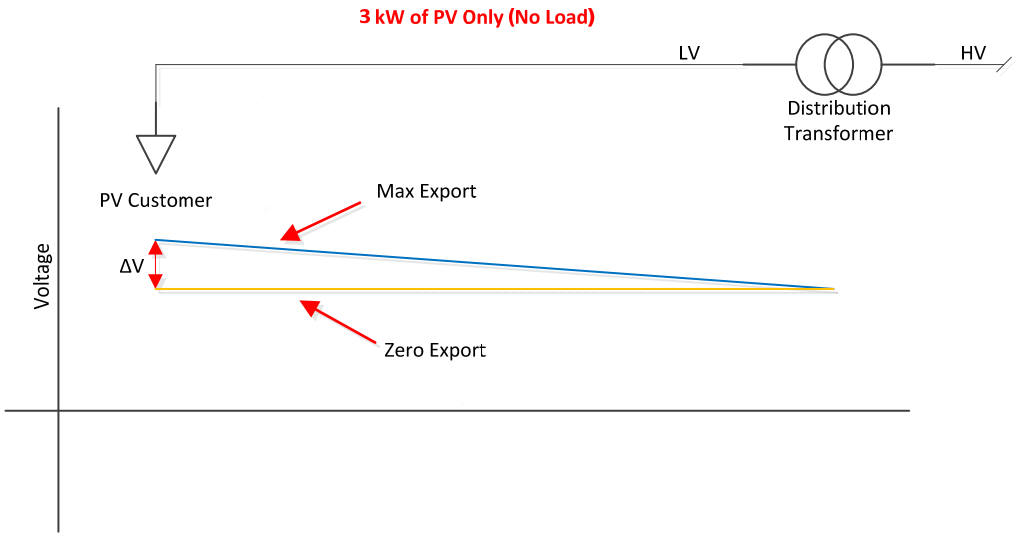


Figure 4: Premise with 3kW of PV (No Load) - Change in Voltage Profile

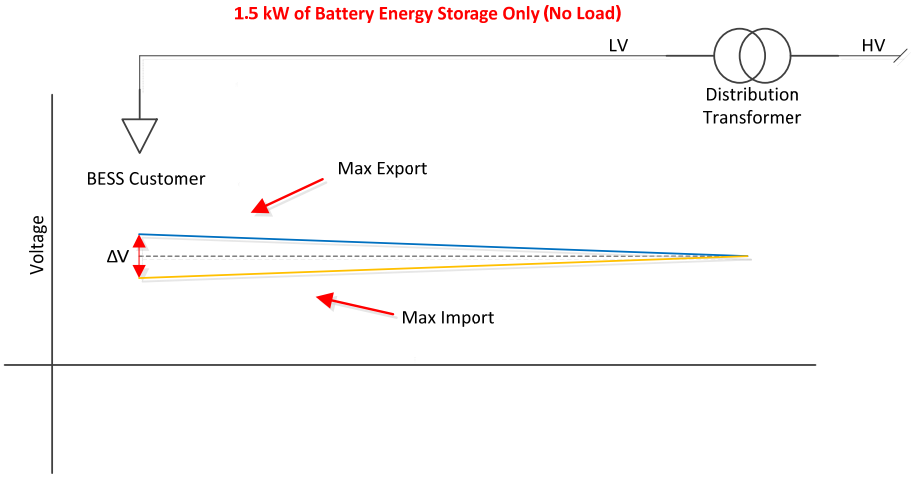


Figure 5: Premise with 1.5 kW of Battery Storage Only (No Load) - Change in Voltage Profile

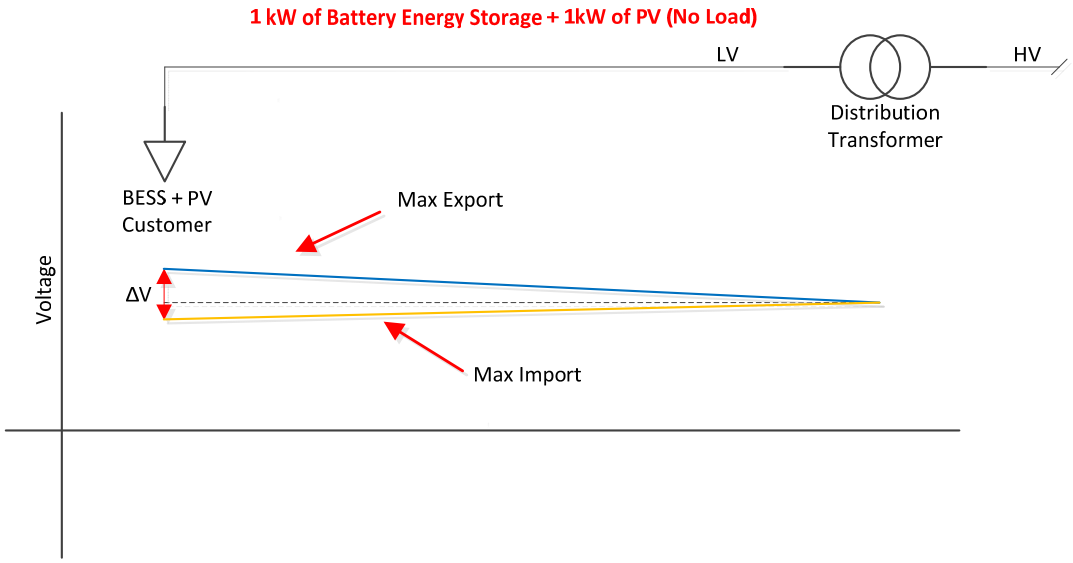


Figure 6: Premise with 1kW of Battery Energy Storage and 1kW of PV (No Load) - Change in Voltage Profile

Potential Issues from the Aggregation of BESS

Based on the potential network issues discussed, there is concern that increasing the number of BESS units connected to common network assets that synchronised (loss of diversity) control (i.e. cloud flicker, aggregator control) may magnify such issues, particularly on weak networks due to the high source impedance.

Such issues caused by synchronised events are already being experienced on networks across Australia. Ergon Energy for example has placed restrictions on the export capacity of PV inverters based on network locality due to voltage rise issues experienced from high density units exporting to the grid simultaneously. Similarly, Essential Energy has also experienced voltage rise issues on feeders with high penetration of PV.

Attachment B: NSW DNSPs response to the AEMC's consultation questions

Proposed scope of work

1. **Do stakeholders agree that the appropriate scope for the AEMC's work is the NEL and the NER as they relate to the integration of energy storage?**

Yes, however the NSW DNSPs note that the NEL and NER are technologically neutral and this should be maintained in any amendments (if required). We also note that jurisdictional regulations such as the NSW Service and Installation Rules and Industry Standards such as AS 4777 will also be relevant considerations.

2. **Are there elements of the current consumer protection framework that need to be reviewed in relation to the penetration of energy storage?**

We consider the existing framework accommodates storage although consumer groups may be in a better position to comment on this issue.

3. **Are there jurisdictional and sub-jurisdictional instruments relevant to energy storage that the AEMC should also consider?**

Yes, Service and Installation Rules in NSW, Environment Protection Authority (regarding emissions or noise), Building Code (BCA) requirements and any Council requirements (regarding noise for example) may require consideration.

End users and aggregators using storage

1. **Connection processes are new and still being implemented. Do you anticipate any issues with the connection process associated with storage?**

We consider the connection process for micro embedded generators has a good level of maturity and it can be readily adapted to accommodate storage systems.

For example, Ausgrid has recently added extra categories to the connection forms for battery as a type of generation, and have already received and accepted applications for battery systems using the existing connection processes. It will be important to educate customers and electricians to ensure there is compliance with the connection processes and procedures. For instance, the addition of a battery to a solar system should be regarded as an upgrade to the micro generator at the site which requires connection paperwork be completed and submitted to Ausgrid. However, this issue of awareness and compliance would be present for both a new or amended connection process.

2. **Do connection processes represent a barrier to storage? If so, what specifically is the issue?**

No. These requirements and processes are necessary to ensure we meet our obligations to operate a safe and reliable network. We also note that our processes are subject to consultation, review and approval through the determination process and there has not been any negative feedback to note regarding our micro embedded generator connection processes to date.

See the main response 'technical requirements and network load control' section for additional detail.

3. **Should DNSPs be required to have a connection offering that separately addresses the connection of micro storage capability?**

No, we consider the current processes accommodate storage. We consider the generator characteristic of the storage device should continue to be treated as a generator. Whilst the load characteristic be addressed through standard rules and processes – for instance the NSW Service and Installation Rules. For example, if the storage device has a large charging capacity then it may involve upgrades to metering, service mains or fuses or further electrical work and relevant Notice of Service Works (NOSW) and Certificate of Compliance Electrical Work (CCEW) paperwork processes should be followed.

4. **Do connection costs represent a significant barrier to storage? If so, what specifically is the issue?**

No, it is important the distinction between cost reflective price signals and cost barriers is understood. We consider the cost of the capital equipment borne by the customer is a legitimate cost. If the cost of the equipment is high for legitimate reasons (a relatively new technology for instance) then this is a legitimate cost. Equally, there are costs distributors incur in assessing voltage levels for larger micro embedded generator units. These costs are passed through to customer through connection charges which are regulated

5. **Would a separate industry standard for the connection of small or micro storage assets to a distribution network be appropriate? If so, what should be included?**

We consider the existing suite of standards/guidelines should be sufficient with AS 4777 being the core reference document. This standard has already been recently amended to better accommodate energy storage whilst other reviews by relevant industry bodies (e.g. Clean Energy Council and Standards Australia) are already under way.

For instance, Standards Group EL-042 (Renewable Energy Power Systems) is drafting AS/NZS 5139 Electrical Installations – Safety of battery systems for use in inverter energy systems. Also, 4755.3.5 - Interaction of demand response enabling devices and electrical products—Operational instructions and connections for grid-connected Electrical Energy Storage (EES) Systems is in draft and potentially be referenced once finalised.

Individual jurisdictions may also impose additional requirements via Service Rules and/or legislation that can tailor standards for local conditions, and also by reference to Clean Energy Council or other industry body's guidelines.

6. **Do storage systems have characteristics, either individually or in aggregate, that mean regulation through the retail exemptions framework set out above is inappropriate for the relevant value stream? For example, there is no limit on the number or size of generating units a small generation aggregator can aggregate and so sell into the wholesale market. Does this present a concern?**

Such issues may not arise until the market matures and we gain greater experience. However, we consider there is the potential for a large number of smaller systems aggregated in a certain location to create localised network issues. Aggregators will operate the batteries to their, and their customers, benefit without regard to network constraints which may create network issues. For example, if all storage systems discharged at a high pool price time or called upon to charge at the same time. If there was a high enough level of penetration in this instance it would lead to a high voltage cutout of solar generators further down the LV distributor. These potential issues may arise if the system operator has no knowledge of the loads controlled by other providers or if there is no ability to impose limitations or manage such issues.

7. **Aggregating parties would be required to register with AEMO if they intend to participate in the NEM. Will this provide any kind of barrier?**

We consider it is necessary that AEMO or the aggregating parties notify their DNSP. This will provide networks with some visibility of their network and assist in contacting the aggregators for demand management projects. We do not consider this will create any cost barriers as there is no obvious difference between a storage system and any other generator.

8. **Does standard AS 4777 represent a potential barrier to the deployment of storage by providers other than networks? What elements of the standard are problematic?**

See main response, 'technical requirements and network load control' section for a detailed response.

Overall, we consider AS 4777 is an enabler for storage rather than a barrier as well as being necessary for the safe and reliable operation of the device and network. Whilst the standard is primarily focused on safety issues it has recently been redrafted to amend or introduce the following features:

(i) Safety: including voltage and frequency cut-out limits and anti-islanding specifications;

(ii) Demand management (ref AS4777.2:2015 Sect 6.2): The standard only requires DRM0 (Disconnect the device), the other modes are optional and theoretically available for any party to use provided the inverter is equipped with the capability.

(ii) Power quality support (ref AS4777.2:2015 Sect 6.3): No elements of the standard are seen to be problematic, the provision of power quality support modes are optional.

It is important to note that the majority of demand response and power quality support control functions are optional and flexibility is provided to utilise this functionality via an external device or integrated into the inverter. Also, the newly added standard control functionality can be utilised by various providers, not just the DNSP, and would require agreement with the customer or owner of the equipment.

The introduction of a standard functionality for Demand Response Modes or power quality support on inverter energy systems may enable providers (aggregators and retailers) to use this standard control functionality at a lower cost than developing more sophisticated control software and communication platforms that rely on multiple propriety control systems supplied by different battery manufacturers. Standardising control functions may provide additional value streams for a customer who installs a battery and may be able to "sell" back network support services directly to the network or through an aggregator or retailer.

In addition, introduction of a mainly optional minimum standard for control functionality does not exclude providers from developing and using other more sophisticated methods of controlling storage devices. As an example, various networks including NSW networks have been able to take advantage of the optional Demand Response Modes introduced through the AS4755.3.1 standard that have been incorporated into certain models of air conditioners. This has enabled programs to be offered to customers at a lower cost than would otherwise have been achieved using alternative methods of control. Other providers such as aggregators and retailers are not excluded from utilising this standard control functionality to provide services.

9. **Should aggregators be able to offer FCAS? If no, why not?**

No Comment

10. **What are the technical or data requirements that would need to be addressed?**

No Comment

Network businesses integrating storage

1. **Do stakeholders agree that there may be tensions and ambiguities within the distribution service classification framework that would benefit from clarification?**

See main response, 'Service classification' section for detailed response.

No, we consider the distribution service classification framework is appropriate. However, the differing views of the AER and AEMC on this matter are problematic and require clarification.

The proper application of the guidance provided in the rules will contribute to the achievement of the NEO. It is the service which should be classified rather than the underlying technology. A focus on the latter results in illogical and arbitrary outcomes that are inconsistent with the NER framework.

2. **Do these issues relate in particular to the potential for development of competition in the provision of energy services from storage?**

No, the classification of a service should not inhibit competition in storage technology. Storage technology may provide both contestable and non-contestable services.

3. **How should network business-controlled storage on the network be regulated – as standard or alternative control, or other?**

We consider this question is not technologically neutral and therefore misdirected. The AEMC have correctly identified the four categories of services battery storage may provide. It is these four services that should be classified. Energy storage is simply a solution that enables the provision of a service; the technology itself is not a service.

Some of the potential services energy storage can enable will be unregulated whilst others (such as network support) will be regulated functions. A network business should not be precluded from pursuing the least cost, efficient option and classifying a technology rather than the service may result in this to the detriment of customers.

4. **Do stakeholders agree that the current rules applicable to networks are capable of integrating storage?**

Yes

5. **Is the incentive framework for distribution and transmission businesses creating any barrier to the deployment of storage where it is cost effective to do so?**

We consider the incentive framework is sufficient however the inappropriate application of the incentive schemes will act as a barrier to deployment of storage.

For example, in recent decisions the AER has rejected expenditure on trials of alternative network solutions under the premise that it may result in a reliability benefit and be funded through the STPIS. It is unlikely small scale pilots or trials will have a discernible STPIS impact (if so it could be confined in any STPIS calculations). We consider the DMIA is designed to provide incentives for DNSPs to investigate and research demand management programs. Whilst the DMIS, when implemented, will offer incentives to support the implementation of DM solutions, of which storage may be one, to meet network needs.

We consider the relationship of the DMIA and DMIS with the STPIS should be clarified. There may be a barrier to deployment of storage if no funding is provided for these programs and it is instead postulated that a potential STPIS benefit will fund the program.

6. **Given the relatively unproven nature of battery storage should it be treated differently to other assets?**

No we consider a technological neutral approach is required. Special treatment of a particular technology may introduce an investment bias which would not be efficient. The DMIA provides the appropriate funding path for the testing and trial of innovative non-network solutions such as battery storage.

7. **Are any of the timelines associated with regulatory processes likely to be problematic? — For instance are the lead times in the planning process sufficiently long to capture the value of an incremental storage solution as substitute for traditional network investment?**

Consultation periods for non-network alternatives in RIT-D are still relatively untested and we would not recommend altering them until there is evidence that they are insufficient. Any long term incremental benefit derived from customer activity would be captured in our annual spatial demand forecast and would be no different to energy efficiency activities by customers for instance.

We do note that while the incremental introduction of small scale storage in a particular network area might be found to be the least cost solution, this is no different to similar non-network alternatives such as small scale embedded generation, load control (air conditioner, hot water etc.) or energy efficiency. Extending lead times would only impose planning schedules on networks that might be inefficient.

8. **Would current ring fencing guidelines address any concerns about a TNSP being able to impact the wholesale market or does storage raise unique issues? If changes are required, what are they?**

See main response, ‘Ownership’ section.

9. **What will be required in the ring fencing guidelines to maximise the benefit of network use of storage?**

We do not agree with the underlying assumptions in this question. The question assumes ring-fencing will be required and that maximising the use of storage is the appropriate goal.

The NEO will be achieved by promoting the efficient and prudent operation of and investment in the electricity network. This objective is technologically neutral; it may be achieved by maximising energy storage or through a combination of network and non-network investment. It should not be assumed that maximising energy storage will by default be the most desirable option.

We consider the need for ring-fencing has not yet been established and a full, evidenced based review is required. See main response, 'Ownership' section for our detailed views on this issue.

10. **What will be required in the ring fencing guidelines to minimise a network business's ability to unduly impact a contestable market?**

As above, we do not consider it has been established that networks have the ability to unduly impact the energy storage market. Nor has it been established that if the potential for anti-competitive behaviour does exist, that ring-fencing is the proportionate response to the issue rather than the existing regulatory framework. See main response, 'Ownership' section for our detailed views on this issue.

11. **The current cost allocation arrangements do not appear to raise any issues in relation to the use of storage assets. Do you agree?**

Yes and we consider these arrangements obviate the need for ring-fencing.

12. **The current shared asset arrangements do not appear to raise any issues in relation to the use of storage assets. Do you agree?**

Yes and we consider these arrangements obviate the need for ring-fencing.

Ownership and control

1. **Are the connection requirements that are being imposed by different distribution businesses for consumer- or retailer-controlled storage being used as a barrier? If so, how?**

See main response, 'connections' and 'technical requirements and network load control' sections for detailed response.

No, we do not consider there is any evidence to suggest that connection requirements are being used as a barrier.

The connection requirements mainly refer to AS4777 which is concerned with safety and reliability. The distribution business generally does not impose any further restrictions than to independently developed standards.

Our connection agreements are governed by the NER, meaning they are subject to review, consultation and approval from the AER.

2. **Does the ongoing degree of control that is being required by distribution businesses for consumer- or retailer-controlled storage represent a genuine safety, security or reliability need, or is it more appropriately a network interest that should be negotiated or signalled through prices?**

See main response, 'connections' and 'technical requirements and network load control' sections for detailed response.

As detailed in our main response we are not sure what the AEMC are referring to by "the ongoing degree of control". Any degree of control is primarily governed by regulating authorities external to a DNSP. Any additional forms of load control are negotiated and entered into with the agreement of the customer (for example hot-water load control for off-peak pricing).

The technical requirements are necessary for the safety and reliability of the network. Further, the demand response modes in AS 4777 simply standardise the control functionality. This standardised control can be utilised by networks, retailers or aggregators and is designed to facilitate customer choice and enable the customer to access (and benefit from) more cost reflective price signals.

Storage at the wholesale electricity level

1. **Is more clarity required in the definition of a 'generating unit'? If so, what changes would be necessary? How would such changes be necessary to preserve the registration requirements and eligibility criteria currently in place for generators?**

No Comment

2. **Are current registration requirements appropriate for storage that may be used both as generation and load? Should a person operating storage to both buy and sell electricity through the spot market be required to register as both a market customer and a generator?**

No Comment

3. **Do you see any issues with the current connections framework? For storage as a generator? For storage as a load?**

No Comment

4. **Do performance standards represent a barrier to storage connection? For storage as a generator? For storage as a load?**

No Comment

5. **Is there anything unique about the use of storage devices that makes the existing arrangements regarding fees/charges for participation in the NEM not fit for purpose?**

No

6. **What are the implications of current arrangements for ancillary service provision and cost recovery for storage?**

No Comment

7. **Are there other services that could potentially be provided by storage – such as a substitute for inertia through very fast response services – and does a lack of a market for these represent a potential barrier or opportunity?**

No Comment

Attachment C: Summary of NSW DNSPs response to the AEMC's preliminary findings.

End users and aggregators using storage

The analysis has led the AEMC to make the following findings:

1. **The existing connection process under the NER for micro-embedded generation appears to accommodate a consumer seeking to install storage behind the meter.**

We agree with this position

However, there may be value in DNSPs being required to have a basic connection offering that separately addresses the connection of storage capability.

We consider the existing arrangements (with minor amendments as required) will suffice and an additional basic connection offer service will not add value. A storage device is currently treated as both a load and a generator. There are existing rules, standards, guidelines and processes for both connecting load and connecting micro-generation and we consider both should be followed for a storage device

2. **The technical requirements that apply to storage behind a customer's meter should be investigated to assess their appropriateness and whether there is potential for standardisation.**

— Consider a review of the different requirements being applied to behind-the-meter storage by distributors in different regions.

We would be supportive of a review but consider any requirements are likely to be the same as those which currently apply for micro embedded generation. Generally, we support standardisation as it will provide certainty to customers and the installers. It will also make it easier for networks to process and approve the applications.

However, if there is any material difference in how devices are treated between networks, the review should also consider the context of each network. It may be appropriate for networks to tailor certain standards to the circumstances of their respective network. For example, some networks have much higher penetration of micro embedded generation and have implemented different connection processes because of network safety and reliability concerns arising from high penetrations.

— Consider whether the technical requirements, including AS 4777, give network businesses too much control over what is connected to their networks, both in terms of:

(i) specification of the equipment and technical performance; and

AS4777 is an Australian standard for inverters that simply seeks to ensure the products manufactured are safe and meet the requirements of what the product should do. This standard is necessary to allow networks to maintain a safe and reliable network.

More generally, it is not clear how this standard imposes an unreasonable degree of control on customers. The standardised control functions can be accessed by networks, retailers and aggregators under the recent amendments. This provides customers choice and certainty as to the functions they can negotiate for at a minimum.

We suggest that the AEMC consult with Standards Australia and raises any concerns with the Standards committee.

(ii) remote control.

In our view, AS4777 and AS4755 provides networks the same opportunities as retailers and aggregators to provide control services to customers. As noted above, AS4777 only sets the manufacturing standard; networks (or any other party) are still required to negotiate voluntary contractual arrangements with customers.

3. **We recommend investigating, for the existing registration category of small generator aggregator, whether the ensuing rights and obligations are suited to storage behind the meter, for instance thresholds on what can be offered into competitive markets, and if so when scheduling requirements would apply.**

— Consideration should also be given to whether the operation of end-user storage – either individually or in aggregate – creates system operation or network operation concerns. This is discussed in Chapter 4.

Yes, the NSW DNSPs believe this should be considered and investigated further

4. **We are of the view that small generation aggregators should be able to offer FCAS into the wholesale market. We therefore recommend that further consideration be given to whether there are any technical limitations to them doing so, and whether any changes to market arrangements and procedures (e.g., data validation) would be necessary to facilitate their participation in FCAS markets.**

Network businesses integrating storage

The analysis has led the AEMC to make the following preliminary findings:

1. **Service classification. There is scope for the AER to classify storage for use by network businesses under existing service classifications. It is the AEMC's preliminary view that the provision of storage behind the meter is a contestable service and should therefore be unclassified. Networks should not be able to install storage behind the meter unless they do so through a ring-fenced business. Where storage behind the meter would be useful for providing network support, these services must be contracted from a third party or ring-fenced business. Storage used to provide services on the network would be subject to the AER's usual service classification.**

We agree that there is current scope to classify the use of storage by network businesses under existing classifications. A similar example might be Ausgrid's portable truck-mounted Motor Generator (MG) sets, which are used for network support services (standard control service).

We consider that classification should be technology neutral as per the regulatory framework contained in the rules. It is premature and inappropriate to recommend that behind-the-meter storage is a contestable service that networks could only participate in through a ring-fenced business or contracted from a third party. This approach would be arbitrary and contrary to the best achievement of the NEO as it may preclude networks from pursuing least cost network options. Storage is simply a technological solution; it is the services it may provide that should be classified.

We consider network support services and quality reliability of supply services should be regulated activities irrespective of the location of an asset. Whilst market ancillary services or energy trading are contestable activities which should be unregulated.

— Metering for small customers has been treated as an alternative control service but in future advanced metering will be non-regulated and subject to competition. Similarly, storage technologies should also be considered in this way as a contestable service.

As above, this an arbitrary approach that is not technological neutral or consistent with the classification framework contained in the Rules. The potential for competition in the service should be considered, not the technology which provides the service. Storage technologies may be used to defer capital augmentation or improve reliability which are not contestable services. In the circumstance where owning storage assets and placing them behind-a-meter is assessed by the AER to be the most efficient solution to provide a regulated service then a network should not be precluded from doing so.

2. **Cost recovery. Once service classification is determined, the efficiency sharing incentives should lead network businesses to seek the most efficient trade-off between storage and traditional network assets, and between owning storage assets and procuring their services under contract. We do not recommend any blanket prohibitions on networks owning storage or requirements that they only competitively tender for storage services on their networks. It is unlikely that networks purchasing storage for their network will prevent the development of a competitive market for storage devices - given the amount of activity by retailers and direct sellers.**

We agree with this position, the existing framework will drive the best solution for the network and customers.

— We do not think extra powers are needed for AER to exclude non-proven technologies from the RAB.

Agreed

3. **Ring fencing. It will be very important that strict ring-fencing provisions are in place for network businesses looking to set up separate entities to install storage behind the meter. These provisions must prevent any ability of the network to favour affiliated businesses or provide advantage to the affiliate in areas like connection processes. Strong enforcement and compliance obligations will also be required to give the market confidence that a level playing field is being maintained. This is also applicable to transmission businesses looking to enter contestable markets.**

— Cross-ownership considerations may also need to be applied if the policy principles that underlie vertical separation of monopoly from competitive electricity activities are threatened – see next chapter.

The NSW DNSPs consider that ring fencing may have a role to play in ensuring a level playing field is maintained and that DNSPs do not cross subsidise or use their influence as a monopoly in the market to unfairly disadvantage competitors. However, the potential for this to occur does not in itself automatically justify the imposition of prescriptive ring fencing requirements. Rather, the requirements should be proportionate to the issue having regard to whether any existing mechanisms address the behaviour the AEMC is concerned might occur. It is inappropriate to advocate for prescriptive regulation without proper analysis of whether existing mechanisms address or in part address the issue of a DNSP improperly using its market power in competitive markets to the detriment of other participants. This is because the imposition of regulation is by its very nature intrusive and costly. To impose prescriptive regulation where there is no demonstrated need for such a level of prescription will result in outcomes contrary to the NEO, as it may result in duplicative obligations, distort efficient investment and is likely to stifle innovation.

We consider that ring fencing should not preclude DNSPs from being able to deploy battery storage behind-the-meter, where it is for the purpose of providing a network service (otherwise it should be ring-fenced), as it is unlikely that this will interfere with the competitive market. As discussed above, the location of a solution should not determine the service classification or the ring-fencing provisions to apply.

An evidence based approach is required to determine whether storage technology is dependent on monopoly assets and whether anti-competitive behaviour by networks inappropriately leveraging their monopoly assets could impact storage solutions. The costs involved in establishing ring-fencing arrangements, including the potential loss of integration benefits and efficiencies should also be assessed to ensure a proportional response is adopted.

In our view, there is no evidence to suggest networks have, under current arrangements, exerted improper control over storage solutions to the detriment of the market. Rather, we consider local experiences and international examples demonstrate that electricity distributors play a key role in developing alternative technologies and are often incentivised to do so by regulatory authorities.

4. **Annual planning process. The existing network planning requirements and investment tests should lead network businesses to consider storage as an alternative to traditional network solutions. The option value element of the investment test should also lead them to value the potentially incremental nature of a storage solution (as opposed to a "lumpy" network investment.) However, the lead times in the planning process should be reviewed to test whether they are sufficiently long to capture an incremental solution, especially one that needs to be implemented incrementally as loading of a network element increases in order to indefinitely defer an augmentation.**

Consultation periods for non-network alternatives in RIT-D are still relatively untested and we would not recommend altering them until there is evidence that they are insufficient.

We note that our processes can consider incremental demand reduction solutions. Any long term incremental benefit derived from customer activity would be captured in our annual spatial demand forecast and would be no different to energy efficiency activities by customers for instance. However these solutions (as with any others) must be firm and be able to be called upon to support the network when required.

Ownership and control

The analysis has led the AEMC to make the following preliminary findings:

1. **Storage has the potential to generate a number of value streams, but control of the device will be required for this to occur. The NEM's current framework is built on the idea that market-based outcomes tend to be the most efficient. Control of storage devices should therefore, in all but a narrow band of circumstances related to system security and safety, be based on market-based price signals.**

Ideally, a market-led approach and efficient distribution pricing would result in the efficient development and utilisation of battery storage. However, in this circumstance we consider there are barriers which exist that may prevent the efficient operation of market-based price signals. The benefit of certain network controls is that they may remove these barriers. For example, AS4777 s6.2 & s6.3 and AS4755 try to address this barrier by introducing a standard minimum control functionality that providers (retailers, networks and aggregators) may be able to use to control the device in standardised ways. Access to this minimum control functionality is not limited to networks only. Furthermore, it does not exclude other control solutions that the market may provide which may be more sophisticated.

2. **AEMO should investigate the potential system operation effects of a prevalence of distributed energy devices; in particular in a scenario with a lower amount of synchronous generation, identify issues and their extent.**

Agreed. Any review should cover the distribution network.

Competitive neutrality

The analysis has led the AEMC to make the following preliminary findings:

1. **Storage is a contestable service and participation of network businesses in this market must be done on a level playing field with other market participants. The market-led installation of storage is most likely to lead to efficient outcomes. The Commission would not recommend any policy decisions to actively encourage the deployment of storage by networks in contravention of a framework that assumes that competitive energy activities should be market-led.**

As previously noted, storage is a solution rather than a service. Storage may be used to provide both regulated and non-regulated services. Ring-fencing provisions may be appropriate where a network provides non-regulated services using a storage device. A technologically neutral approach and principle based approach is required to developing any ring-fencing guideline.

We also agree that in general, market led outcomes should be encouraged. However, in certain circumstances there are limitations preventing the market from providing an efficient price signal. Further, there is evidence which suggests that a network controlled integration of storage can enhance the value realised by customers. Contrary to the AEMC's preliminary view, other international regulatory bodies have sought to encourage and incentivise network participation in the deployment of innovative technologies such as storage.

To impose onerous regulatory requirements where there is no evidence to demonstrate the potential for a market failure to warrant additional regulation, and without undertaking a review to determine whether existing mechanisms already address the AEMC's concerns will result in outcomes contrary to the NEO as it will impose unnecessary costs, stifle innovation and inhibit competition to the detriment of consumers.

2. **It will be important to monitor the impact of ring-fencing requirements to ensure the vertical disaggregation of the electricity supply chain between regulated monopoly and competitive activities is maintained. In relation to energy storage, we take this to mean:**

(a) Network businesses should use energy storage where it substitutes for traditional network (not behind the meter), where it is efficient to do, so long as it does not significantly displace competitive energy services. It is appropriate for the storage to be financed from regulated expenditure to the extent that it is providing network services.

Agreed, however we require further information about what "displace competitive energy services" effectively means. A behind-the-meter storage solution which provides a regulated service is still subject to negotiation and agreement from the customer. It is not clear how a voluntary arrangement could displace a competitively provided service in this instance or how this would be inappropriate if it was replacing a previously negotiated service the customer has chosen to exit.

(b) If a network business installs storage on its network to provide network services, then its use for energy trading (or other competitive energy services) should be strongly separated from the regulated network business. The auctioning of energy trading rights from network-connected storage that has been proposed by Oncor, or the transfer of those benefits to a retailer in the ElectraNet trial, are attractive models.

Storage may be of potential value for regulated network services on both the customer and grid side of the meter. If it connected on the customer's side of the meter there are potential additional benefits (depending on operation) that may accrue to the customer through reduced electricity bills. If located on the network side of the meter these reduced electricity bill customer benefits would not be realised. Network ownership of storage allows more certainty around control, functionality and specifications in order to address the network regulated service possibly more reliably than price signals or customer rebates.

Where the storage solution is also used to provide energy services by the network then ring-fencing arrangements would be appropriate. As noted previously though, we consider a proper assessment is required before any recommendation can be made. Any ring-fencing arrangements should be principle based and proportionate to the potential issues identified.

Storage at the wholesale electricity level

The analysis has led the AEMC to make the following preliminary findings:

1. **We do not see the need for a new category of registered participant to be introduced for persons operating a storage device. A person seeking to participate in the NEM using a storage device should be registered according to the value stream from the storage device in relation to which that person intends to participate in the NEM. This would mean that the owner/operator of a storage device could be registered as a generator, customer, or both.**

2. **AEMO will need to be satisfied that the person intending to register can comply with the associated requirements of that role. It is not yet clear whether the obligations and requirements for each category of registered participant under the NER are appropriate to the operation of the storage device. For example, the following issues will need to be worked through:**

(a) whether the relevant technical standards are appropriate for the connection of a storage device;
(b) whether the thresholds for registration continue to be appropriate in the context of storage;
(c) the implications of registering in more than one category of registered participant, e.g., participant fees, prudential requirements and other financial obligations.

No comments