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6 October 2021

Ms Anna Collyer
Chair
Australian Energy Market Commission

By online submission (AEMC ERC0319, RRC0040)

Dear Ms Collyer,

Governance of distributed energy resources technical standards consultation paper – AEMO submission

Thank you for the opportunity to provide a submission to the AEMC's consultation on Governance of distributed energy resources (DER) technical standards Rule change proposal (the consultation paper).

AEMO considers the AEMC's consultation paper is an important step in a series of measures to ensure the ongoing secure, efficient and affordable operation of the National Electricity Market (NEM), as it integrates greater amounts of DER.

Context: The DER ecosystem

The rapid uptake of DER over the last decade has contributed to the transition of the energy sector from a one-directional system to a multi-faceted system. Our understanding of and ability to manage emerging DER impacts in the energy market, networks and the bulk power system needs to evolve at pace. Emergent system security risks, such as sensitivity to voltage disturbances leading to significant loss of DER from the power system, have arisen in the recent-past and issues are likely to continue as energy production, usage and associated markets grow.

Cyber security risks, and their scale given the growth in 'connected' devices and the number of actors that can interact with them, is also evolving continually. Capability to protect against and rapidly respond to these risks, which may require device level patching or other requirements, is imperative to maintaining a secure operating environment for the power system. Interoperability, data and performance capabilities for DER are all under development across a myriad of actors. Consistency between these capabilities is important to keep the power system secure and to deliver consumer outcomes such as choice of provider and cost efficiencies.

Original Equipment Manufacturers (OEMs) seek defined yet *minimum* technical standards as these deliver clarity, consistency and in-turn manufacturing efficiencies, while enabling innovation as OEMs, networks and service providers are free to develop enhanced functionality.

DER encompasses a broad spectrum of devices and coordinating systems and is an area subject to high levels of innovation, accessibility and uptake. Distributed solar photovoltaics have grown from micro-scale to now represent (in aggregate) the largest generator in the NEM; electric vehicles, consumer batteries and demand side response are at the beginning of their uptake curves and will likely replicate a similar trajectory. AEMO considers that an enhanced governance arrangement is required to coordinate DER technical standards for the long-term benefit of consumers. Continuing with the status quo is likely to lead to a disorganised and large pipeline of DER technical standard rule change requests from a variety of stakeholders, likely with overlapping scope and timing. An enhanced governance arrangement would help to manage the many changes required under a common vision.

Rule Change Proposal

The Rule change proposal recognises that DER requires a framework that can rapidly respond to this pace of change and at the same time be accountable. AEMO supports the Rule change proposal option for a new Governance Committee for DER Technical Standards (the Committee) to be convened on an 'as needs' basis. To deliver efficient and secure DER technical standards integration, the Committee's structure and its ongoing advisory roles should be established under the NER and capable of making DER technical standards for the NEM – including appropriate ability to manage compliance.

AEMO considers the AEMC should coordinate on-going operations of the Committee, including membership requirements. As market and system operator, AEMO would anticipate being a member of the Committee given its role in maintaining system security, power system operation and market operation. Funding for the Committee should be commensurate to the impact of DER on the power system and energy markets.

DER Governance Committee Role

AEMO agrees with the Rule change proposal that the Committee's role should be to monitor, review, develop, consult on and set direction and work program for DER technical standards, in collaboration with industry.

The Committee should be clearly accountable for recommendations to the Australian Energy Market Commission (the Commission) and direction in this space and thereby bring a coherent focus for DER technical standards.

The Committee should be able to consider appropriate Australian Standards or International Standards already in place if they are suitable, or facilitate the development of a new or updated Australian Standard. This would be subject to consultation and a fully accountable process with endorsement by the Commission.

This Committee structure complements existing processes in place in the NEM and the role of Standards Australia. Australian Standards have no requirement to be 'implemented or complied with' without a regulatory lever. By establishing a DER technical standards framework within the

NER with a dedicated Committee and ability to 'make' standards, this means the standards, if in the NER, have the option to have a compliance obligation. Existing workstreams in this space such as those under the Distributed Energy Integration Program (DEIP) coordinated by ARENA are essentially voluntary. The AEMC could consider using this Rule to formalise the DEIP structure under the Committee.

DER Governance Committee Scope

The AEMC will need to clarify the scope of the Committee's role with regards to DER technical standards. AEMO suggests that the Committee's role could relate to those systems and devices which in aggregate relate to or have an impact on the power system and energy markets including the network impacts. This approach provides a basis to place boundaries around the remit of the DER technical standards framework but ensures sufficient flexibility to allow future innovations to be included.

DER 'Device level' & 'Systems level' interface

Current arrangements for the connection and registration of large-scale energy resources (generation and market loads) ensures that there is coordination of technical performance, power system operations and market participation for Registered Participants. One entity is responsible for both market and technical compliance matters for each facility. This is in contrast to the existing arrangements for DER technical standards.

The development of aggregate DER-based market participation for small-scale resources by arrangements such as virtual power plants (VPPs) introduces a greater dispersal of accountability, particularly with respect to connection arrangements and technical performance matters for such 'aggregators'. While an aggregator may manage resources under their portfolio to meet market participation obligations, managing matters such as connection and technical compliance has limitations, particularly in an environment where flexibility and portability is of value to customers.

To ensure ongoing security of all levels of the network and power system and enable efficient market operations, it is imperative to ensure that there are mechanisms to set technical performance for parties managing DER devices – such as aggregators and other energy management service providers. This may be achieved through the application of standards – set and managed at the appropriate level. Complexity in the regulatory framework and the need for coordination arises, partly, through the mix of agents, for example:

- OEMs (for the inherent capability of their devices, and any future firmware changes).
- Installers (who set the local settings and ensure compliance with relevant standards at the time of connection).
- Device owners (who might also have the ability to amend device settings after the time of installation).
- NSPs – who set their own local connection requirements.

Minimum technical standards are required across the various 'layers' of networks, the power system and markets. This approach is further detailed and visually demonstrated in Attachment 1. Any DER Governance regime must consider how to deliver a coordinated approach between 'layers', such as the device level, DER aggregator and network systems. Standardisation efforts will require extensive coordination and collaboration across industry, informed by a whole-of-system architectural view of the future power system and its key actors, devices and interactions.

Coverage of DER 'device'

Further to 'behind-the-meter' device level DER, this framework could apply to distribution level rooftop solar, electric vehicles and energy management systems. AEMO envisions the Committee could lead the development of performance and capability standards for larger-sized DER systems that are not covered by either AS/NZS 4777.2 or the NER Schedule 5.2, for example systems connected at the medium voltage level.

Restricting the focus of this Committee to devices behind the meter would leave a significant gap in covering devices larger than this size but not covered by S5.2, which would then need to be addressed by a separate process. Given the scale and pace of change in the NEM, it would be a significant missed opportunity (and potentially security risk) if we don't simultaneously address the gap in standards for medium voltage connected DER

Currently, there is inconsistency as to the scope and applicability of existing requirements covering these devices in the NEM. Consistent national standards would provide developers and OEMs of larger scale DER, clarity and simplify modelling requirements.

Compliance

One of the very significant challenges for DER technical standards is to be able to apply some level of compliance with the requirements. Whilst well-defined technical capabilities are critical for system security, power system and market operation, the effectiveness of these requirements are limited by the extent to which compliance occurs, is monitored and addressed.

AEMO suggests the AEMC consider how compliance with various DER technical standards might be achieved. One area of interest is the upgrade and modification of firmware and device settings once installed. Both of these activities present opportunities and risk to be managed. It will be essential to clarify the respective responsibilities of the Australian Energy Regulator and Clean Energy Regulator in regards to compliance with new technology. The DER technical standards framework could bring the standards within the NER framework with the intent that they be complied with. Based on the latest insights emerging from AEMO's Engineering Framework gap analysis process, it may also be prudent to consider as part of this Rule change how obligations on OEMs can be brought into the Rules. There appear to be a growing number of risks associated with large scale generation and DER that might be most efficiently managed if stronger obligations were placed on OEMs

AEMO would welcome the opportunity to discuss this submission and be involved in further consideration of the DER technical standards governance arrangements, given the material impact on system security, the power system and energy markets.

Should you wish to discuss any of the matters raised in this submission please contact Kevin Ly, Group Manager Regulation on kevin.ly@aemo.com.au.

Yours sincerely,

Tony Chappel
Chief External Affairs Officer

Attachment 1: Coordination of DER Technical Enablers

Attachment 2: Responses to consultation questions

Attachment 1

Coordination of DER Technical Enablers and the Smart Grid Architecture Model

This attachment provides an example of a model to demonstrate the additional complexities and new challenges associated with DER. Maintaining the right outcomes for consumers and managing system security in the face of these 'layers' requires many actors to come together to share experience and expertise. While it is likely to remain appropriate for the AEMC to make the rules and apply the NEO. The complexity suggests that coordinate these layers requires enhanced governance arrangements to support the traditional rule making process – such as Committee.

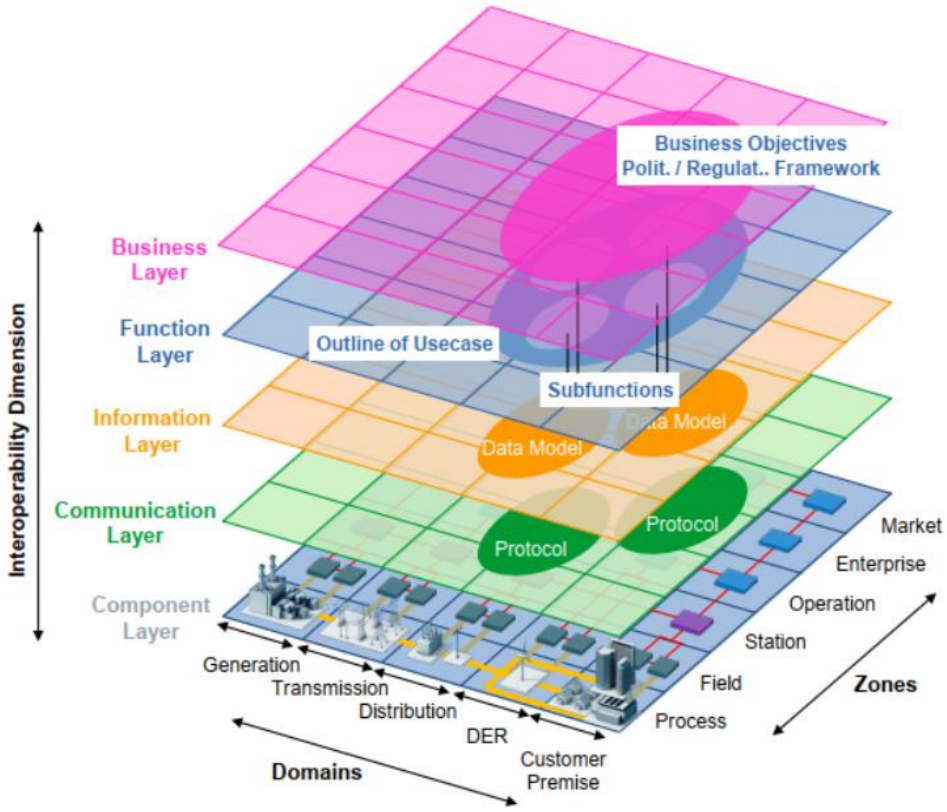
DER integration into the power system and markets at scale must be able to support devices and systems developed and operated by many different utilities and solution providers, and millions of industrial, business and residential end users. This encompasses multiple 'layers' of the power system and markets.

The smart grid architectural model (SGAM) is a commonly applied conceptual framework for understanding these various 'layers' - the cyber-physical (i.e. informational and electrical) interactions within the integrated power system.[1] The SGAM framework, illustrated below presents interactions between 'Domains', the components of the electricity supply chain, and the Zones, which are the necessary systems and processes within each Domain. Overlaid on this are several dimensions of interoperability between each Dimension and the Domains.

Interoperability within the integrated power system refers to the extent to which this 'system of systems' can work together, and demonstrates the coordination and consistency required between the various layers and 'participants' within the NEM to enable such functionality.

[1] The SGAM framework was formed in 2012 through the National Institute of Standards and Technology (in the U.S.) Smart Grid Interoperability Panel's development of a 'smart grid architecture conceptual model' defining domains, actors, and stakeholders associated with the integrated power system – then, further refined by the European Smart Grid Coordination Group Reference Architecture Working Group.

Figure 1: Smart grid architecture model (SGAM) conceptual framework for the integrated power system



Governance of distributed energy resources technical standards consultation paper – AEMO submission

Attachment 2 – AEMO response to consultation questions

<table>
<tr><th>Topic</th><th>Question</th><th>AEMO Response</th></tr>
<tr><td rowspan="2">Q1. Assessment Framework</td><td>1. Do you agree with the proposed framework?
Table 4.1: Proposed assessment framework<table><tr><th>OBJECTIVE</th><th>DESCRIPTION</th></tr><tr><td>Security and reliability</td><td>• Maximising DER's potential contribution while maintaining grid security and reliability, particularly as the energy transition results in increased DER installation and grid-scale VRE
• Accounting for differences in DER installation rates between and within NEM regions
• Timeliness of DER technical standards setting for the NEM given the rapid pace of new DER capacity being installed by consumers</td></tr><tr><td>Price</td><td>• Complexity, cost and timeliness of standard setting and compliance under any new governance arrangements are no more than necessary to achieve security, reliability, and safety objectives (including internal opportunity costs for the AEMC from appropriately resourcing any new governance activities)
• Parties responsible for meeting the costs of any new governance arrangements are those best able to manage and mitigate those costs</td></tr><tr><td>Safety</td><td>• Promote and maintain approved industry safety standards for the owners of DER and across the power system more broadly</td></tr></table></td><td>AEMO agrees that we consider and establish standards as new needs arise for reasons under the NEO.</td></tr>
<tr><td>2. Should the assessment framework include any additional considerations? If so, what are they and why?</td><td>As per above.</td></tr>
<tr><td rowspan="3">Q2. Identifying governance problems</td><td>1. Do you agree with the problems identified by the rule change request? Why?</td><td>AEMO agrees with the problems identified within the rule change request. However, additional considerations need to be given to the definition of DER and the scope of Technical Standards that would be addressed through the Governance proposal, as discussed in AEMO's submission.</td></tr>
<tr><td>2. Do you agree with the rule change request on the causes of identified problems? Why?</td><td>AEMO supports the Rule change proponent's approach that a formal governance structure be established to guide, develop where required and implement DER Standards.</td></tr>
<tr><td>3. To what extent has the commission's recent rule change on DER Technical</td><td>The minimum DER technical standards rule change implemented device level technical requirements specific to inverter energy systems connected at low voltage. This standard covers a specific (albeit significant) subset of DER and the requirements</td></tr>
</table>

Topic	Question	AEMO Response
	standards resolved or likely resolve the identified governance issues?	addressed are only one element of those required from DER to operate a secure and efficient high-DER power system. Other areas include but are not limited to data, interoperability, cyber security and performance. Further, larger scale (medium voltage connect plant) and non-inverter based plant is not addressed by this standard. An enduring framework is required that allows for flexibility in accommodating application of new and emerging technology and considers the suite of capabilities required and their improvement over time. The DER Technical Standards rule change did demonstrate that it is possible to utilise processes currently outside the NER to support application of standards to particular DER systems. It is not clear that such mechanisms exist to address all future concerns regarding DER (for example larger DER systems not currently captured by the NER).
	4. When do longer term issues such as interoperability and cybersecurity need to be addressed? Can existing governance arrangements and the recent rule change address these issues in a timely manner or is further governance reform required?	Interoperability and cybersecurity technical standards for DER are critical for maintaining security and reliability for the NEM and efficient consumer outcomes and should be addressed urgently. The recent rule change does not address these issues and will not moving forward as the scope of AS/NZS 4777.2 does not encompass this functionality. Increasing its scope would make future updates to the standard impractical. There are numerous different capabilities and system integration decisions required as DER uptake continues and becomes increasingly diverse, including: interoperability, data exchange, cyber security and performance across the range of emerging DER devices and services that will need to be addressed. Further governance is required that has a forward view of these requirements, and coordinates these standards across the NEM ensuring that the broad impacts of both market operations and power system needs are considered.
	5. Are there any other governance problems not identified by the rule change request? If	The scope of technical standards and frameworks to integrate DER needs to be considered. Defining this scope should occur via a principles-based approach to

Topic	Question	AEMO Response
	so, why does the AEMC need to consider these issues?	ensure flexibility. As an indication of what the scope needs to encompass via important capability areas that require consideration wile allowing continual innovation and adaptation, this includes, but is not limited to: • Device level interoperability • Operational data exchange between actors (information models, protocols for information change) • Systems level / 'aggregator' minimum capabilities • Technical standards for MV connected DER • Performance and capability requirements for aggregated DER • Framework for managing compliance of aggregators, and OEMs • Frameworks for managing/addressing compliance include for firmware updates for devices/systems in the field
Q3. Assessing the market impact of identified problems	1. Do you face any costs from governance arrangements in place prior to the commencement of the new DER technical standards rule change on 18 December 2021? Can you quantify theses costs?	It is likely that the regulatory resource requirements to keep pace with the impacts of DER will continue to increase and additional funding and resources may be required.
	2. Alternatively, how would you be impacted if the commission does not establish new governance arrangements for DER technical standards?	A By 2025 for some periods almost 80% of demand in the NEM will be met by DER. It is imperative that the market and power system can operate securely at these levels of DER contribution. Standards are essential to support this. Inconsistency of technical performance, a lack there-of, or ability to rapidly mitigate unforeseen challenges will risk both market operations and power system security.
	3. How certain are you about any forecast future costs?	Uncoordinated and inconsistent DER capabilities will create inefficiencies and increase costs for consumers. AEMO will decreasingly be able to contain DER technical standards work within business-as-usual operational costs.
Q4. DER Technical	1. Should DER technical instruments relevant to the NEM be included in the NER, or a subordinate instrument?	AEMO prefers that DER Technical instruments be achieved through a subordinate instrument under the NER, managed via the relevant rules consultation procedures.

Topic	Question	AEMO Response
Standards in the Rules	2. How could any new governance arrangements interact with Standards Australia existing processes in a way which avoids duplication, while ensuring standards are developed in a timely manner?	AEMO considers that such a committee would complement rather than duplicate or interfere with the work undertaken by Standards Australia. Standards Australia responds to industry needs via request for a standard for a specific product or category. The proposed DER governance committee would utilise processes such as Standards Australia's to develop the relevant technical capabilities as required. The Commission would then have the ability to apply relevant new or amended Australian Standards, as without this regulatory lever there is no requirement for application of Australian Standards across the DER ecosystem, hindering integration in an efficient manner. At the same time, where the Australian Standards process does not exist, or is not the most efficient avenue for developing a standard, there is flexibility to utilise a different approach. A structure such as this would have the ability to determine the best mechanism to capture relevant standards. AEMO envisage that some attributes of DER systems may be best addressed at the Standards Australia level (e.g. large numbers of small-scale, mass-produced devices) whereas others may be better addressed via other means – e.g. connection standards or standards within the NER for larger scale systems involving a degree of engineering design, and aggregator functionality levels.
	3. What would be the main benefits from including DER technical standards in the NER, NERR, or a subordinate instrument? Are there any risks?	There are numerous different capabilities and system integration decisions required as DER uptake continues and becomes increasingly diverse, including: interoperability, data exchange, cyber security and performance across the range of emerging DER devices and services. Each of these capabilities or standards development will be finalised over varying time periods; six, 12 months apart or longer over the next 5 plus years. These capabilities will be minimum requirements for power system, network and market operations and industry must discuss what is required as a minimum and how to ensure they are embedded in devices. A rule change to require these standards, the functionality or the principles that deliver this functionality each time they are complete is impractical, not feasible and will delay implementation of such minimum capability. Delay during a period where approximately 1 GW per year of DPV is being installed and the uptake curve for

Topic	Question	AEMO Response
		batteries and EV's commences. This will repeat the DPV era where devices are being installed without capability that meets the NEO – minimum requirements that will enable efficient DER integration in the best long-term interests of consumers.
	4. Did the recent rule change on DER technical standards partly address problems identified in Dr Schott's rule change request?	No, this approach of piece-meal rule changes is not sustainable in the long term.
	5. If so, does the recent rule change on DER technical standards reduce the need to adopt the new governance arrangements proposed by the rule change request?	As discussed, no.
Q5. Who develops and maintains DER Technical Standards	1. Should a new committee be responsible for determining or advising on DER technical standards in the NEM?	AEMO considers this could be in the form of an 'as-needs' yet 'standing' committee that is formally established and able to be convened as required. Such a committee may be responsible for determining the need to a standard, advising on the preferred approach, either over-seeing or delegating development of such a standard and determining the adoption of the standard.
	2. If so, how should members be appointed to the new committee?	
	3. What knowledge and experience would be needed to develop and maintain DER technical standards in the NEM?	Technical, policy, market, networks, new entrants and representatives of new business models.
	4. Should membership of a new committee be paid or voluntary?	To deliver these outcomes in a timely manner, AEMO has learnt through resourcing of the completion of AS/NZS 4777.2 in record time of 18 months for a typical 3 -5 year process, that dedicated effort on holding the pen is required to deliver new DER capabilities in the timeframes that will be required to efficiently integrate DER. Capabilities such as interoperability and cyber security are urgently required so that consumers can continue installing DPV without limits that are currently emerging and existing 5 kW export caps can be removed, allowing consumers to export more

Topic	Question	AEMO Response
		and minimise use of the emergency backstop. These areas require input from the right expertise but with ability to ensure that the outputs may applied efficiently and according to the NEO. As noted, challenges such as this are just the 'start' with EVs and enhancement of load side response key planks of the Energy Security Board's Post 2025 plan.
	5. Should the committee report to the Commission as proposed by the rule change request? Or should the new committee report to another entity? If so, who?	
	6. How would the governance arrangements proposed by the rule change request interact with existing governance arrangements and the recent DER technical standards rule change? Are there any risks of duplication or divergence?	The proposed arrangements are complementary and build on this now existing standard. AS/NZS 4777.2 is now a minimum requirement in the NER and all future updates to this standard will automatically be applied. A similar process is also required for the other DER capabilities, as outlined in this submission.
	7. Are the proposed governance arrangements likely to reduce how long it takes to develop and implement new DER technical standards for the NEM? If not, would any alternative approaches increase the pace of setting standards for the NEM?	A Committee structure and subordinate instrument, yes.
	8. Is there a trade-off between how quickly new technical standards are developed and other NEM objectives such as the safety, security and reliability of power supply?	The trade-off to be considered is the length of time it takes to regulate application of a standard once complete. Standards development is undertaken via rigorous technical process and consensus industry agreement, which with dedicated resourcing could be undertaken in 6-12 months, plus a likely 12-month transition period for OEMs to design, construct, and certify. A two-year (proponents' submission development, AEMC consideration, AEMC commencement to finalisation) rule change process to require application of the standard will further lengthen this process.

Topic	Question	AEMO Response
Q6. How prescriptive should new governance arrangements be	1. How much prescription should be included in the NER to implement the proposed new governance arrangements?	DER will require good regulatory design to achieve both speed and flexibility where needed but also accountability (including a consultative process) in decision making. As outlined in the Consultation Paper the Information Exchange Committee governance arrangements are another model to consider, with adjustments to make it fit for purpose.
	2. Should the AEMC periodically review DER technical standards to determine if further regulatory intervention is needed? What level of prescription should be included in the NER to implement this option?	AEMO considers this could be in the form of an ad-hoc yet 'standing' committee that is formally established and able to be convened as required.
	3. Are there any solutions that can complement voluntary initiatives to address DER technical standards? For example, how could new governance arrangements in the NER support DEIP?	
	4. Is it feasible to amend the role of the Reliability Panel to cover DER technical standards? Would this be preferable to creating a new advisory committee on DER technical standards?	While such a Committee may be similar to the Reliability Panel, AEMO does not support an expansion of the Reliability Panel to include DER interim technical standards as the breadth of issues and stakeholders is different. For example, the Reliability Panel does not usually need to take account for the electricity supply chain down to consumer goods and firmware.
	5. Are there other alternative solutions to address the issues identified in the rule change request? What level of prescription in the NER is required to successfully implement these solutions?	AEMO believes that the proposal for a DER Committee as outlined in this submission is a preferable solution when compared to others which have been previously tried which do not have the essential elements of accountability, speed and compliance needed to address the DER roll out.