

# *Submission to the NEM VPP Demonstrations Program Consultation Paper*

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## About CEEM

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The UNSW Centre for Energy and Environmental Markets (CEEM) undertakes interdisciplinary research in the design, analysis and performance monitoring of energy and environmental markets and their associated policy frameworks. CEEM brings together UNSW researchers from the Faculty of Engineering, the Australian School of Business, the Faculty of Arts and Social Sciences, the CRC for Low Carbon Living, the Faculty of Built Environment and the Faculty of Law, working alongside a number of Australian and International partners.

CEEM's research focuses on the challenges and opportunities of clean energy transition within market oriented electricity industries. Key aspects of this transition are the integration of large-scale renewable technologies and distributed energy technologies – generation, storage and 'smart' loads – into the electricity industry. Facilitating this integration requires appropriate spot, ancillary and forward wholesale electricity markets, entirely reenvisioned retail markets that suitably facilitate distributed resources, efficient network regulation that also supports beneficial innovation and incentivises distributed resources to provide competitive network services, and coherent and comprehensive wider energy and climate policies that can deliver the low carbon energy future required to address dangerous global warming.

Distributed Energy Resources (DERs) are a vitally important set of technologies, with vitally important stakeholders, for achieving low carbon energy transition and CEEM has been exploring the opportunities and challenges they raise for the future electricity industry for over a decade. More details of this work can be found at the Centre website. We welcome comments, suggestions and corrections on this submission, and all our work in this area. Please feel free to contact Associate Professor Iain MacGill, Joint Director of the Centre at [i.macgill@unsw.edu.au](mailto:i.macgill@unsw.edu.au).

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## Introduction

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We commend the Australian Energy Market Operator and its partners for this proposed VPP demonstration framework and, more generally, AEMO's broader work program on better integrating Distributed Energy Resources (DERs) into the electricity industry, and appreciate the opportunity to respond to this consultation paper.

CEEM aims to contribute to this consultation as a University Research Centre with a team of around twenty researchers – academic staff and research students – all working on aspects of Australia's clean energy transition challenges and opportunities. One of the Centre's three research streams is focussed on DERs, and our submission draws upon a range of this work. Our starting point is the urgent need for rapid decarbonisation of the electricity sector. DER integration needs to be assessed, and managed, with this objective in mind. Optimal integration of DER in this context has less to do with cost-minimisation and, instead, should focus on robust frameworks that can rapidly drive down industry emissions through deployment of clean supply and demand technologies and associated behaviours. However, transition also requires a high level of social consensus, and this will hinge on the affordability and security of electricity provision as well as the perceived fairness, for both consumers with and without DER, of these arrangements. In this regard, while there are a range of potential opportunities for DERs to create value, including uncoordinated behind customer meters, as network-controlled load, in peer-to-peer trading, embedded networks or microgrids, we envisage VPPs playing a potentially valuable role in facilitating appropriate DER integration and maximising its broader industry value, especially in the short to medium term. In the longer term, the capabilities of DERs seem likely to go way beyond the ability to emulate conventional thermal plant and participate in market arrangements explicitly designed for such plant. Given the diversity of DER integration approaches, we see sense in narrowing this demonstration program to VPPs, but note that the functioning and regulation of VPPs should be considered within the context of the broader DER integration task, in particular to ensure efficient investment and equitable approaches to grid access. We appreciate that these longer-term perspectives are being addressed in the Open Energy Networks and broader DEIP processes, although we have concerns with the approach taken there to date.

We note that the NEM VPP Demonstrations Program Consultation Paper takes a different approach to the Open Energy Networks process. Whereas the latter assumes the need to centrally coordinate DER through one of three market frameworks, this VPP Consultation Paper focuses on helping VPP proponents demonstrate basic control and coordination capability, providing AEMO with operational visibility, and assessing the need for new or amended regulatory arrangements – which we believe is an appropriate and considered course of action given the current uncertainty about the cost-benefit of services offered by DERs and customer preparedness to participate in potential markets.

We are concerned, however, with the apparent exclusive focus of the Consultation Paper on VPPs that bid into spot/FCAS markets, with little consideration of VPPs that provide network support. Although it is understandable that AEMO would focus on the former, the Consultation Paper itself states "AEMO has established a DER Program to effectively integrate DER into Australia's power system operations and energy market frameworks", and "The demonstrations program aims to map a pathway towards full integration of DER". These outcomes cannot be achieved without consideration of VPPs that provide network support. All the VPP examples in Section 1.4 of the Consultation Paper have an emphasis on providing network support. Although bidding into spot/FCAS markets by these VPPs cannot be ruled out, this does indicate the current market preference for network-focussed functionality. As we discuss below, there are other reasons for the Demonstrations Program to include these types of VPPs.

Excluding them may provide a distorted view of what is actually likely to occur and so could overestimate the impacts of spot/FCAS VPPs, which in turn could result in the implementation of unnecessary policy mechanisms and regulation.

Another concern is that this VPP framework should really be better integrated with demand response initiatives already underway. The potential future challenges of visibility and even power system stability with VPPs would already seem to be apparent with existing unscheduled but price-responsive demand. This demand also lies outside present AEMO dispatch arrangements but can drive significant and very rapid step changes in demand to be met by scheduled generation, posing challenges for forecasting and frequency control services. The VPP program could potentially be extended to test arrangements for DR spot market participation.

## Significant synergies

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As explained in our response to Question 2.1, the Consultation Paper VPP Objectives apply equally well to both spot/FCAS VPPs and network VPPs. This is especially relevant where value stacking is maximised through designing VPPs that can participate in both spot/FCAS and network markets. Undertaking Demonstrations that focus only on spot/FCAS VPPs would therefore appear to be a wasted opportunity.

## Network VPPs and non-participating DERs could have a more significant impact on AEMO's operations

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VPPs engaged in spot/FCAS markets will be responding to price signals and so will tend to be self-regulating – a high price triggers a response, which lowers the price, which reduces the response. VPPs providing network support will be responding to local network constraint signals, which may not correlate with spot/FCAS price signals, and so could be more problematic for AEMO than VPPs engaged in spot/FCAS markets.<sup>1</sup>

Notwithstanding the above point that network VPPs could have a more significant impact than spot/FCAS VPPs, it is possible that neither could have a particularly significant impact even beyond 2030. AEMO's ESOO 2018 projection of household battery uptake is 2.6GW by 2038. This projection is based on an assumed size of 5kW, which would mean 520,000 households with batteries, of which 28% are estimated to be aggregated into some sort of VPP (making 145,600 VPP households). An ABS projection has about 11 million households in the NEM states by 2036,<sup>2</sup> which means only 1.32% of households will be part of a VPP. These will be split between spot/FCAS and network VPPs. Although we believe these projections to be conservative, even if battery uptake is triple the AEMO projection, only around 4% of households would have VPPs (split into spot/FCAS and network VPPs). Large numbers of uncoordinated DERs may create challenges where they respond in aggregate to system level events, which may be potentially more significant than the impacts of VPPs.

Thus, while the Consultation Paper describes Australia as having a “highly engaged customer base...to test commercial models for VPPs”, a particularly relevant question is whether any work been

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<sup>1</sup> Note that, as detailed in our submission to the Open Energy Networks consultation process, we do not believe that centralised coordination of DER will definitely be necessary to maintain network integrity. In summary, this is because (i) centrally coordinated dispatch of DER would have very intensive data and communication requirements, and a computationally would be very difficult to optimise, (ii) as above, it is not clear that there will be sufficiently high levels of uptake of VPPs to cause network problems, and (iii) significant progress is being made in the creation of operational envelopes designed to maintain network integrity (which has now been recognised in the latest OEN Consultation Response).

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<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/3236.0Main%20Features82011%20to%202036?opendocument&tabname=Summary&prodno=3236.0&issue=2011%20to%202036&num=&view=>

undertaken to assess the likely uptake of VPPs for either spot/FCAS or network markets, and their subsequent impact?

## Responses to questions

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### 1.1 The primary focus of these trials is to demonstrate VPP aggregating battery storage systems. Do intending participants envisage incorporating demand response resources into your aggregated portfolios, and should this be incorporated into the VPP Demonstrations?

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Although we are not, and do not expect to become, a VPP provider, we certainly support the inclusion of demand response into VPP demonstrations. EnelX currently provides aggregated demand response from 30 or so customers for FCAS markets. Note that demand response has for some time been providing network support and will continue to do so. More generally, VPPs based on PV and battery storage really should be looking at opportunities to include demand response. As just one example, a ripple controlled hot water system effectively represents a roughly equivalent energy storage to a Tesla Powerwall, albeit only uni-directional.

### 2.1 Are the VPP Demonstrations objectives logical and achievable? Should any other objectives be considered for these VPP Demonstrations?

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The VPP Demonstrations objectives are logical and, we believe, achievable. Again, as discussed above, there is likely to be a significant number of VPPs providing network support, often without participating in FCAS/spot markets.

The **first objective** (demonstrating basic control and coordination capability) is also applicable to VPPs that provide network support. As such, the Demonstrations should be designed in such a way that they can also help create network support capabilities. Not to do so would be a wasted opportunity. This will be especially valuable where value stacking is maximised through designing VPPs that can participate in both FCAS/spot and network markets.

The **second objective** (demonstrating operational visibility) is also relevant to VPPs that provide network support, which may in fact have more impact on AEMO's systems than VPPs involved in spot/FCAS, especially if they are more numerous (although, as above, both may be less than apparently expected). This is complicated by the degree to which the operation of spot/FCAS VPPs and network VPPs are correlated (i.e. the correlation of high prices and high demand), or not (i.e. local network constraints may not correlate with system-wide price peaks or FCAS requirements).

And of course the **third objective** (developing new or amended regulatory arrangements) is also relevant to VPPs that provide network support, not in terms of the regulatory arrangements relevant to spot/FCAS markets, but in terms of third party operation of behind the meter DERs. Thus, again, the Demonstrations should be designed in such a way that they can also contribute to a better understanding of new or amended regulatory arrangements for network VPPs – again especially relevant to value stacking.

Also, the Consultation Paper states that the demonstrations won't "test new participant categories or multiple relationships at a single connection point". In general, we support the use of demonstrations to provide a safe space for regulatory experimentation. In this case, the demonstration program could potentially be incrementally expanded beyond VPP participation according to the draft specifications for DER provision of regulation FCAS, to allow VPP operators that are not retailers to participate in energy markets, and to test DR participation in energy markets.

## 2.2 How can the VPP Demonstrations projects better capture consumer insights and improve customer experience and outcomes?

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As discussed above, there appears to be little understanding of the likely level of uptake of VPPs for either spot/FCAS or network markets, and their subsequent impact. A valuable contribution would be to extend the AEMO analysis on battery uptake to include consumer interest in participating in either type of VPP.

More generally, AEMO should seek to establish arrangements that allow a wide range of stakeholders to access suitably anonymised data from these demonstration projects, particularly given the proposed public funding support. Our University research group is just one such stakeholder that would greatly benefit from greater data transparency. There is a particular opportunity here to provide data that is currently only available to registered market participants in order to maximise learnings through engagement of a wider group of stakeholders, and to increase transparency around subsequent decision-making. Releasing data would allow potential VPP aggregators to learn from the trial, even if they were not selected to participate. Further, access to data would facilitate deeper engagement from a range of stakeholders in any consultations around proposed changes to market rules or network regulation, including assessment of potential impacts on consumers and communities. The legitimate concerns of the market operator and networks must be balanced with those of consumers, and given that the only member of the (steering committee) representing consumers is the ECA, with comparatively limited resources, and the potential disincentive from AEMO or ENA to share certain findings, engagement from broader stakeholders including research groups will be critical.

## 2.3 Is AEMO's high-level approach to the VPP Demonstrations appropriate? What other arrangements could be tested under the VPP Demonstrations framework?

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As discussed above, the Demonstrations should include VPPs designed to provide network support. More generally, greater thought might be given to the costs and risks for participation by VPP owners and operators in arrangements that might only have a very limited duration.

### 4.1 AEMO would like the aggregated VPP dataset to be refreshed every five minutes to align with its operational forecasting function. Are VPP operators able to provide this data on a 5-minute refresh basis?

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We are not, and do not expect to become, a VPP operator. However, we do work with a number of innovative DER service providers who use their own metering equipment, and who collect DER data at much more frequent intervals than five minutes.

### 4.2 Should the values be reported as an average value across the 5-minute interval or an instantaneous value at the end of the 5-minute interval, or both?

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We would suggest more frequent data collection than five minutes to maximise the value of these VPP demonstrations for understanding and modelling VPP participation in FCAS markets.

### 4.3 What is the appropriate frequency for VPP operators to submit the device level dataset to AEMO? Is there a material difference in resources required to upload the data on a daily, weekly, or monthly basis?

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No response.

4.4 Are there any regulatory or other obstacles to participants facilitating the data sharing arrangements contemplated in this section?

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No response.