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Matthew Armitage

DER Program

Australian Energy Market Operator

Submitted by email to: DERProgram@aemo.com.au

21 December 2018

Dear Matthew,

AEMO Virtual Power Plant (VPP) Demonstrations Program, Consultation Paper, November 2018

Thank you for the opportunity to provide feedback on the Australian Energy Market Operator's (**AEMO**) Virtual Power Plant (**VPP**) Demonstrations Program, Consultation Paper.

AGL Energy (**AGL**) commends AEMO's initiative in establishing the VPP Demonstrations. AGL considers that VPPs will play an important role in Australia's evolving energy market, alongside a broad range of innovative product and service offerings that draw upon the proliferation of distributed energy resources (**DER**) that are entering the market. Given that the current operating environment for VPPs is in its infancy, the VPP Demonstrations have the potential to deliver important market insights regarding their implications for system security and reliability.

Australia's energy markets are undergoing a period of significant transition. AGL is committed to taking a leading role in enabling a reliable, affordable and sustainable energy future for Australia throughout this transformation. This is reflected in our strategic imperatives to prosper in a carbon-constrained future and build customer advocacy. AGL is moving from a mass retailer to a personalised retailer – using smarter solutions, technologies and services to empower our customers.

AGL sees competition and innovation as the primary means for meeting this challenge and aligning the interests of energy service providers with those of the customers we serve. We are therefore continually innovating our suite of distributed energy services and solutions for customers of all sizes. These behind-the-meter (**BTM**) energy solutions involve new and emerging technologies such as energy storage, electric vehicles, solar PV systems, digital meters, and home energy management services delivered through digital applications.

Our offerings provide customers access to a range of value streams including improved solar self-consumption, network services revenue and wholesale market participation, allowing the 'stacking' of values for the benefit of the customer. AGL has considerable experience through a range of programs, most notably our South Australia Virtual Power Plant (**SA VPP**) and ARENA Demand Response programs.

AGL's SA VPP commenced in 2016 with support from the Australian Renewable Energy Agency (**ARENA**) under its Advancing Renewables program. The project comprises the sale, installation and orchestration of 1,000 energy storage systems installed behind-the-meter in homes and small businesses in South Australia. When complete, the VPP will comprise a mix of multiple hardware types (Tesla Powerwall 2, LG Chem

batteries with Solar Edge inverters, and Sunverge SIS) and will deliver up to 5MW of peak generation and 12 MWh of storage capacity to homes, the National Electricity Market (**NEM**) and a range of network services across metropolitan Adelaide[1].

AGL has recently contracted Enbala Power Networks, a VPP software and distributed energy resource management system (**DERMS**) provider, to deliver control services for the VPP SA program. Enbala has significant experience providing both demand management and network services in North America, and AGL is seeking to translate those capabilities to the Australian context.

As part of the project, we are exploring the system-wide benefits that can be realised from a concentrated deployment of orchestratable energy storage systems, as well as improving the understanding of the opportunities, challenges and value generated using VPPs for network services. We are also gaining a deeper understanding of the technical capabilities and limitations or orchestration hardware and software and the possibility for adverse consumer outcomes in some cases.

We provide our advice on the VPP Demonstrations based on our experience.

AGL believes that market demonstrations can be instrumental in developing innovative solutions. The best way to maximise the benefits of demonstrations is by adhering to the following principles:

- Setting appropriate parameters for the demonstration that enable energy services providers to invest, test and learn on their own merits.
- Providing sufficient flexibility to enable market participants to pioneer new business solutions that create value for the broader market through effective customer and commercial relationships.

The attachment to our submission contains more detailed feedback on the proposed VPP Demonstrations, which is based on our knowledge and experience to date with BTM orchestrations solutions. In broad terms, we support AEMO's intention to test how reliably VPPs can orchestrate fleets of batteries to the delivery of energy and FCAS in real-time markets as well as some of the details elaborated in terms of AEMO's approach.

We also provide feedback to further build on the design of the VPP Demonstrations. We believe these recommendations will further boost the program's ability to deliver clear outcomes, keep the cost to participants at a manageable level, and limit the risks to customers seeking to maximise the value of their DER assets. These include:

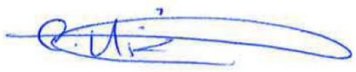
- Setting clearly articulated objective propositions on what AEMO will seek to test that is novel to the current market arrangements;
- Minimising potential complexity and cost in developing an appropriate web-based API to support the VPP Demonstrations;
- Taking into consideration the potential customer impacts of the trial participation model that does not involve a retailer (MASP as VPP operator);

[1] For further information regarding AGL's ARENA VPP SA program, including the two milestone reports published to date, please refer to https://arena.gov.au/projects/agl-virtual-power-plant/.

- Knowledge sharing and access arrangements that appropriately manage customers' privacy, the value of commercial data sharing arrangements and the Consumer Data Right reforms; and
- Ensuring consistency between the proposed objectives and AEMO's proposed approach to data sharing with networks.

Should you have any questions in relation to this submission, please contact Kurt Winter, Regulatory Strategy Manager, on 03 8633 7204 or KWinter@agl.com.au.

Yours sincerely



Con Hristodoulidis

Senior Regulatory Strategy Manager

ATTACHMENT

1. VPP Demonstrations Objectives

The Consultation Paper sets out broad objectives for the VPP Demonstrations, namely to:

- *Allow participants to demonstrate basic control and coordination capability for VPPs providing market services in the NEM relating to both energy and FCAS;*
- *Develop basic systems and capability to provide AEMO with operational visibility of VPPs to understand their impact on power system security and how they interact with the market; and*
- *Assess current regulatory arrangement affecting participation of VPPs in energy and FCAS markets and inform new or amended arrangements where appropriate.*

AGL supports the objective of collective learning on how reliably VPPs can orchestrate fleets of batteries to the delivery of energy and FCAS in real-time markets.

AGL notes the Consultation Paper discusses delivering the full value stack to consumers, however, the objectives do not refer to network value, but rather energy market and FCAS services value. We support this focus, which aligns with AEMO's function as the wholesale market operator. We also support that AEMO does not intend to incorporate network-directed dynamic limits into the VPP Demonstrations at the outset.

In our view, market participants would benefit from more clearly articulated propositions on what AEMO will seek to test rather than the open-ended framework currently envisaged. We would welcome further discussion in this regard.

We support that AEMO's primary focus of the VPP Demonstrations is to demonstrate VPPs aggregating battery storage systems, including the delivery of FCAS. We would also welcome consideration of subsequent broader demonstrations of DER product and service offerings.

2. Roles and Responsibilities

AEMO

AEMO's role in the VPP Demonstrations will entail, among other things, developing and implementing a variety of new IT systems to facilitate the trials, including:

- *A new web-based portal to receive:*
    - *Operational forecasts from VPP operators, enabling AEMO to monitor the regional supply/demand balance, adjusting regional forecasts to account for anticipated VPP activity.*
    - *Operational performance data from VPP operators. This dataset will allow the AEMC, AER, and AEMO to assess the relevance of existing NER frameworks to VPPs across a range of areas, including, but not limited to, the suitability of existing network regulations for enabling DER capability, metering requirements, and the registration thresholds, criteria, and processes.*
- *New automated systems for FCAS measurement and verification for DER.*
- *New VPP Registration support tool. This will allow basic standing data (for example, National Meter Identifiers [NMIs]) for each connection point in a VPP portfolio to be easily provided, amended as VPPs scale up in size, and integrated with other AEMO systems.*

We would welcome further discussion on the configuration of AEMO's proposed new automation systems for FCAS measurement and verification for DER and VPP Registration support tool including how they would interact with other rules changes applicable to frequency control and other ancillary services.

AGL supports AEMO's intention to develop a web-based API to support the VPP Demonstrations. In developing the IT solution, AGL suggests AEMO consider the lack of a standard industry-wide communications protocol, and the costly processes that are entailed in aggregators integrating multiple technologies into their control platform to provide the dataset that AEMO have requested across multiple device types.

For example, hardware vendors typically have their own proprietary control platforms to manage their deployed hardware. However, functionality and telemetry capabilities across these systems varies widely, and may not be practically controllable as a single VPP without an additional orchestration layer that supports two-way communication with each hardware vendor platform. In practice, this additional orchestration layer is expected to be bespoke for each orchestration entity, as is the case today.

We consider that multiple communications layers will be required to support end-to-end communications between the customers' participating assets and AGL's orchestrated Virtual Power Plant, as is illustrated in Figure 1.

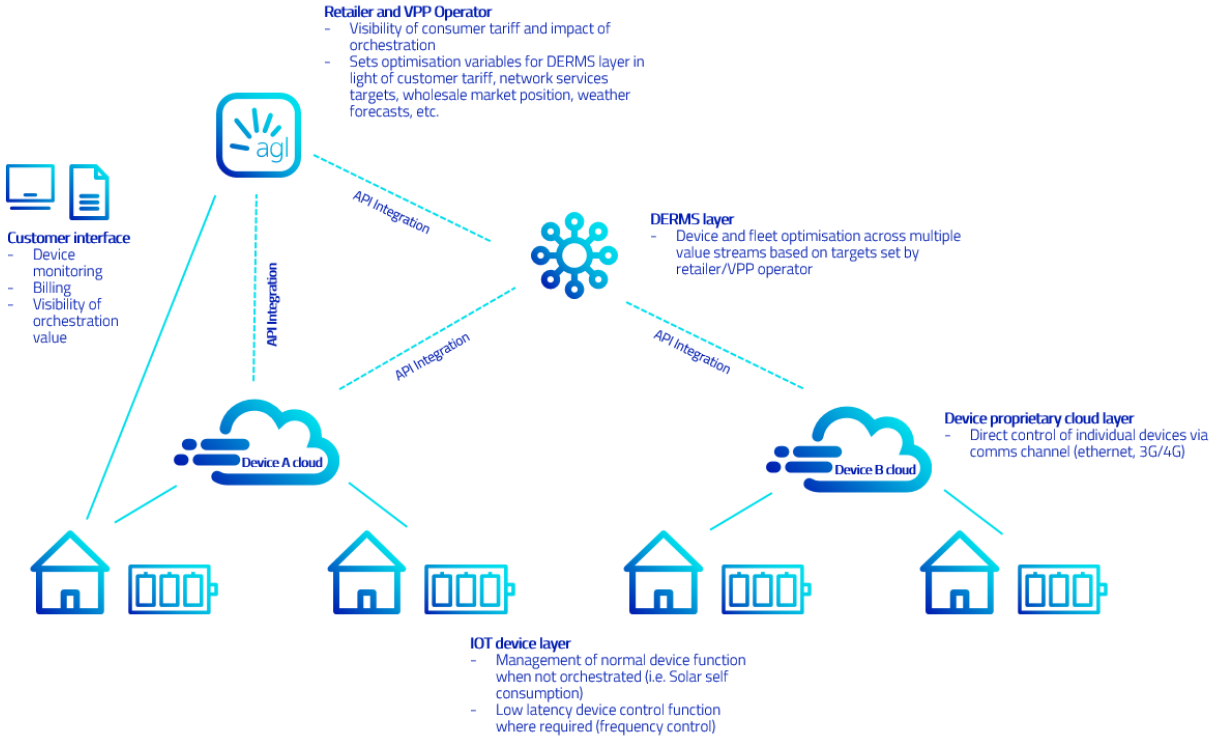


Figure 1: Technology Integration

In our view, the requirement that the device-level VPP data set be delivered via an API may not be justified on a cost benefit analysis. We do not consider that the current operating environment for VPPs is mature enough to justify the costs that would be incurred to support the development of an API for the provision of

this information. Indeed, these costs may present as a barrier to entry for smaller market participants. In our view, AEMO could gain sufficient insights on the behaviour of VPPs through other reporting arrangements.

The development of information sharing, including any possible API solution, should balance the costs of the build with the benefits/insights the VPP Demonstrations will deliver. As a starting point, AGL believes any agreed industry data sharing arrangement should focus on:

- customers' privacy;
- the commercial value of data sharing arrangements; and
- the implementation of the Consumer Data Right reforms as they relate to the energy sector.

We look forward to contributing further to this discussion once we have had an opportunity to review AEMO's draft API specification.

Distribution Network Service Providers

We note that AEMO is interested in collaborating with DNSPs in a number of areas, such as:

- *The specification of web-based interfaces to communicate with VPPs; and*
- *Identifying new data sources.*

The Consultation Paper suggests that VPPs could represent new sources of power quality data, as an alternative to installing separate monitoring equipment at consumers' expense. Data from the VPP Demonstrations could show that VPPs represent a viable source of power quality data for network businesses, potentially delivering a new revenue stream for VPPs and representing a cost saving for DNSPs and consumers in their network.

AGL supports AEMO's intention to identify these new data sources. We agree that this information would be of value to market participants interested in integrating DERs into the grid, and customers in terms of savings from avoiding installations of separate monitoring equipment.

Nevertheless, given the VPP Demonstrations are not focused on network value, we would recommend that data sharing be restricted to AEMO's stated objectives in the Consultation Paper, being for the purposes of forecasting, aggregated market reporting and system security. We provide further advice on AEMO's proposed data requirements and sharing arrangements in sections 5 and 6 below.

AGL acknowledges that sharing network value between consumers and participants will be an important enabler of VPPs and indeed other innovative BTM solutions. To this end, we believe in a balanced regulatory approach to integrating DER into Australia's energy system that supports market participants who are interested in providing orchestrated solutions, networks' role as system operators, and customers' ability to connect and transact across the grid. In the near term, the following regulatory areas will play a key role in integrating DER into Australia's energy systems:

- A national connections framework, independently developed with a focus on the customer, that enables them to easily connect new BTM technologies and in turn allows them to realise the full benefits of their investment in BTM assets
- Proactive management of voltage issues by network businesses, including through appropriate commercial arrangements with energy service providers engaged in the operation of VPPs to improve visibility and enable network business to implement technical solutions

The customer experience

AEMO has also sought feedback on how the VPP Demonstrations could better capture consumer insights and improve customers' experience and outcomes. In our view, a preferable approach would be to design a test matrix that reflects different VPP operating regimes, and then deploy across the trial participants in a consistent way so that market participants themselves can test how these variations may impact the customer experience.

Optimising the customer experience/dispatch trade-off will be a key source of competitive advantage in the emerging distributed energy market. We would therefore recommend that AEMO focus on identifying the NEM/VPP operating regime that best enables market participants to perform this optimisation challenge.

3. Approach to the VPP Demonstrations

In broad terms, AGL supports AEMO's proposed approach to the VPP Demonstrations, including that:

- *VPPs would operate as non-scheduled resources in the energy market until an understanding of the feasibility of including VPP's as a scheduled resource can be developed;*
- *Trial participants would be permitted to seek classification of both negative and positive flows from the connection point as part of their ancillary service load (contrary to the current Market Ancillary Services Specification (MASS) and AEMO's registration requirements);*
- *The VPP Demonstrations will test verification for fast FCAS by assessing measurements from both high-speed meters at a sample of sites and lower granularity measurements from each battery device; and*
- *Energy provided by VPPs in the Demonstrations will be settled via the wholesale market and will be metered according to current NER requirements, with a single FRMP for each connection point and suitable NEM standard metering in place.*

Given that VPPs would operate as exempted non-scheduled resources, we would request further clarity on whether other wholesale market obligations would apply to participants, for example the causer pays provisions.

AGL notes that AEMO has requested metering on the grid side of a customer billing meter, whereas most DER devices (if they do measure and report voltage and frequency at all) do so on the customer load side of the meter. AEMO observes that the cost involved in installing additional devices might be minimal. In our experience, adding additional devices to a customer site has been costly. We would therefore recommend that AEMO consider these additional cost factors in its analysis:

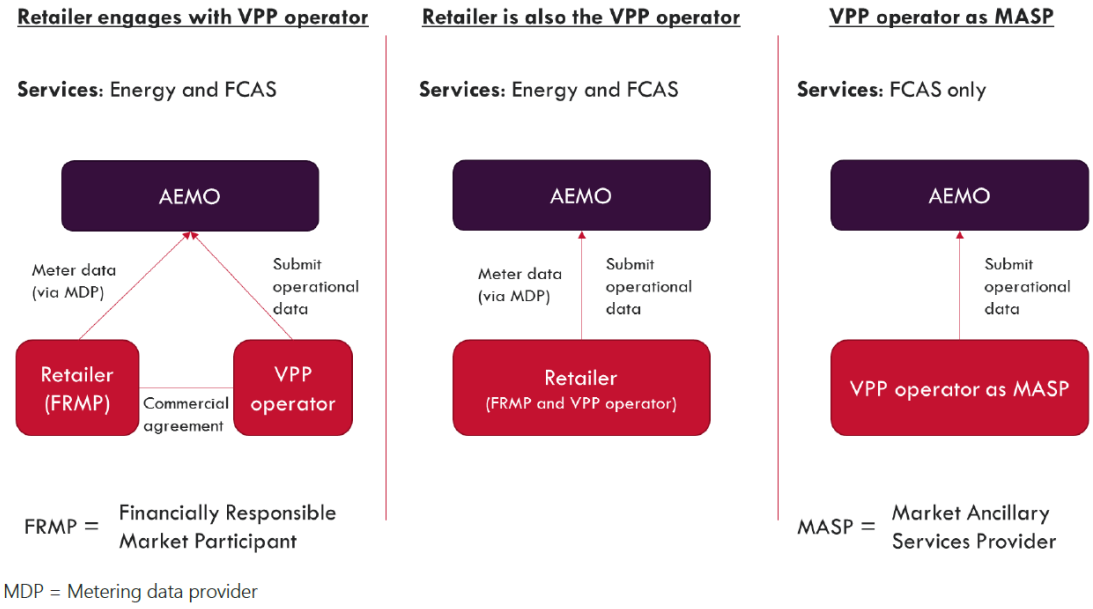
- The cost of retrofitting existing sites with additional hardware can also be costly, especially where amendments are required to customer distribution boards (that may be undersized or may contain asbestos, for example). AGL would be happy to share our experiences on this with AEMO.
- Not all participants will have the capability (or commercial relationships with installers and hardware vendors) to install such devices. Developing *ad hoc* capability will attract additional cost for customers.
- Additional cost would be entailed in a mechanism to transfer data (3G/4G comms, or ethernet hardwiring) from the additional on-site device, as well as a mechanism to ingest, warehouse, and

integrate that data with a participants VPP platform. In some circumstances, these elements would require participants to develop new relationships with third parties that will further complicate data sharing arrangements.

4. Trial participation models

AEMO envisages three different models of VPP participating proponents, as is illustrated in the diagram below.

Figure 1 Three models for participation in the NEM VPP Demonstrations



In theory, a test and learn approach to the VPP Demonstrations would suggest that all three models should be engaged. However, in practice AGL believes there are risks associated with the non-retailer model (MASP as VPP operator, illustrated on the right of the diagram) in terms of customer impacts.

Given that the VPP Demonstrations are focused on the energy and FCAS wholesale markets, we would recommend that AEMO require that energy retailers be engaged to ensure that the customer impact is minimised in terms of billing, credit collection, metering, and the customer experience. Optimising the customer experience/dispatch will be critical to the success of the VPP business model in the emerging distributed energy market.

In our view, participant models that entail a retailer function have greater visibility of customers' billing arrangements and are better placed to manage system security and customer protections. AGL's experience of direct interaction with customers is that calculating and communicating the impact to customers from orchestrations is an essential function. The risk of misunderstanding and misalignment in the MASP as VPP operator model is significantly increased. The MASP as VPP operator may result in customer costs that are not easily managed. These customer impacts could severely restrict the development of this emerging market. We would therefore recommend that AEMO limit the participation models to those that entail a retailer.

We also consider that market participants would benefit from AEMO providing greater clarity on how the proposed participation models would align with the existing participant categories in the NEM.

5. Data requirements

Participants in the VPP Demonstrations will be obliged to provide two datasets to AEMO, namely:

- *An aggregated VPP dataset – an aggregated forecast of anticipated active power flows, and aggregated actual performance data, from each VPP for a given NEM region via an API; and*
- *A device-level dataset – a set of key DER system variables, both sampled and derived, at 5-minute resolution.*

AGL supports AEMO's intention to require the provision of an aggregated VPP dataset. However, in order for participants to assess the level of sophistication that should be entailed in their forecast models, we would encourage AEMO to elaborate further its objectives in requesting data on aggregated forecast of anticipated active power flows.

The accuracy of forecasts between participants is likely to vary considerably across the market. As defined by AEMO, the forecast includes the BAU operation of the DER (solar self-consumption in the case of batteries) as well as any additional overlay of orchestration activity. As the BAU/solar self-consumption operation is the result of a device algorithm developed by the hardware vendor (and not necessarily known to the VPP operator), AGL anticipates that the accuracy of these 5-minute forecasts will vary. This is especially true in the case of batteries where solar self-consumption performance is significantly influenced by a range of exogenous inputs over which the battery has no control (for example household load and grid voltage).

With respect to the device-level dataset proposed, we provide the following advice:

- Device level data may be of limited value to AEMO's assessment of the impacts of VPPs in terms of power system security and in their interaction with wholesale and FCAS markets. Device-level data will likely not be from pattern-approved metering/architectures nor will correlation studies have been completed with pattern-approved meter data sources. We anticipate greater insights from the aggregated data sets.
- AEMO will need to appropriately manage customers' privacy in relation to device level data as well as the implementation of the Consumer Data Right reforms as they relate to the energy sector.
- Existing contractual arrangements with customers may restrict program participants from sharing customer site data. In our own experience with the AGL SA VPP, data on individual devices is subject to our contractual obligations with customers (that limit both who the data may be shared with and for what purpose it is shared).
- Customers' device level data has a commercial value to customers and a range of market participants that should be appropriately protected through any data sharing arrangement.

In light of these concerns, we would recommend that AEMO reconsider the need for a device-level dataset in the context of the VPP Demonstrations.

In terms of the frequency of data provision by participants, we would recommend that all provision of manual data be required on a monthly basis to enable participants to appropriately verify information. Frequent cloud to cloud provision of information would entail a substantial cost for participants.

6. Data sharing arrangements

AGL supports AEMO's intention to share insights from the VPP Demonstrations to lift the collective industry learning on how to effectively integrate VPPs into Australia's energy markets.

We note that AEMO may also publish or provide aggregated data in connection with the VPP Demonstrations to third parties (including Governments). We consider that this reporting should be aligned to clear insights, based on the objectives of the VPP Demonstrations, rather than being shared as raw data. The intent and purpose of any publication/ provision of data should be clearly articulated and agreed with program partners upfront.

In our experience with ARENA's Advancing Renewables program, knowledge sharing obligations are most effectively managed through clearly described agreements between the participating parties that consider the outcome and allow the program partner to develop the most appropriate mechanism for gathering and sharing the information. Our experience is that these reports balance the need for appropriate knowledge sharing to the market with the commercial imperatives to therefore encourage further market innovation and participation.

As part of the terms and conditions governing participation in the Demonstrations, AEMO proposes that participants will be required to provide AEMO rights to access, use, and share the data as required to facilitate the Demonstrations. This will include rights to share data provided in the VPP Demonstrations:

- *With NSPs where it is pertinent to system security; and*
- *More generally, to facilitate knowledge sharing around the results of the Demonstrations.*

We consider that any data access from the VPP Demonstrations should:

- Ensure appropriate customer privacy protections, and for the most part, be restricted to AEMO. Where third parties are seeking insights that may be extracted from the data, these should be agreed between the third party and program participants such that the insight is able to be shared at an aggregate level without a sharing the raw data itself.
- Be clearly aligned to the objectives of the VPP Demonstrations and specific outcomes proposed by AEMO. The intended purpose and potential uses of data should be clearly articulated and agreed with program partners upfront so that these provisions can be reflected in customer agreements.
- Only be granted to network businesses where justified on the basis of system security. In circumstances where data is shared with network businesses, it should also be shared equally with all market participants. This is consistent with the principles of competitive neutrality and open access.