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Submission to methodology study – Value of Distributed Energy Resources (VaDER)

SA Power Networks welcomes the opportunity to comment on the consultation draft report (draft report) on the methodology for determining the value to the electricity system of changes in Distributed Energy Resources (DER), prepared by Cutler Merz and CSIRO for the Australian Energy Regulator (AER).

We appreciate the engagement provided in arriving at this draft report. Many of the draft report's recommendations appear reasonable, and we support measures that can assist distribution network service providers (distributors) and stakeholders in streamlining the economic analysis required as part of the AER's regulatory determinations.

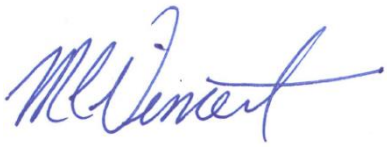
Our submission comments only on issues warranting further consideration, as follows:

- Context is needed, as VaDER assessments should only be one input to a distributor's expenditure proposal to enable DER hosting capacity. The 'identified need' for expenditure, may under proposed rule changes currently being considered, be driven by the nature of the service requirement that distributors may have to achieve, and in particular, the preferences of customers which must be central to any network regulatory process.
- In defining the system / market boundaries to VaDER assessments, the costs of customers' investments in DER, which we consider to be driven largely independently of the presence of available network hosting capacity, should be excluded from assessments.
- The preferences of customers, should ideally be quantitively valued in the VaDER in the same way as currently occurs in a RIT-D market benefit analysis, or otherwise there needs to be another means for incorporating views as to what customers actually want from the distribution network.
- The setting of a base-case counterfactual can provide useful context to an expenditure proposal. This review should avoid being definitive on which base-case will be most appropriate, as the credibility and technical assessment of network options is not within the scope of this review. Notwithstanding this point, we disagree with the proposal that the base-case should entail relying on AS4777 inverter protections to trip customer equipment, as this is not a 'business-as-usual' credible option for managing network hosting capacity limits.
- Further detail is required on the approach and assumptions used in the modelling, to explain the differences in the VaDER testing results between National Electricity Market (NEM) jurisdictions. Taking into account the new interconnector between NSW and SA, we are unclear why the methodology should produce such a significant difference in the long-term value of DER exports between SA and NSW, for example.

We have provided further commentary in the attachment to this letter.

We would be pleased to further assist CSIRO / Cutler Merz and the AER as this important review progresses. If you would like to discuss anything raised in our submission, please contact [redacted]

Yours Sincerely,



Mark Vincent
General Manager Strategy and Transformation

Attachment: Submission to methodology study

Approach to expenditure proposals

The draft report focusses on the methodology for quantifying the value of a change in DER generation and / or capacity, namely the benefits (positive or negative) shared across the broad customer base arising from expenditure by distributors to provide network hosting capacity for customers' DER.

The scope of this review does not intend to cover the overall approach that should be taken to distributors' expenditure proposals or business cases to the AER, and we agree that it should not. That said, we disagree with the apparent suggestion that the VaDER can be soley relied upon to identify an economically efficient or optimised level of expenditure in network hosting capacity. This is noting that:

- The limited scope of this review is appropriate at this time as the AEMC is currently considering rule change proposals to amend the regulatory framework to strengthen distributors' requirements and incentives to enable 'export services' to customers (as distinct services) and to enable cost reflective charging (i.e. export charges) for those that use these distribution network services.
- Market benefit assessments including VaDER assist with identifying the relative merits of different options for achieving an 'identified need' for expenditure. However, the 'identified need' will be influenced by the outcome of the rule changes, particularly the nature of the requirements on distributors to meet and manage customers' demand for 'export services' and to maintain service performance to levels that customers value and are willing to pay for, and the interaction with service incentive targets that are to be determined.
- The central role for revealing customers' willingness to pay for network hosting capacity should be better recognised in this review. Network expenditure will best align with economic efficiency when it is driven by customers desires and their willingness to pay for network services:
    - The most direct way of doing this is to set a price and observe customer demand. Export charges would will help reveal customers' willingness to pay over time. But, if network revenues are allowed on an ex-ante basis, consideration is needed as to a means of understanding how much customers value service provision, ahead of observing their response to a price.[1]
    - As an input to ex-ante expenditure assessment, a VaDER might reflect some correlation to customers' willingness to pay to use the network to export their DER energy.[2] However, there is potential for a mismatch between the two. Market benefit analysis is inherently complex and is typically approached conservatively. Further, the market participants (retailers and Virtual Power Plants) who deal directly with and sell DER products and services to customers are best placed to understand their expectations of market movements and the payments they may be willing to offer customers to incentivise them to invest in DER and to export energy - these market participants respond to NEM wholesale market signals in this regard.
    - Given the potential mismatch between a VaDER and customers' willingness to pay, the VaDER should be an input to, but not the sole determinant of, network investment decisions on hosting capacity. Networks should be placing greater emphasis on what customers actually want when making investment decisions, not less. Therefore, a distributor's expenditure proposal / business case to the AER should also include analysis on the views of its customers on their willingness to support a higher (or lower) level of network expenditure than that suggested by a VaDER.

[1] For this reason, in considering network expenditure to enable consumption services, distributors use a Value of Customer Reliability (VCR), to understand how much customers value levels of service, among other information and engagement.

[2] The payments retailers or VPPs may be willing to offer customers for their DER exports, should relate to the benefits these participants expect by way of displacing the need for higher cost centralised generation.

Defining the electricity system boundaries

The draft report proposes to set the boundaries of the electricity system so that the costs of additional customer investments in DER units would be counted as negative benefits in distributors' expenditure proposals to the AER. We disagree that customer investment in DER will be materially incentivised by / be elastic to distributors investing in network hosting capacity. This is noting that:

- In most cases, a customer's decision to invest in / purchase DER will primarily be driven by a desire to self-consume and lower their electricity bills, as well as intangibles such as a desire to help reduce greenhouse emissions, have a greater sense of energy self-sufficiency, and conform to what is becoming the norm. This is different from the factors driving investment in large grid-connected generators like solar farms, which are more directly linked to the economic value of exported energy.
- Further, and aside from any government subsidies, a customer's decision to invest in DER of sufficient size and configuration to generate excess energy to export will primarily be incentivised by market participants such as retailers and VPPs who directly deal with and sell DER products and services to customers.[3] It is the payment streams that these participants are willing to offer customers that incentivise customers to want to export, with these payments reflecting the signals that these market participants receive from the wholesale market in terms of the effect that releasing more DER energy may have on NEM generation and / or capacity costs.
- The payment streams that customers earn by investing in sufficient DER to export energy are incentives that are independent of the extent of available network hosting capacity. These incentives instead influence the customer's willingness to pay to fund increases in network hosting capacity in order to export. Put another way, if retailers and VPPs did not offer payments to customers to incentivise them to export, the presence of spare network DER hosting capacity would not in itself incentivise customers to invest in DER.
- It is inaccurate to describe the distribution network regulatory process in a manner akin to central planning – that is, with distributors building hosting capacity ahead of and somehow independently of customer demand for this capacity, with this then incentivising customers to invest in DER:
    - Customer demand and willingness to pay for network services including to export should be at the forefront of any regulatory framework.
    - Even where ex-ante allowances are required (depending on the form of regulatory control), a distributor's forecast of network expenditure should be based on reasonable forecasts of customer demand to use the network to export, using various sized DER systems – again, customer investment in DER is independent of the extent of available network hosting capacity.
    - The extent to which distributors physically build network capacity ahead of demand for services by customers materialising will depend on business specific factors and expectations of how rapidly customer demand to connect DER will grow. The current regulatory framework incentivises distributors to appropriately time its network asset investments commensurate with prevailing conditions, and if these conditions flatten, to minimise potential spends.

[3] At times there may be other payments such as from distribution networks such as where exports assist in alleviating peak consumption demand on the network.

Value steams considered

The value streams identified in the draft report were guided by the premise of examining changes in consumer and producer surplus (as reflected in the RIT-D), resulting from network hosting capacity investments. We observe that in the RIT-D, assessments of changes in consumer and producer surplus include a quantified consideration of customer preferences. That is, consideration is given to how much customers value continuation of reliable electricity service, by considering the potential for involuntarily curtailment should an investment not proceed, valued at the VCR.

The final report should comment on why it is proposed that the VaDER pay no regard to customer preferences and what this might mean for the overall approach to distributors' expenditure proposals. This is noting that:

- In the proposed VaDER, there is no quantification of customer preferences for reliable use of the network to export energy. That is, there is no VCR equivalent for export services. In our view this means that the VaDER risks inaccurately accounting for changes in consumer and producer surplus – as differences in what consumers receive versus what they may be willing to pay for are central to these economic concepts.

- Without a VCR equivalent for exports, there is even greater importance on needing to directly engage with customers to understand their preferences and willingness to pay for network hosting capacity, in addition to assessing VaDER as we outlined above

Establishing the base-case counterfactual

The draft report recommends that business cases to the AER include a base-case counterfactual in which customers' inverters are allowed to trip, and that assuming low or zero static export limits is inappropriate. Noting that a technical assessment of potential credible options and base cases is outside the main scope of this report, we recommend avoiding such definitive statements. In our view:

- It is incorrect to consider that reducing static limits to a low or zero limit does not align with the RIT-D base-case guidance of not implementing 'any other credible option'. Static limits are currently a 'business-as-usual' means by which distributors are currently managing hosting capacity.

- The 'business-as-usual' approach to maintaining the quality, reliability and security of supply of the distribution system does <u>not</u> currently entail relying on trip settings in AS4777 and /or Volt-Watt response modes in individual inverters. Again while outside the scope of this review, we note that these protection settings are intended as a backstop, and not a credible means for networks to meet their obligations to maintain quality of supply, for a number of reasons including:

    - Local over-voltage is not an indicator of all network impacts due to high levels of PV. In some parts of the network (e.g. some modern underground networks with low impedance) customers' voltage may remain within AS4777 limits while their systems continue to export at levels that contribute to upstream network quality or capacity problems. High transient energy flows due to VPP operations (e.g. FCAS response) on such networks might also exceed local thermal limits before overvoltage protections operate. There are also other factors that influence hosting capacity that are not manifested in local voltage rise; for example, in areas of high solar PV penetration it can become impossible to restore supply after an outage using temporary generators at certain times, as temporary generators cannot provide stable supply when there is excess local generation from PV.

    - Reliance on local protection settings is inequitable. Over-voltage tripping leads to inequity with respect to network access as customers connected to the same local network (facing the same network constraint) will be affected differently depending on where they connect along the

length of the feeder, and other factors such as the size and length of their service mains and their own wiring. In practice some customers' systems will always trip before others and these customers will experience a much lower share of available network capacity and lower performance from their PV systems. Fixed export limits allocate capacity more equitably, and our planned approach of implementing flexible exports provides a pathway towards fully equitable access to available capacity in future.

- Inverter tripping leads to instability at high PV penetrations. AS4777-compliant inverters tend to exhibit cyclic tripping behaviour during overvoltage conditions, typically tripping first on the 10-minute average overvoltage protection setting, then reconnecting and tripping repeatedly through the middle of the day. This behaviour can lead to significant transient changes in local voltage and load levels when multiple inverters are cycling on the same local network, with negative impacts on upstream grid stability and voltage regulation plant.

- Compliance to connection standards is low. We have found, based on sample testing, Quality of Supply (QoS) investigations and our engagement with customers and solar installers that installers often do not program inverters with the correct trip settings and voltage response curves as specified in SA Power Networks' applicable technical standards TS129.

- Battery inverters tripping may exacerbate quality of supply issues. Batteries generally help to reduce daytime over-voltage issues (a) soaking up a portion of PV generation that would otherwise be exported to the grid and (b) through their inverters' Volt/VAR support. Relying on customer inverters tripping to maintain quality of supply when battery inverters (which by definition are all newer inverters) will be among the first to trip, can exacerbate, not improve, local voltage issues. We have seen in South Australia, that where customers have added new batteries to older PV systems, the battery trips on over-voltage while the older PV inverter remains connected (as its settings are based on the previous version of AS4777 which allowed for a broader voltage range), so the effect is that the over-voltage condition gets worse.

Results of testing

The draft report presents the results of modelling / testing undertaken by CSIRO / Cutler Merz on their view of the VaDER for each NEM jurisdiction, as displayed in Figure 2 of the repo. The final report would benefit from more detailed explanation of the following:

- the assumptions and approaches that were used to arrive at the VaDER testing results, including for example, the changes in the generation mix that were assumed, and if the impacts of a new interconnector to South Australia were factored into the analysis; and

- why the VaDER results for South Australia differ so greatly from the VaDER for other NEM jurisdictions, and what assumptions have been used with respect to volumes of tripped solar and the value of that solar. In an interconnected NEM, we fail to see why the value would be so much lower than in other NEM jurisdictions, particularly with the value for NSW.