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16 February 2023

Dear Ms Collyer,

Re: Unlocking CER benefits through flexible trading

Evergen Pty Limited (Evergen) welcomes the opportunity to provide the Australian Energy Market Commission (AEMC) with feedback on the rule change request submitted by the Australian Energy Market Operator (AEMO) related to unlocking the benefits of Community Energy Resources (CER) through flexible trading.

Evergen is an Australian company founded in 2016. We are a software and infrastructure platform for enabling CER monitoring, control, optimisation and orchestration. Rather than being a VPP, we enable VPP owners and CER owners to readily integrate and participate in energy markets.

From early beginnings with residential photovoltaic (PV) and battery systems, Evergen now has more than 11,000 such systems on our platform, making us one of the most significant VPP enablement platforms operating in Australia today. We deliver VPP capability for a large range of clients, including retailers, network service providers and CER system suppliers. We also provide similar capabilities for larger scale renewable energy and storage facilities, and flexible loads such as air-conditioning. While based in Australia, Evergen is active internationally, with initiatives under way in Latin America, Europe and Japan.

CER is an umbrella term for a variety of devices, including various types of controllable load, PV, stationary energy storage, controllable EV chargers, and mobile energy storage (EV batteries). However, there are stark differences in uses, behaviours and functions across these devices. Such differences are important yet easily glossed over when considering regulatory change for CER.

Evergen's view on the rule change proposal is based on consideration of these differences, and provides our perspectives on the impacts that introducing flexible trading arrangements would have on consumer value when considering a) flexible/controllable load CER and b) PV and storage CER.

a) Flexible/controllable load CER:

Evergen is ambivalent to secondary metering for flexible loads such as hot water, pool pumps, etc. The possible advantages for the consumer from compartmentalising market exposure of loads are apparent, but could be offset by the negative outcomes for consumers resulting from increased complexity and costs. The cost of rewiring within the home should also not be underestimated. Information asymmetry is a known issue in electricity, and increased complexity may work against the consumer by exacerbating this.

b) PV and storage CER:

In addition to the reasons stated above, Evergen is pessimistic about the value of secondary metering and flexible trading for PV/batteries and sees little practical justification for this rule change on the basis of this use case. Fragmentation of CER behind the connection point will reduce the usefulness of PV/batteries for consumers.

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Focusing on PV/battery installations, as a key use case, and applying the AEMC's assessment criteria, Evergen does not believe secondary metering will: result in a better outcome for the consumer; result in additional decarbonisation benefits; or meaningfully increase innovation, flexibility, or competition. We recommend the rule change proposal is not progressed and outline the reasons for this conclusion in detail in the attached submission.

If you would like to discuss any aspect of our submission please don't hesitate to contact me at kate.reid@evergen.energy.

Yours sincerely

K. M. Reid

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Attachment

Fragmentation of CER behind the connection point will reduce usefulness for consumers

The first place that CER are “integrated” with the electricity grid is behind the meter. PV/batteries almost always service on-site load before doing anything else. Notwithstanding a very brief period in the distant past when lucrative gross feed-in tariffs (FiT) existed in some jurisdictions, consumers do not install PV/batteries to focus on exporting for a FiT, participating in the broader market or delivering grid services. Consumer research, and our own experience, show their primary goals are:

- Energy independence (maximising *self-sufficiency*[1]).
- Reduced power bills through lower grid imports and (where applicable) demand charges
- Individual climate action

Exclusive to controllable storage such as batteries, the following additional reasons are prominent:

- Maximising *solar self-consumption*[2] (since feed-in is no longer lucrative, and sometimes not possible with export limits).
- Arbitrage via load-shifting when prices are variable (TOU tariffs or spot-price exposed retail offerings).

AEMO’s rule change proposal allows for CER, whether controlled loads, PV/batteries or EV chargers to be metered separately. With subtractive metering, these separate metering arrangements will logically and financially isolate PV/batteries from some or all of the loads behind the meter.

This fragmentation negatively impacts all of the above consumer goals:

- When PV/battery is isolated from local load (in a settlement sense, with separate settlement points, even if physically they are integrated)) they are unable to maximise self-sufficiency, maximise solar self-consumption, or perform load-shifting arbitrage.
- In Evergen’s view, the costs of this fragmentation to the consumer outweigh any benefits that might arise from flexible trading, meaning increased power bills.
- Loads that are shifted to night (as existing off-peak hot water is) and/or met by grid imports rather than local PV generation/storage negatively impacts individual climate action and decarbonisation more broadly, since fossil-fueled generation is a more significant part of the mix at night.

Additionally, fragmentation may increase the burden of PV on the distribution network, if it means that all PV generation is exported rather than first meeting local load and only exporting the excess.

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[1] Self-sufficiency: This specifically refers to the percentage of a consumer’s gross electricity consumption that is met by local generation/storage rather than grid imports.

[2] Solar self-consumption: This refers to the percentage of solar generation that is consumed behind the meter, rather than exported to the grid. A battery, for example can store excess solar generation during the day to be used after dark, thereby increasing solar self-consumption as well as self-sufficiency. More loosely, we also use this term when referring to the possible increase in solar generation made possible when local consumption prevents export-limit related curtailment.

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By extension, this could negatively impact the grid-scale PV, which may be subject to curtailment due to these effects, further increasing emissions.

The full impact of secondary metering is best illustrated with scenario comparisons. In these scenarios, we refer to the PV/battery having "visibility" or not of local loads. We will first define what we mean by this.

Visibility

Batteries may autonomously charge or discharge at varying power levels depending on whether there is excess PV (which could charge the battery) or excess load (which battery discharge could help to serve). However, to know what to do, the energy management system (EMS, which typically resides within the inverter/charger to which the battery connects) needs to know:

- What is the PV generation power right now
- What is the grid import/export power right now

From these, local gross electricity use can also be calculated, if it is not also directly measured.

To know these things, it is essential that additional metering be installed as part of the battery installation. There is always a meter installed to ostensibly measure grid import/export, which we will refer to as the "battery-grid meter". For DC-coupled systems, where PV and battery are connected to the same inverter, no additional meter is required for the EMS to have *visibility* of PV generation power. For AC-coupled systems, where the battery inverter is separate to the PV inverter, an additional meter/CT-clamp must be installed so that the battery inverter can gain *visibility* of PV generation power right now. We will refer to this as the "battery-PV meter".

These metering devices are essential in any PV/battery installation. They are additional to any revenue/settlement metering to which a NMI is associated. Battery inverters rarely communicate directly with the revenue meter.

Placement of these meters directly impacts how the EMS controls the battery. If excess PV is sensed, then the EMS can direct the battery to charge at a power value to match the level of excess PV. If there is excess house load then whether the EMS has *visibility* of this depends on where the battery-grid meter is placed:

- If the battery-grid meter were placed at or close to the connection point, then excess load would be *visible* as a movement towards grid importing at this location, and the EMS could swiftly direct the battery to discharge to avoid this.
- If the battery-grid meter is placed at a secondary point, then it will only measure grid imports related to any load that is also behind this secondary point. That is, the EMS will only have *visibility* of house load that is "behind" the battery-grid meter, even if that load is still behind the connection point.

The placement of the battery-grid meter will impact EMS visibility and battery behaviour. However, this is separate to the impact that secondary metering and multiple settlement points will have on settlement for the consumer. We explore these complexities in the scenarios below. Scenarios #2 and #3 differ only on the placement of the battery-grid meter, impacting the *visibility* of load to the battery.

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Scenario #1: one settlement point and one retailer

The following is the default behaviour of just about any residential PV-battery system under current arrangements, based on Evergen's experience with >11,000 systems under management today. The EMS employed with such a system will operate autonomously to maximise self-sufficiency and solar self-consumption. Battery power adjusts from moment to moment to achieve the below:

- During PV generation, local load is served first. Any excess PV charges the battery. Grid import/export is zero, and there are no kWh charges to the consumer.
- When the battery is full or there is sufficient excess PV to exceed battery max charge power, excess PV is either exported for modest income, or else curtailed due to export limits.
- When load exceeds PV generation, the battery discharges, grid import/export is zero.
- When the battery is empty or else excess load exceeds battery discharge power then grid imports occur. If this occurs at all, it will more likely be at night, when TOU tariffs are typically low.
- Evergen's optimisation: in addition, where Evergen is optimising a battery, if an overcast day or (spot-price optimisation) a price fluctuation is forecast, Evergen may precharge the battery from the grid at lower rates to avoid the need to import later in the day when rates are higher.
- The battery capability for contributing to an FCAS response or other market services must be co-optimised with local needs, or else work around them.

Overall consumer outcome: minimal import costs, and minor export income. This provides huge value to the consumer in maximising self-sufficiency, maximising solar-self consumption and arbitrage, giving a reduced power bill. There is a slight limitation on availability for market/network services due to co-optimisation with self-consumption.

Scenario #2: PV/battery behind a secondary meter with a secondary FRMP, all loads behind the primary meter with a primary FRMP. The battery-grid meter is placed near the secondary meter, so that no house load is *visible* to the battery inverter EMS..

- When it is sunny, PV may charge the battery. There is no import/export at the secondary meter. Meanwhile, the consumer uses electricity, which is metered and incurs charges at the primary meter.
- At various points, the secondary FRMP/controller may discharge the battery to the grid, or allow PV to export to the grid. This will be metered at the secondary meter, generating income for the consumer. This will also impact energy flows at the primary meter, possibly resulting in *physical* export at the primary meter. However, with subtractive metering, the "load" at the secondary meter is subtracted from the primary meter for billing purposes. This means that even if the primary meter physically meters the net of generation and load, once the output of PV/battery at the secondary meter (which is like negative load) is subtracted, the consumer will be billed by their primary retailer as thoughany local loads not behind the secondary meter met entirely by grid imports.
- Participation in other market/network services is maximised under this scenario as the PV/battery can be operated with the sole objective of market participation, in isolation of other loads behind the connection point

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Overall consumer outcome: Consumer self-sufficiency and solar-self-consumption is logically/financially eliminated. All consumer electricity consumption is billed by the primary retailer. Even putting aside the intangible value to a consumer of being energy independent and seeing their own consumption and emissions directly offset by their CER purchases, the consumer is only better off financially if the additional value derived from the secondary retail contract exceeds the bill reduction benefits from self-sufficiency and self-consumption that would have arisen in Scenario 1. In Evergen's view, it is **very unlikely** that forgoing these benefits in favour of a VPP owner fully utilising their CER for market participation or FCAS will lead to a better financial outcome for the consumer.

Consider: PV/battery can avoid retail import costs of 20-60c/kWh ($200-$600/MWh) if used to maximise self-sufficiency, depending on tariff and time of consumption. Although a VPP may be able to trade at this level of value from time to time, unless this can be done every day, the consumer will be better off focusing on self-sufficiency. That FCAS income in some jurisdictions during unforeseen grid disturbances may result in one-off high value contributions are not guaranteed versus the high and every-day value from local PV/battery use, especially when FCAS is still possible under scenario #1.

Scenario #3: PV/battery behind a secondary meter with a secondary FRMP, other loads behind the primary meter with a primary FRMP. The battery-grid meter is placed at or close to the connection point, so that the battery inverter EMS has *visiblity* of all house loads and will respond accordingly..

- When PV generation occurs, it serves local load. Any excess PV charges the battery. Grid import/export at the primary meter is zero. However, the secondary meter records PV/battery output to meet this local load, and this is subtracted from the primary meter during billing. The outcome is that the consumer receives payment from the secondary retailer for any PV/battery output that serves local load as though they had exported to the grid, and the primary retailer will bill the customer for their local load as though it had been imported from the grid, even though physically it was not. The only difference with scenario #2 is that the EMS controls the battery as though it were the case that PV generation will first meet local load before battery charging..

Overall consumer outcome: there is the illusion of self-sufficiency and self-consumption physically, but for billing purposes these are still eliminated, as for scenario #2. Unlike Scenario #2, the FRMP/controller has less control over the PV/battery, since the placement of the battery-grid meter means that the EMS will try to use PV/battery to serve local load, despite the isloation for settlement purposes.. Local load will therefore reduce the availability of PV/battery for grid services, even though the consumer does not benefit from it doing so. Everybody is worse off.

Scenario #4: PV/battery and inflexible loads at primary meter, only flexible loads behind secondary meter. The battery-grid meter is placed near the connection point / primary meter..

- PV/battery will behave as for scenario #1.
- The consumer secures a more valuable retail contract for their flexible loads, in exchange for acquiescing to external control over when these loads occur. Flexible loads are settled at the secondary meter, regardless of whether PV/battery output results in zero net grid import at the primary meter.

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- Although PV/battery will attempt to serve the flexible loads behind the secondary meter due to placement of the battery-grid meter, subtractive metering means that flexible loads are excluded from settlement at the primary meter. This means that:
  - Good for consumer: at times when PV/battery may have been incapable of servicing any loads (e.g., at night when the battery is empty) the consumer avoids being billed for their flexible loads by their primary retailer, who presumably/hopefully had a higher tariff than what is available from the secondary retailer.
  - Bad for the consumer: at times when there is excess PV/battery output over and above what is required to meet inflexible loads, the primary retailer will pay as though this excess were exported to the grid. So the consumer may receive, say 5c/kWh for this, If the primary retailer FiT is less than the import tariff offered by retailer 2 for flexible load consumption, Then the consumer loses money: they would have been better off using their PV/battery to avoid any grid import costs at all instead of exporting and then having flexible loads billed as though being serviced by grid imports.
- The cost of rewiring to achieve this outcome should not be underestimated, as any retrofits will incur unintended costs for bringing the whole installation up to code.

Overall: the consumer derives some gross financial benefit from better tariffs for their flexible load. However, since they can no longer financially avoid imports for their flexible load by using PV/battery, they may in fact be net worse off financially if a significant chunk of their low-tariff flexible load could have been avoided entirely by their PV/battery. What value is a low tariff to shift your load to solar soak times, when the consumer is already incentivised to shift loads to make use of their own solar?

To the extent that the secondary FRMP shifts flexible loads to night time, when solar is absent and coal-fired generation predominates in the NEM, the decarbonisation outcomes will be worse. Even if the primary FRMP shifts flexible loads in such a way that the grid can accommodate more renewable energy (e.g. to daytime when PV increasingly dominates the NEM) this is arguably no better from a decarbonisation perspective than if the consumer met these loads with local PV/battery.

Scenario #5: THis scenario assumes parallel metering, rather than subtractive metering. PV/battery and inflexible loads behind secondary meter #1, only flexible loads behind the secondary meter #2. The battery-grid meter is placed adjacent to secondary meter #1.

This scenario plays out almost identically to scenario #4. The only difference is that the battery inverter EMS will not have *visibility* of the flexible loads behind secondary meter #2, and will not control the battery in response to these. The metering outcome for the consumer is much the same: the flexible loads are billed by the secondary retailer as though fully serviced by grid imports.

We note some additional considerations:

FCAS accounting and verification for VPPs

Through their lengthy consultation process to amend the Market Ancillary Services Specification (MASS) in 2021, AEMO concluded that FCAS delivery from VPPs should be measured at the connection point, not at the device level. Under the existing MASS, devices such as batteries that may attempt to inject power in response to a frequency disturbance must first meet local load, which

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erodes the maximum power contribution that a battery may deliver. On a first pass, this seems like a benefit of secondary metering, that a device may inject to its fullest extent for FCAS, without first needing to meet local load. However, there is only an advantage to an FCAS VPP from secondary metering if the PV/battery is completely isolated from house load. And as discussed above, the lost value in eliminating self-sufficiency, eliminating solar-self-consumption and increasing solar export / distribution woes are almost certainly going to outweigh the additional benefit in delivering FCAS.

With existing arrangements, the VPP will need to forecast and account for other loads and devices behind the connection point when making bids, but participating in FCAS is still possible, and can be co-optimised with other benefits like self-consumption. The consumer is able to join a VPP with their FRMP, or an FCAS VPP via an independent MASP/DRSP separate to their FRMP already, so there is no obvious competition benefit from secondary metering permitting multiple FRMPs.

Wholesale market participation

AEMO is moving forwards to bring VPPs comprising distributed CER formally into the NEM, through initiatives such as schedule-lite.

However, as discussed above, Evergen believes there is currently a disconnect between the value of PV/batteries for the consumer, versus the value that can be garnered from wholesale energy market participation via a VPP. Fully committing all PV/battery behaviour to the wholesale market via a VPP is unlikely to generate better value for the consumer versus self sufficiency and solar self-consumption. Consumers may be willing to offer “flexible” generation/load into their VPP, where “flexible” denotes surplus or transitory capability (if prices are particularly high), rather than CER’s entire output.

Secondary metering / multiple FRMPs does not facilitate this hybrid behaviour of mostly using PV/battery locally and then sometimes contributing to wholesale market participation. Rather, a single settlement point at the same place as the connection point is required, putting the onus on companies like Evergen to effectively forecast local loads and generation and deliver co-optimisation between customer uses and VPP uses, a capability Evergen has already developed. Consumers will maximise return on investment for their PV/battery when they can co-optimise across a value stack including self-consumption, flexible loads and market participation.

Concluding recommendation

Considering the suggested assessment criteria proposed by AEMC, and focusing just on PV and battery-based CER, Evergen does not consider that AEMO’s rule change proposal has merit and should not be progressed. Secondary metering may have some minor positive impacts on safety/security/reliability, or in theory provide more options for consumers and increase competition. However, in practice, Evergen does not believe adopting secondary metering for PV/battery will result in a better outcome for the consumer,result in additional decarbonisation benefits, and do not think it will meaningfully increase innovation, flexibility, or competition.