Ausgrid's Battery Virtual Power Plant

Progress Report 2021

Contents

1 Executive Summary

Ausgrid's VPP trial commenced in 2019 with 237 battery customers representing an aggregated dispatch power capacity of 1MW and a storage capacity of 2.4MWh. Since then the VPP fleet has increased to approximately 750 battery customers with a total battery power of 3.4MW and storage capacity of 7.3MWh. The results from the first two years demonstrated that:

- Orchestrated VPP dispatches can offer considerable additional power when compared to 'business as usual' battery profile.
- With a sufficiently sized fleet, VPPs have the potential to address network constraints
- Value stacking can impact the availability of VPPs during peak demand days

In the previous year, Ausgrid has continued to explore the potential of VPPs and various ways to optimise their performance.

Key findings from the trial results in the previous year include:

- Automatic pre-charging of the VPP is useful for achieving maximum energy dispatches however automatic pre-charging should be avoided during or close to the peak period. Further investigation and collaboration with VPP providers is required to provide the user and Industry with options to prevent pre-charging during peak period.
- Dynamic dispatch offers a more consistent load profile and better controllability at the metering point when compared to a static dispatch.
- To implement FiM (Feed in Management) successfully, it is important to ensure that all inverters on site are set up and compatible with the FiM technology. This could be challenging for sites with older solar inverters, which are more likely to have compatibility issues.
- Gross FiM can add cost to the customer's energy bill as it restricts all solar output resulting in the customer having to import grid electricity during solar hours. Payments to customers for market and/or grid support would be required to compensate customers for this.
- Net FiM management is preferable to gross FiM as it allows the customer's load to be supplied by solar while restricting export into the grid. However, net FiM is more complex to implement as the inverter must be able to constantly adjust solar output to supply the load but limit export to a set threshold.
- Both gross and net FiM can assist with lowering voltage during minimum demand days when solar export can cause high voltage levels in the network.
- Customer feedback has been largely positive with a majority of the customer expressing that they're satisfied with their experience so far and are likely to join a VPP again in the future.

2 Introduction

Ausgrid's Virtual Power Plant (VPP) project explores how the grid can integrate with renewables and partner with industry and customers to maximise grid efficiency benefits and reduce costs for customers. By offering reliable and cost competitive sources of demand reductions or voltage support services, battery VPPs have the potential to help avoid or defer network investment.

The battery VPP trial is part of Ausgrid's broader Demand Management Innovation program and is one of the ways Ausgrid is engaging with market providers and customers to shape the future of energy, by working smarter with the customers. Our partnership with Reposit Power, Evergen and ShineHub has enabled Ausgrid to dispatch hundreds of residential batteries and test a wide of variety features in order to explore the potential of battery VPPs .

3 Background

3.1 What is a VPP?

A VPP links decentralised and independent small-scale generators (such as solar power systems and batteries) into a network, forming a centrally managed virtual generating unit. VPPs can be coordinated to provide support to the electricity grid on days of very high demand or can be used to trade electricity at times of high wholesale electricity prices. Participating customers are paid for use of their batteries, lowering their energy costs. By dispatching stored energy from customers' batteries when of highest value, VPPs offer Ausgrid greater flexibility of choice in optimising planning and operation of the grid, leading to lower costs for all customers on the network.

Over the course of Ausgrid's VPP trial, participants are occasionally called upon to dispatch energy from their battery systems. Each Ausgrid dispatch event is crafted to explore a research objective in areas such as the delivered reduction in demand on the grid and the performance of battery management systems. When Ausgrid activates signals to customers' batteries through their battery VPP provider, the stored energy is used within the home with any excess exported to the grid. In return, participating customers are paid for the energy they dispatch from their battery, lowering their energy costs.

3.2 Previous research

Ausgrid has been exploring the potential for behind the meter and grid-based batteries for peak demand reductions since 2012. A residential battery trial in 2012 involved the installation of zinc bromide RedFlow batteries for 60 residential premises (5kW / 10kWh batteries) at Scone and Newcastle in the Hunter region. Although RedFlow batteries were just emerging from the research and development phase, this trial highlighted the significant potential of batteries for grid support. The trial also identified several obstacles, such as with battery stability, reliability and costs.

The Newington Grid Battery trial[1] in 2014 involved the connection of a 60kW / 120kWh lithium ion battery to the low voltage distribution network in the Sydney Olympic Park area. The trial again demonstrated the value of batteries for grid support, but highlighted issues related to battery management system reliability and the need for further reductions in battery storage costs before batteries could be considered a firm and cost competitive demand management resource.

Since these early trials, there have been significant technological and market improvements which have made the reassessment of behind the meter batteries for network support particularly relevant. These developments include the maturing of battery technologies in terms of size, capability and cost, the emergence of the VPP concept to meet multiple network and market needs, and the emergence of VPP market providers and aggregators. Across Ausgrid's network there are over 6,000 residential battery installations and this number is expected to grow significantly in the future as battery costs continue to fall.

4 Trial Overview

4.1 Objectives

Ausgrid's VPP project seeks to leverage the existing customer battery capacity of VPP providers and provide additional value to customers to support additional market uptake.

Primary research objectives of the project include determining:

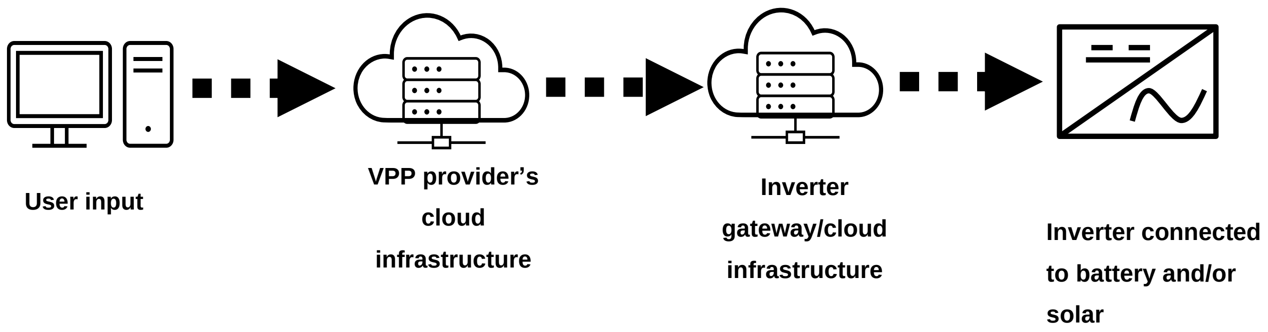
- whether VPPs can provide reliable short-term demand reductions (typically 2 – 4 hours) during hot summer and cold winter evenings when demand peaks;
- whether VPPs can provide reliable sources of voltage support in conditions of over-voltage (typically during sunny Spring and Autumn days) or under voltage; and
- the typical battery charge and dispatch profile, to assess BAU (Business-As-Usual) battery operation and to provide a baseline operating condition for the assessment of VPPs.

4.2 VPP Dispatch and Communication

VPP dispatches and reports are managed via user-friendly platforms developed by the VPP providers, where dispatches and reports can be quickly generated by Ausgrid with a few clicks at anytime and anywhere with a login account.

[1] Newington Grid Battery Trial: https://www.ausgrid.com.au/-/media/Documents/Demand-Mgmt/DMIAresearch/Ausgrid_Newington_Grid_Battery_Report_Final.pdf

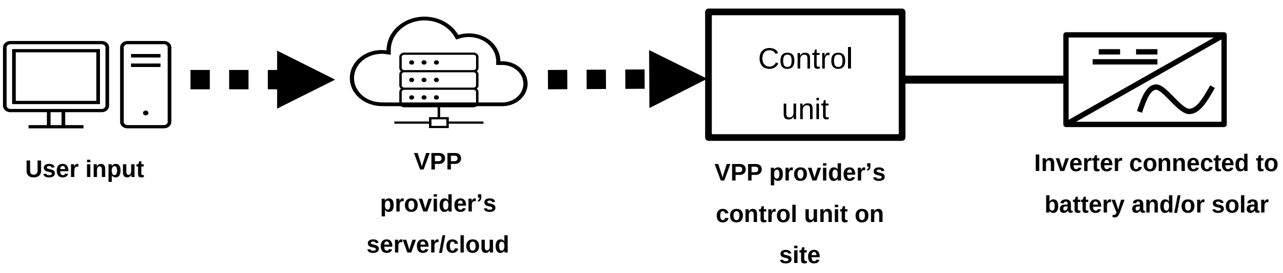
Figure 1 – High level communication process for VPP dispatch via inverter manufacturer's gateway



Amongst Ausgrid's VPP partners, there are two processes used to communicate dispatch signals to the inverter on customer's premise. Figure 1 illustrates a process where the dispatch commands are received by the inverter via inverter company's gateway/cloud infrastructure. The advantage of this method is that it avoids the need for installation and maintenance of additional control hardware at the customer's premise. Further, if the customer decides to leave the VPP program there won't be a need to decommission the hardware or potentially have a stranded hardware at the customer's premise. This arrangement is dependent on the inverter company facilitating a gateway/cloud solution to control and monitor their inverters.

Figure 2 illustrates a process where the dispatch signals are communicated via VPP provider's control unit that's directly connected to the inverter on customer's premise. The advantage of this approach is that it allows the VPP provider to customise certain aspects such as data refresh rates and metering configuration. In addition, the VPP provider can send and store a set of dispatch signals in the control unit prior to a dispatch so that if internet connectivity is unavailable during a dispatch, the inverter continues to receive command signals from the control unit that's connected at the site. This arrangement is dependent on the control unit being compatible with the inverter on customer's premise.

Figure 2 – High level communication process for a VPP dispatch with a control unit

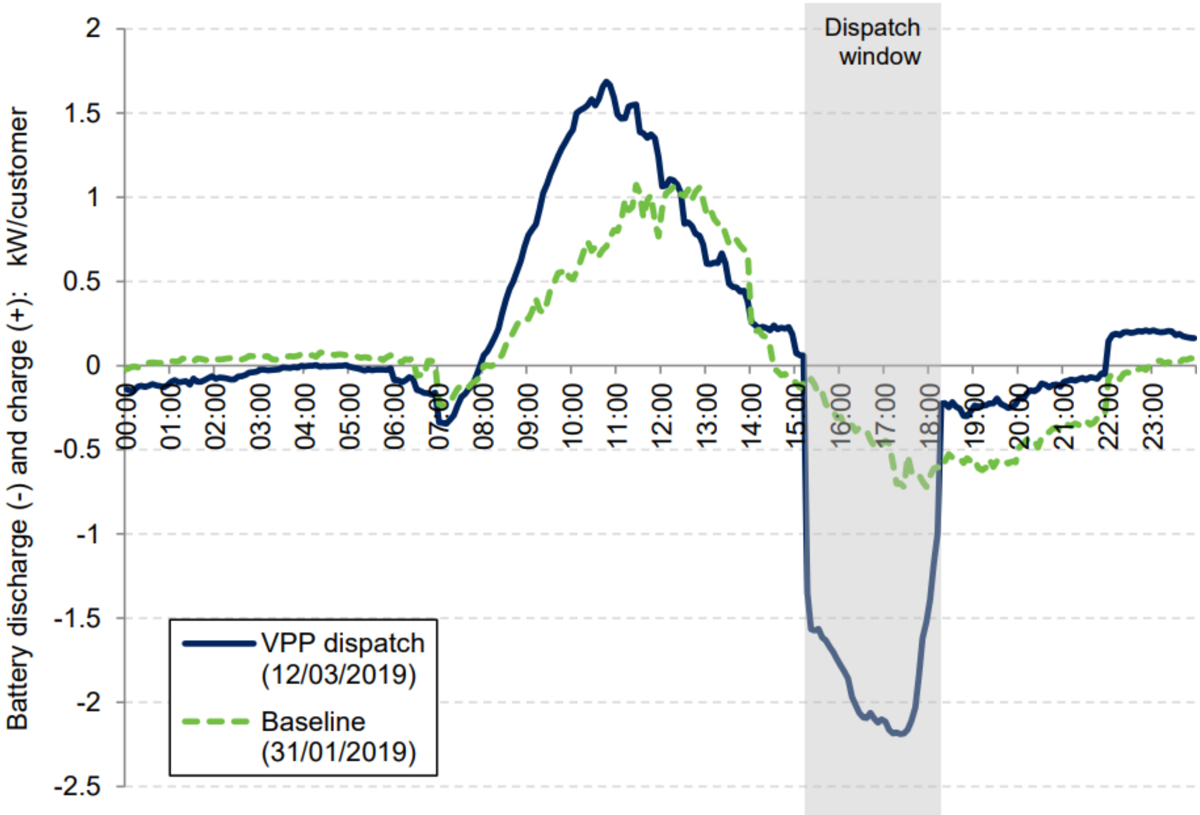


5 Trial Results

5.1 Year 1

In 2019, Reposit Power was selected as the VPP provider for phase 1 due to their proven experience with residential battery management and dispatch, significant experience with R&D and demonstration VPP projects, and their established customer base. A total of 237 customers were initially included in Ausgrid's VPP, representing an aggregated dispatch power capacity of 1MW and a storage capacity of 2.4MWh. One of the key findings from the first year was that a targeted VPP dispatch can deliver considerable additional power during evening peak periods in comparison to a 'business as usual' non-dispatch battery profile. This was demonstrated in a dispatch on 12 March 2019, in which additional 1.4kW/customer was delivered when compared against the 31 January 2019 'business as usual' baseline da (see Figure 3).

Figure 3 - Average battery charge and discharge profile on 12 March 2019



An interim report detailing results from phase 1 was published in August 2019, which discussed issues such as:

- Battery BAU profile and its potential impact on the grid
- Performance of battery VPP dispatches
- Customer benefits associated with the VPP trial

5.2 Year 2

After being selected as part of an open tender process in 2019, Evergen and ShineHub joined the trial in 2020. The VPP power capacity, at this stage, had increased to 1.4MW with a storage capacity of 3.5MWh across approximately 350 battery customers. The dispatches during the second year of the trial demonstrated that peak demand on constrained assets can be materially reduced with an adequate number of battery VPP customers (see Figure 4 and Figure 5).

Figure 4 - Projected VPP impact on 11kV feeder 80923 at Kurri zone for the dispatch on 28 Jan 2020

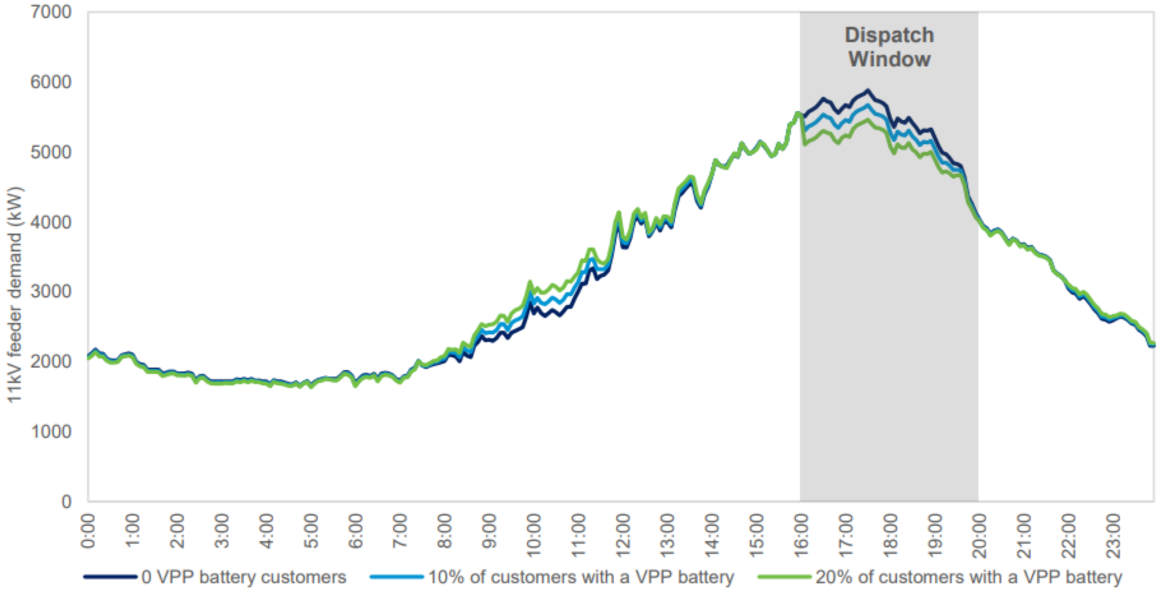
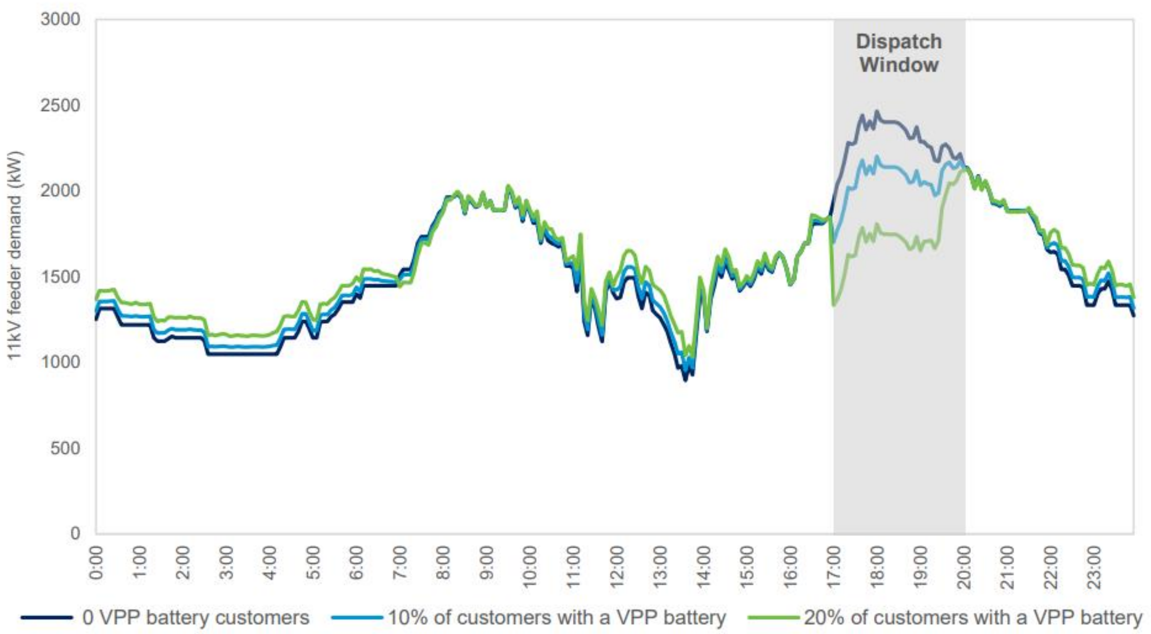


Figure 5 - Projected VPP impact on 11kV feeder 80923 at Kurri zone for the dispatch on 14 July 2020



Other lessons learnt during the second year of the trial included:

- Battery pre-charging can add to the peak load depending on when it's scheduled
- Value stacking can impact the availability of VPP during peak demand days
- Dispatch profiles can vary between different fleets and providers
- According to surveys 'Helping the electricity grid to be managed more efficiently', environmental benefits and financial incentives were the main reasons for joining the VPP trial

A progress report summarising these results was published in November 2020.

5.3 Year 3

Ausgrid VPP fleet currently has a total battery power of 3.4MW and storage capacity of 7.3MWh across approximately 750 battery customers. During FY2021, there were 66 event days with over 60MWh of energy dispatched. In the previous 12 months, Ausgrid further explored ways to optimise VPP performance and tested new features. The areas of focus included:

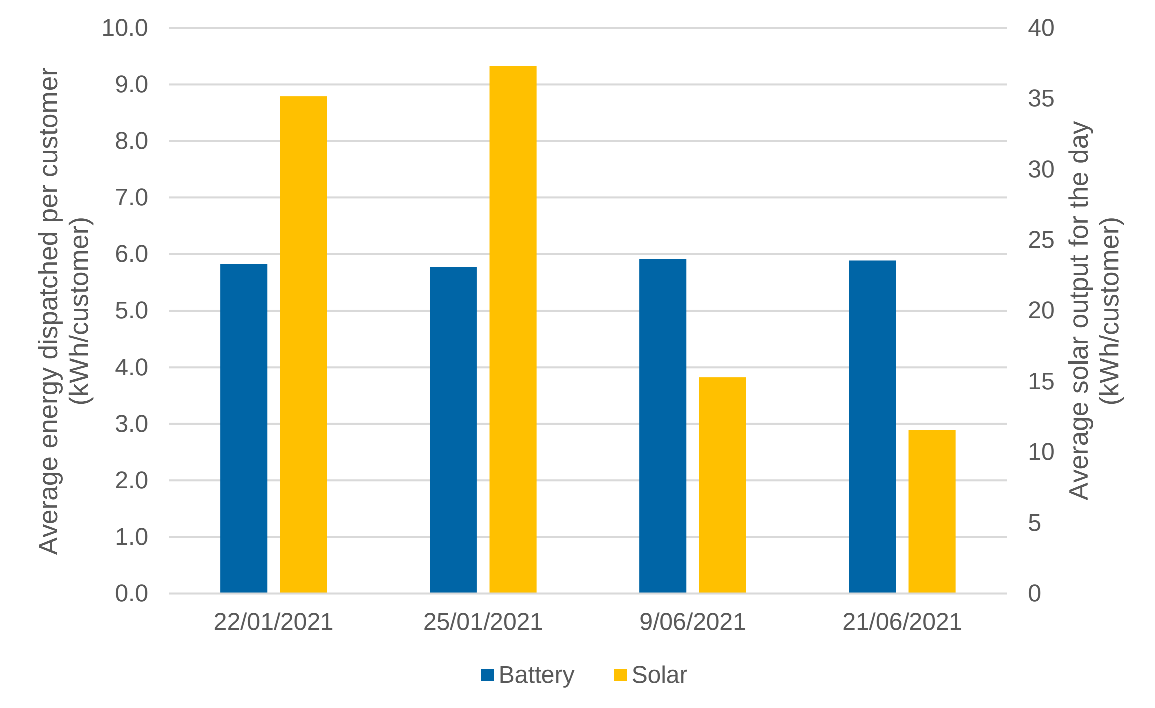
- Maximising dispatched energy using automatic pre-charging
- Dynamic dispatch that adjusts energy output to follow the load profile
- Feed in Management (FiM) to address high voltage situations during minimum demand days
- Feedback from customers and VPP partners

A summary of the findings is presented below.

5.3.1 Pre-charging to maximise dispatched energy

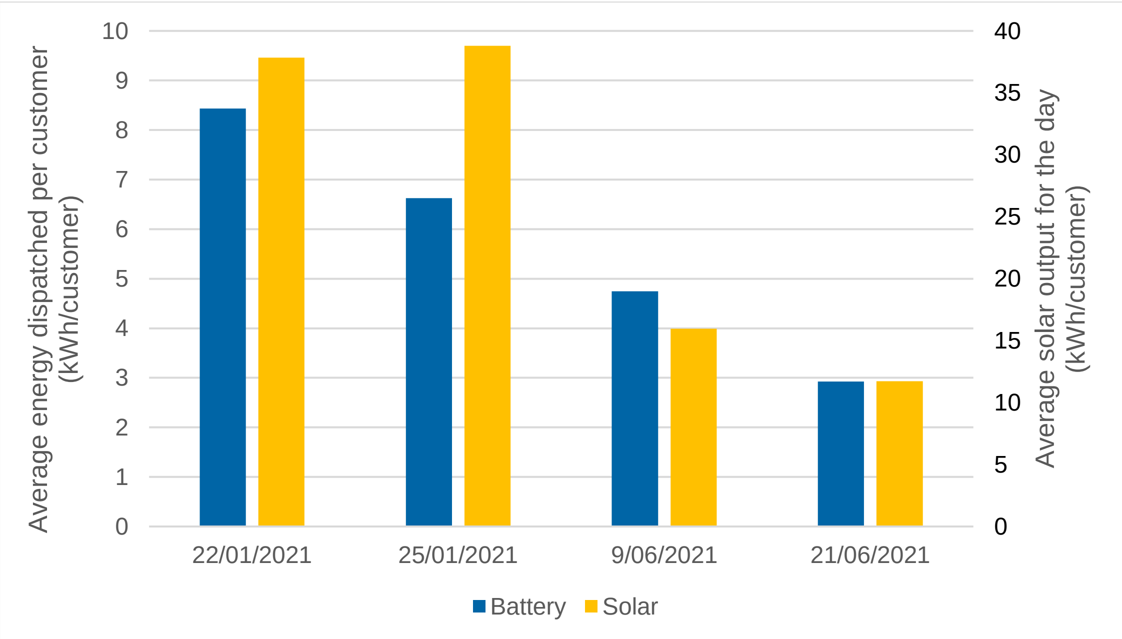
One of the main methods to maximising dispatched energy from a VPP is to pre-charge the battery fleet before a dispatch. Approximately half of the batteries in Ausgrid's VPP fleet have an automatic pre-charge function, where the BMS (Battery Management System) monitors the battery state of charge and automatically charges the batteries prior to a dispatch with the aim of maximising available energy. Figure 6 shows that dispatched energy for a group of batteries with automatic pre-charge function is consistent (+/- 0.1kW) throughout summer and winter days with varying output from their solar system.

Figure 6 - Dispatched energy for a group of batteries with an automatic pre-charge function



For batteries without an automatic pre-charge function, the dispatched energy is dependent on solar output and customer usage leading up to and during the dispatch. Figure 7 highlights the fluctuations in dispatched energy for batteries without an automatic pre-charge function. While a manual pre-charge can be scheduled for these batteries, it is not as efficient as an automatic pre-charge function where the BMS monitors the batteries and charges the batteries as required.

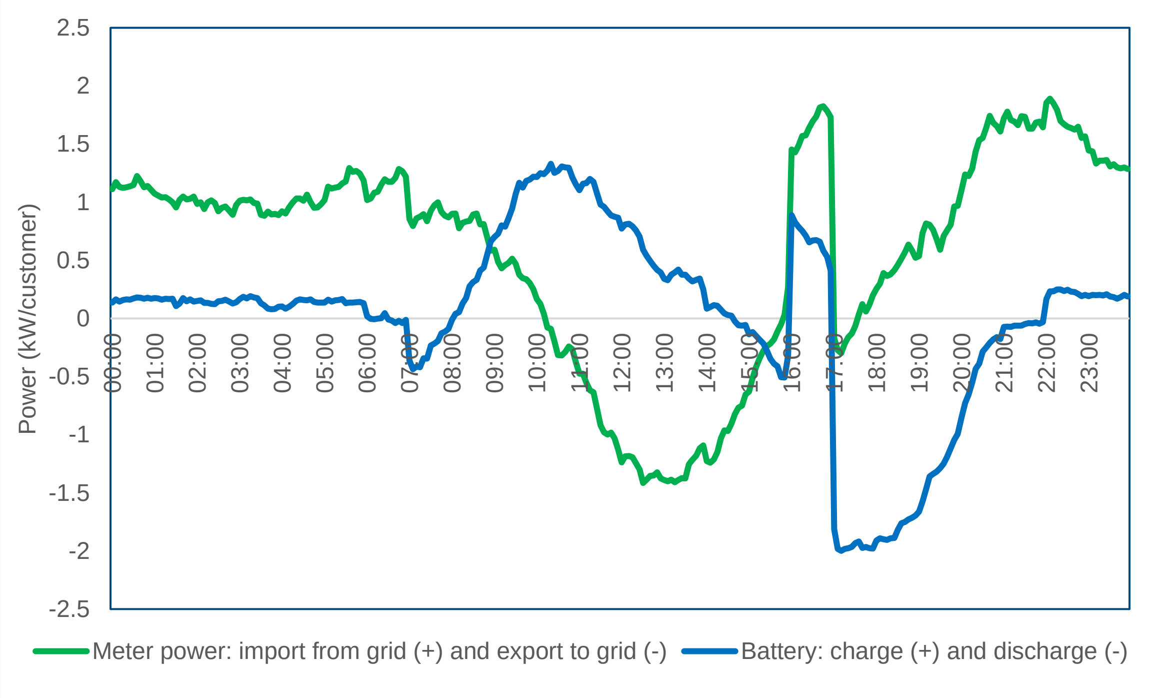
Figure 7 - Dispatched energy for a group of batteries without an automatic pre-charge function



While an automatic pre-charge function is useful for maximising energy dispatched, the pre-charging could potentially increase maximum demand if it occurs prior to a peak demand dispatch.

Figure 8 shows a dispatch that was called one hour prior to the dispatch window (17:00-21:00) which resulted in a pre-charge that increased the customer's load between 16:00-17:00.

Figure 8 - Dispatch for a fleet of batteries with automatic pre-charge function on 29 July 2021

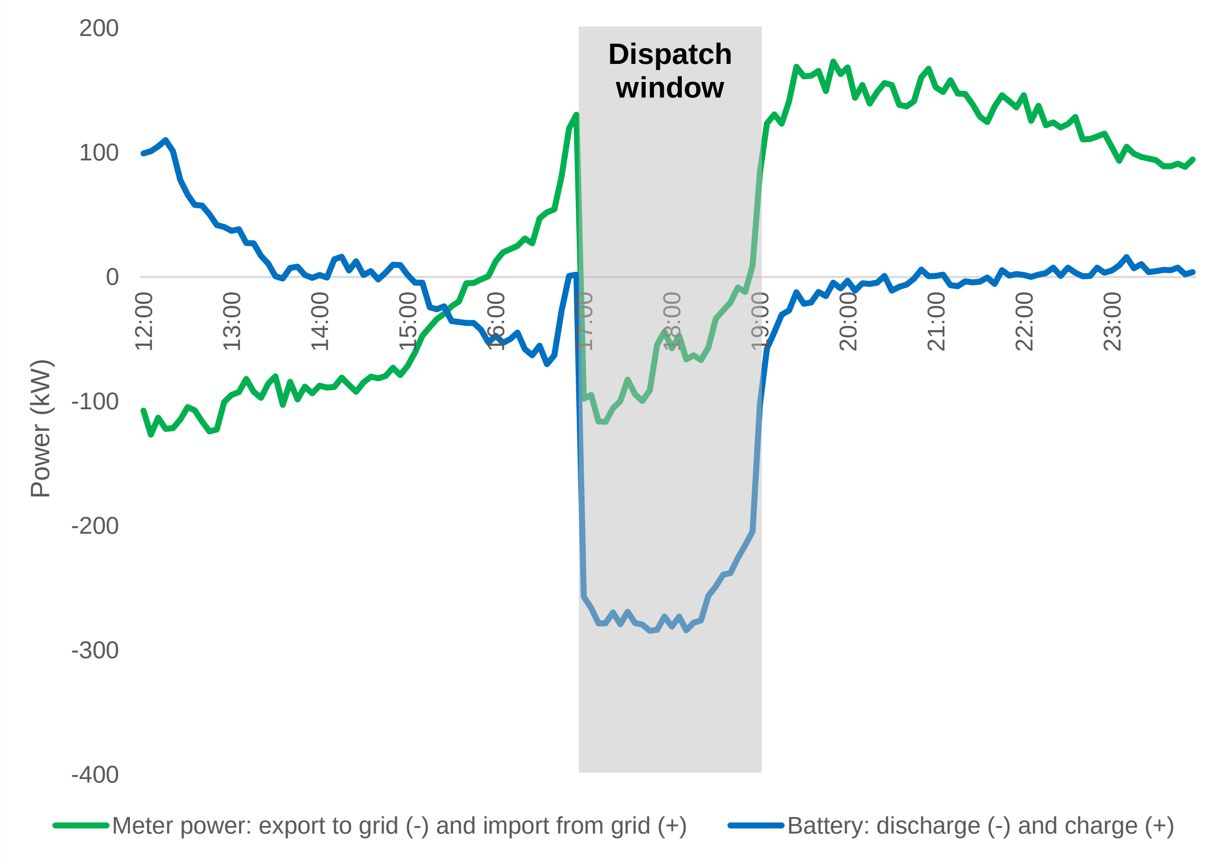


These results highlight the usefulness of automatic pre-charging but also the importance of managing the timing of the pre-charge. Ideally pre-charging should occur during an off-peak or shoulder period however this may not always be possible especially if the dispatch is scheduled with a short notice just prior to the dispatch window. Currently there is no option for the user to turn off the automatic pre-charge or adjust the level of automatic pre-charge. This automatic pre-charging works well for cases where the dispatch is scheduled with advance notice (e.g. 8-24 hours) prior to the event window as the pre-charge generally occurs during off-peak or shoulder period for these cases. However, when an event is scheduled with short notice (e.g. 1-3 hours) prior to the dispatch, the user could be provided with an option to turn off or adjust the level of automatic pre-charge to avoid the possibility of pre-charging during the peak period. One option available to the user right now is to adjust the amount of dispatch requested from the fleet to the state of charge of the batteries to minimise pre-charging.

5.3.2 Dynamic dispatch

The majority of dispatches scheduled so far in the VPP trial have been static dispatches, where the aim is to discharge at a fixed level of power throughout the dispatch window without considering the customer's usage. Figure 9 demonstrates an example of a static dispatch (17:00 – 19:00) where the VPP output is relatively consistent and meter power varies throughout the dispatch window due to changes in the customer's energy usage.

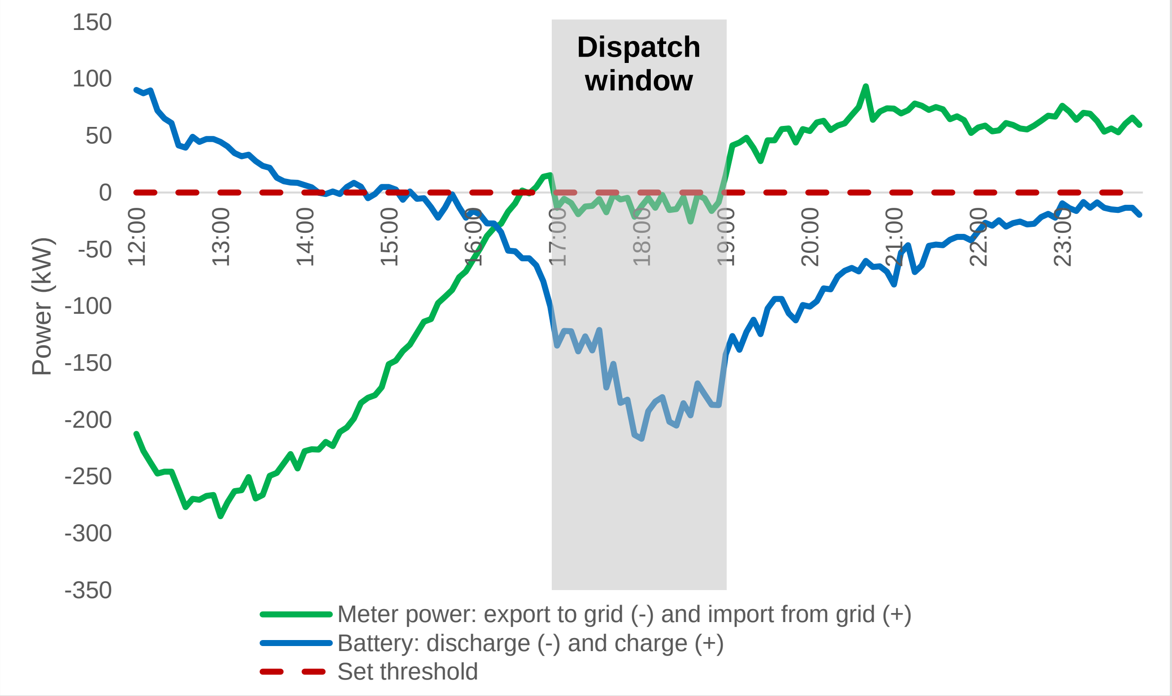
Figure 9 - Typical static dispatch on 26 July2021



Recently, Ausgrid implemented a dynamic dispatch feature, where the battery VPP output is automatically adjusted to maintain meter power below a certain threshold.

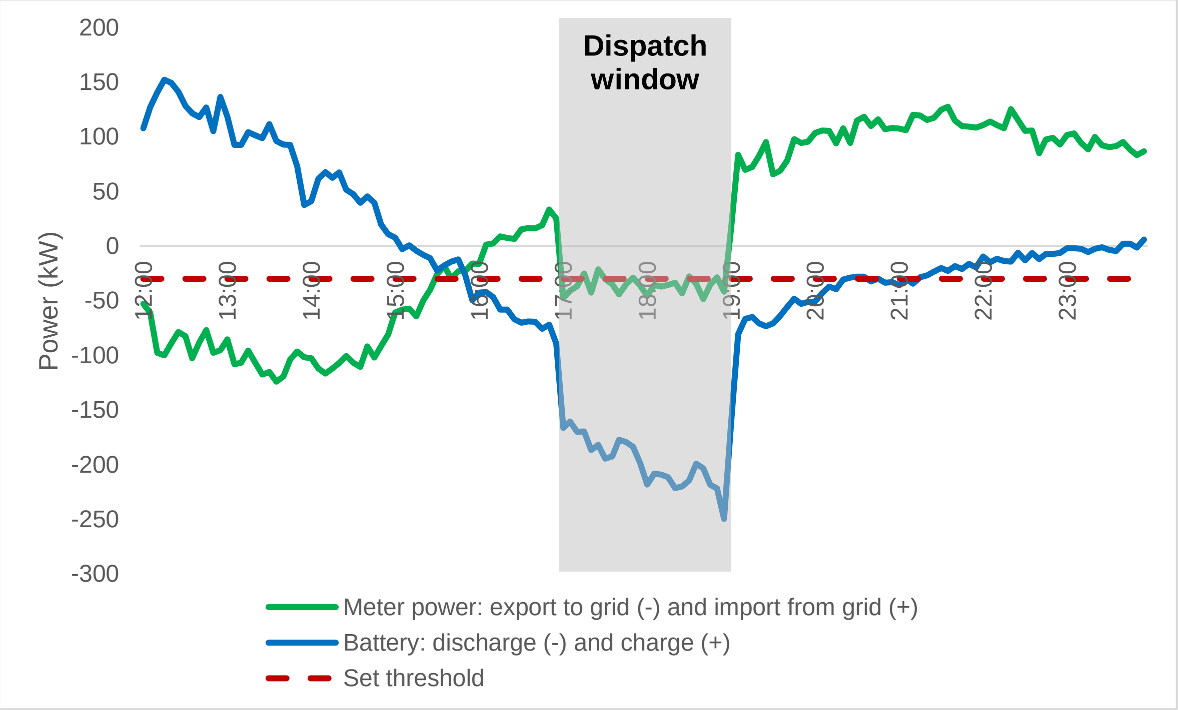
Figure 10 shows an example of dynamic dispatch where the threshold is set to zero (no consumption).

Figure 10 - Dynamic dispatch with threshold = 0 (no load consumption) on 16/08/2021



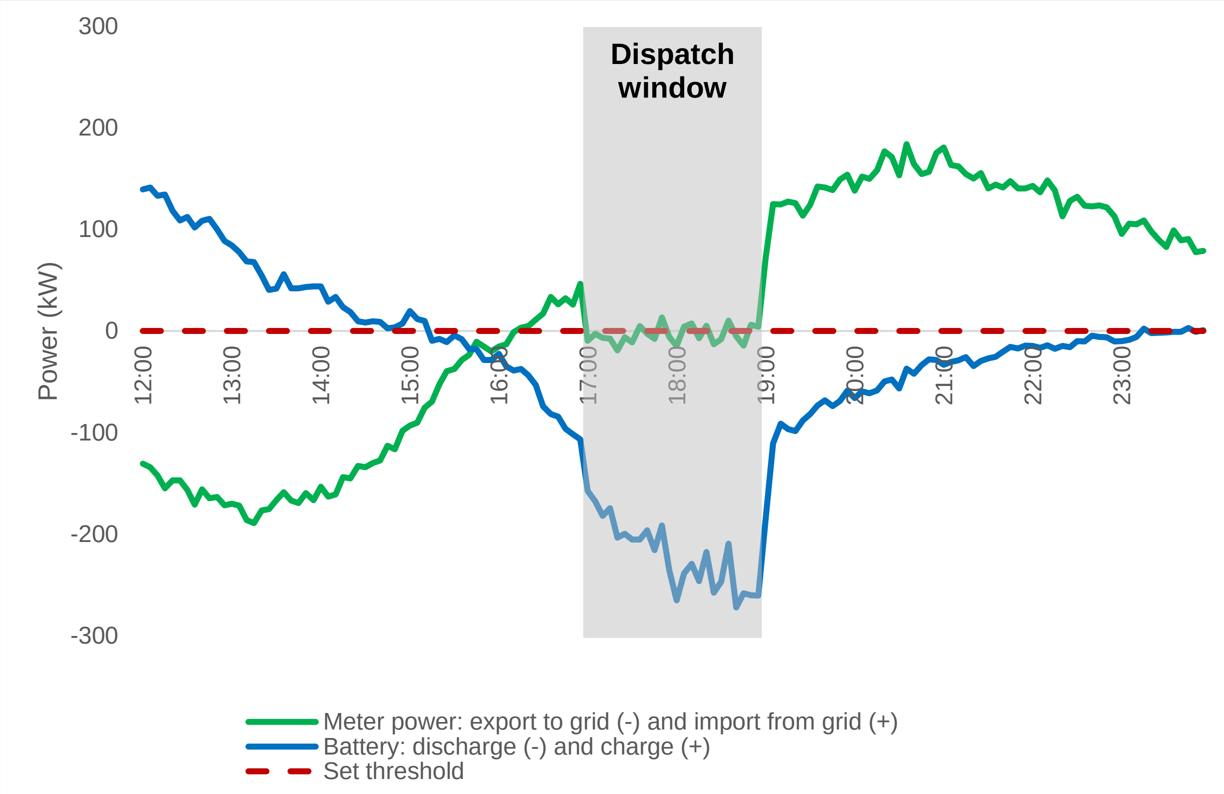
The threshold can also be set to a negative number (export), which means the BMS will adjust VPP output to achieve a minimum level of export at the meter point to assist the grid during peak periods. Figure 11 shows a dynamic dispatch where the threshold is set so that there is a minimum export of 30kW.

Figure 11 - Dynamic dispatch with threshold = -30kW (export) on 31/07/2021



Dynamic dispatch feature does require a reliable communication network as it involves regular communication (multiple times per minute) between the battery inverter and the BMS. Occasional threshold exceedances can be seen in Figure 11 and Figure 12, which can be explained by connectivity issues.

Figure 12 - Dynamic dispatch with threshold = 0 on 22/07/2021



A static dispatch generally involves discharging a maximum fixed amount during an event window. This may be suited for emergency scenarios where a network is overloaded, and the aim is to dispatch as much as possible to reduce the load quickly.

A dynamic dispatch is suited for days when the exact peak time is unknown. Dynamic dispatch can be schedule for longer event window (e.g. 6 hours). The discharge will only occur if the load at the metering point is expected to exceed the threshold and will be adjusted based on the household consumption.

These charts demonstrate the advantages of dynamic dispatch compared to a static dispatch, which include:

- Battery is only discharged when required to meet a set threshold at the metering point
- A more consistent load at the metering point, which assists with network stability
- Allows the network operators to plan and set a threshold that is appropriate to the network constraint at the metering point.

5.3.3 Feed in Management

Instances of higher voltages on local low voltage distributors are increasing as networks continue to experience high growth in new solar PV connections. The local low voltage network and customers' solar installations contribute to the higher voltages which typically arise at times when there is low demand for grid power and high volumes of local solar generation. Solar power systems include solar inverters which are programmed to disconnect or ramp down generation when the local voltage rises above certain limits. A customer's solar power system may be interrupted or reduced in output during these times of local higher voltages.

There are a range of network upgrade options which can alleviate these issues and avoid instances where solar power systems are interrupted or restricted due to high volts. But to explore potentially better ways to regulate local voltage, a Feed in Management (FiM) functionality available with some VPP participants was tested to explore efficacy and reliability.

In November 2020, Ausgrid tested solar Feed in Management (FiM) for a month with 24 battery customers that were part of the VPP trial. The main objective of the trial was to explore the effectiveness of FiM in regulating voltage. The FiM participants had either AC coupled, DC coupled or AC/DC configuration at their house. In many of the sites, compatibility with legacy solar inverter prevented the FiM technology from working as planned. Both gross FiM and net FiM were tested during the trial. Net FiM restricts solar generation to supply customer load and limits the net export to a set threshold. For example, net zero FiM event would restrict solar generation to supply only the load and limit net export to zero. Gross FiM turns off all solar generation.

For an AC coupled site (Figure 13), the control function was only set up for the battery inverter and not the solar inverter, which resulted in FiM functionality not working as planned for these sites. Figure 14 and Figure 15 show a lack of response for the FiM events that were scheduled with AC coupled sites.

Figure 13 - AC coupled site

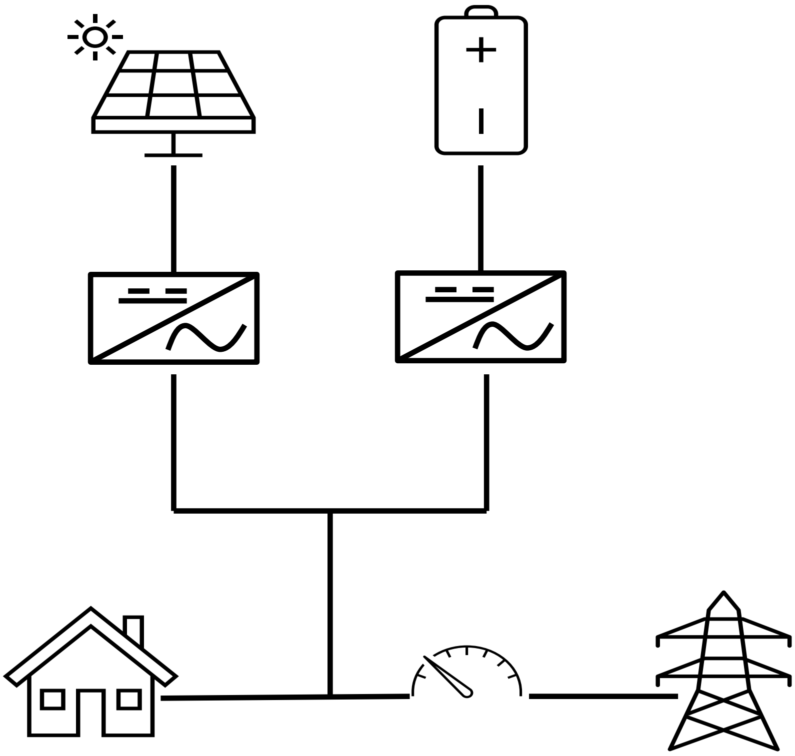


Figure 14 - Demand Profile of AC coupled sites that participated in gross FiM event on 18/11/2021

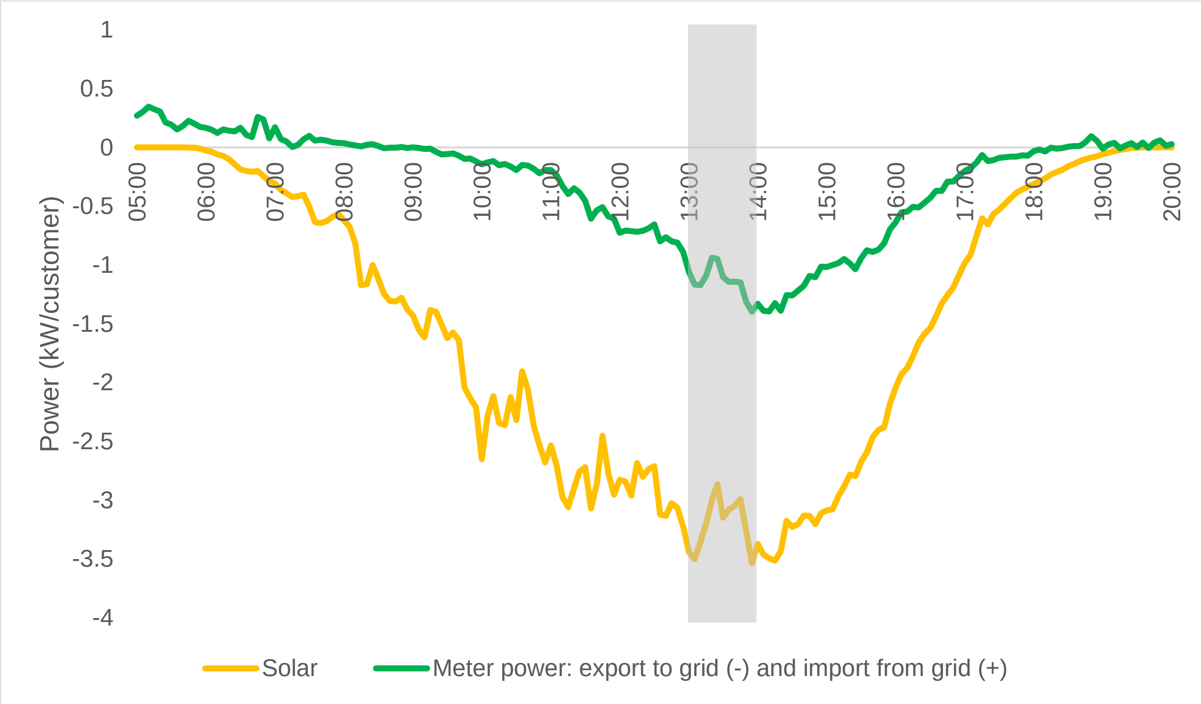
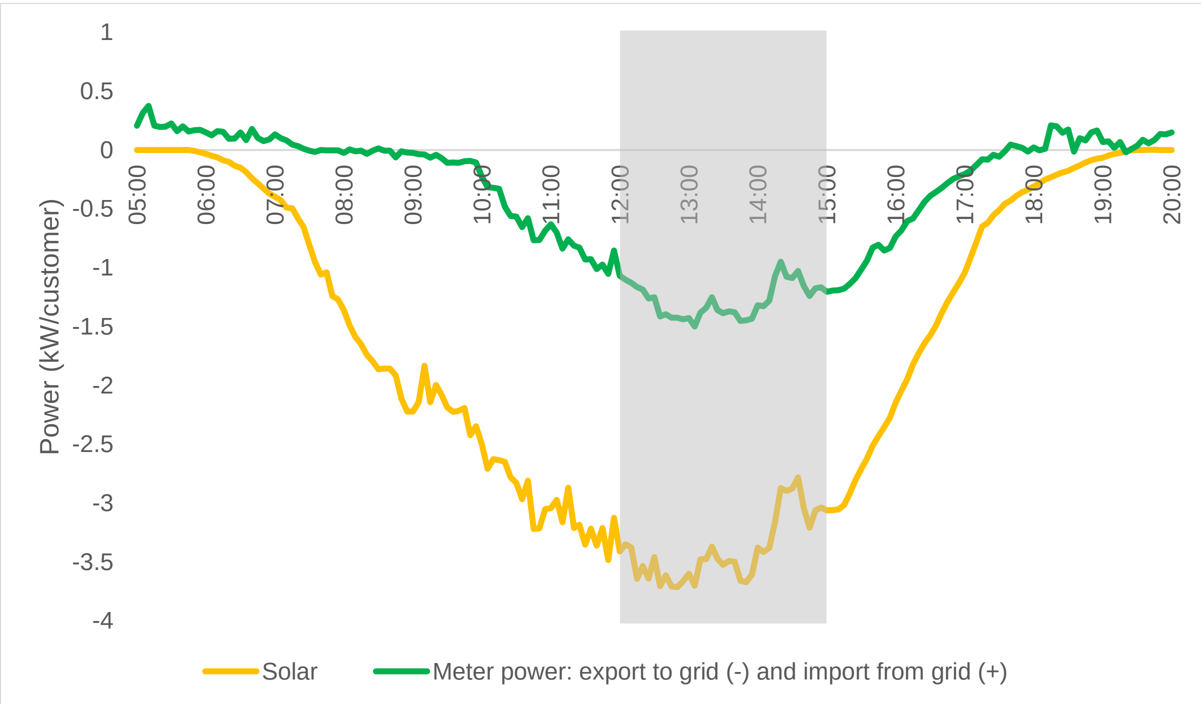


Figure 15 - Demand Profile of AC coupled sites that participated in net zero FiM event on 19/11/2021



For an AC/DC configuration (Figure 16), the control function was only set up for the hybrid inverter with the solar and battery, and not the standalone solar system. Therefore, FiM response was observed for the solar that was connected to the hybrid inverter and not the standalone solar system.

Figure 17 shows gross FiM event where all solar generation was scheduled to be turned off. The results show that only the output from one of the solar systems was turned off while the standalone solar system continued to operate normally. Similarly, only one of the two solar systems seems to have responded to the net zero FiM event on 19/11/2021 (see Figure 18).

Figure 16 - AC/DC coupled site

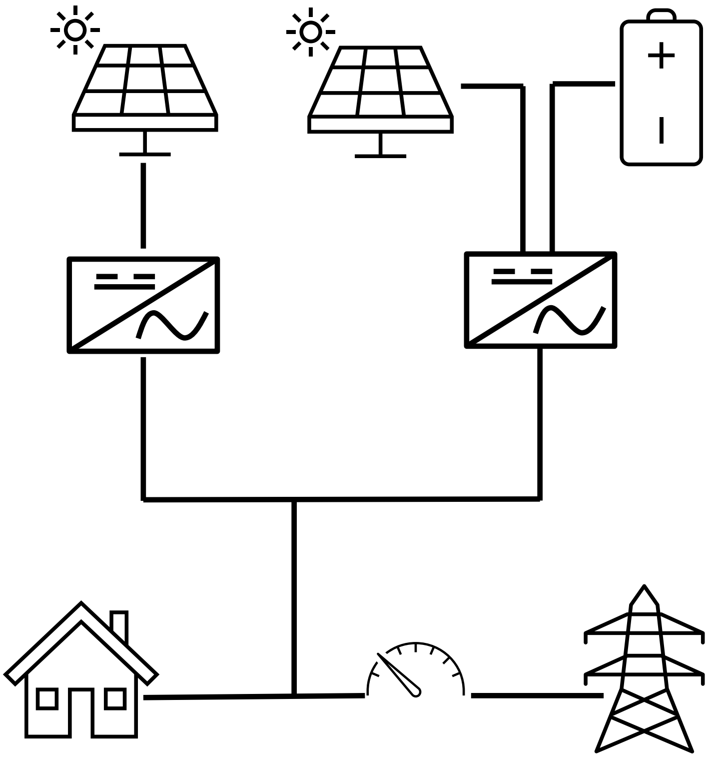


Figure 17 - Demand profile of sites with AC/DC coupled sites during gross FiM event on 18/11/2021

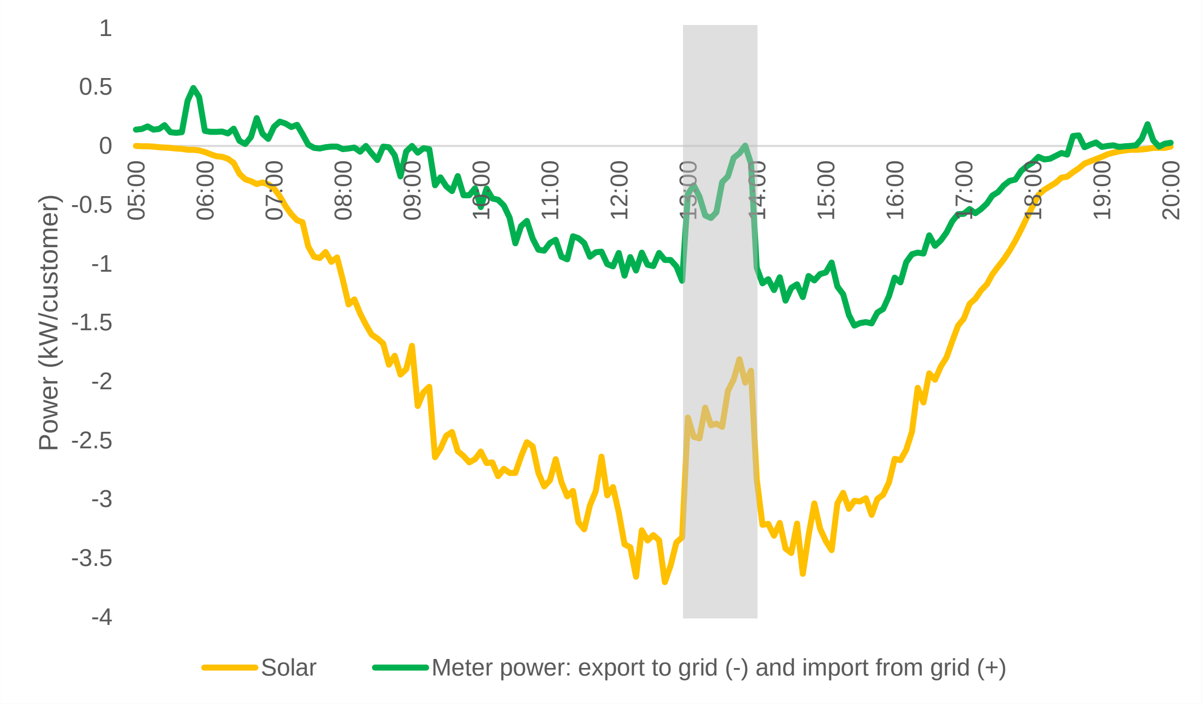
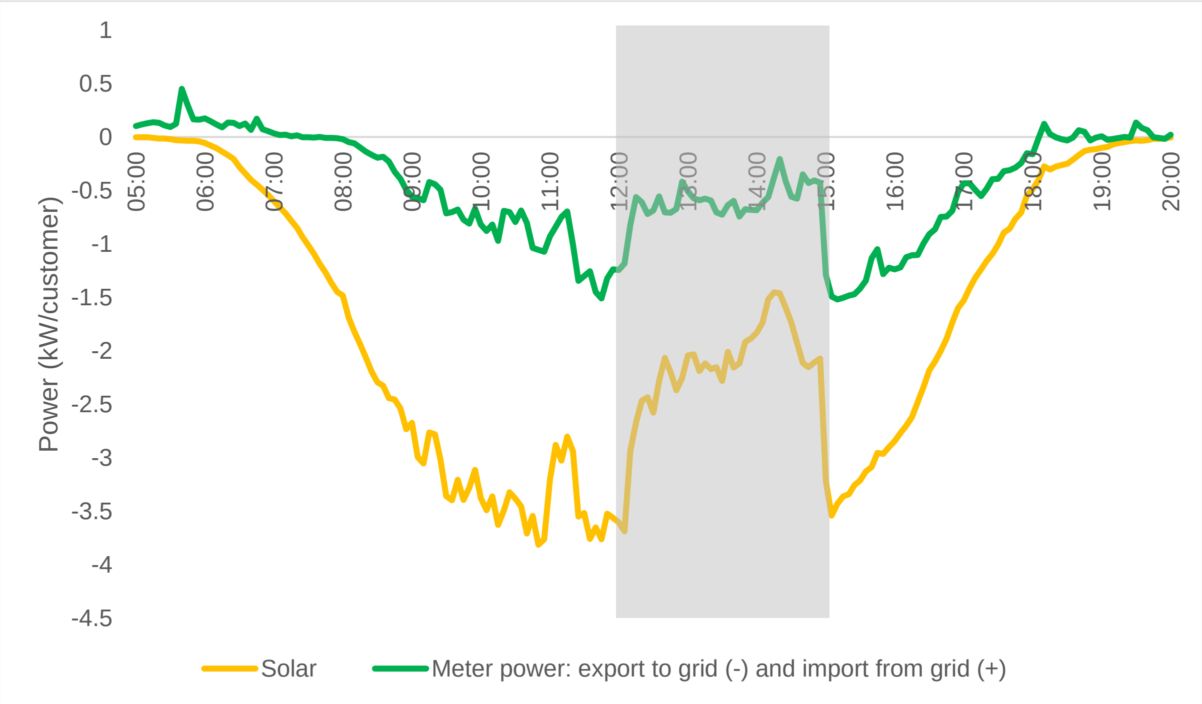


Figure 18 - Demand profile of AC/DC coupled sites during net zero FiM event on 19/11/2021



For a DC coupled sites (Figure 19) with only one inverter the FiM functionality generally worked as planned. As shown in Figure 20, the gross FiM event switched off all solar generation, which resulted in the customer having to import electricity from the grid when its solar system is capable of supplying the load.

Figure 19 - DC coupled sites

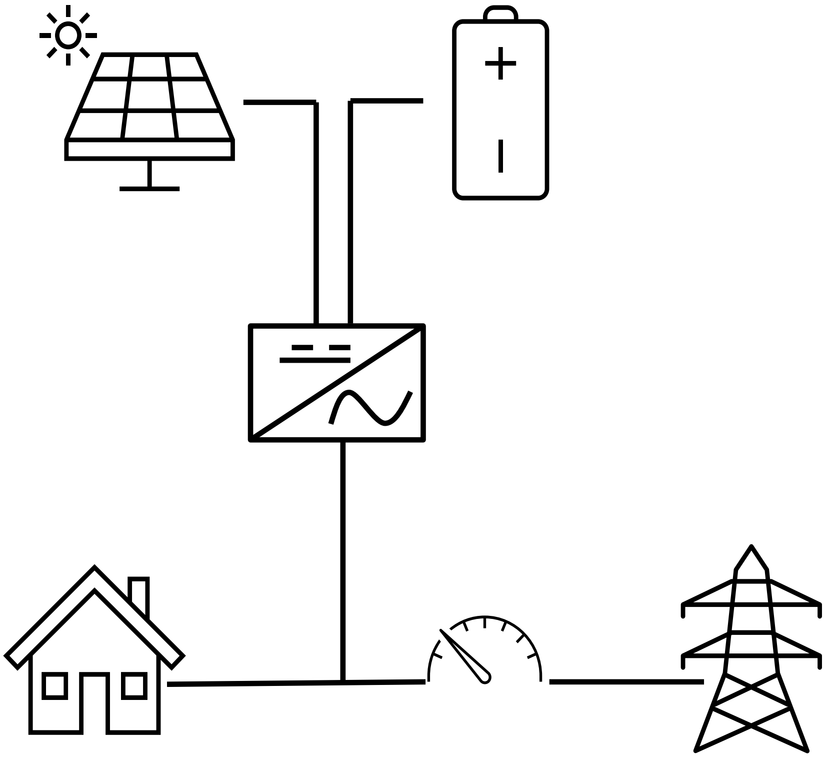
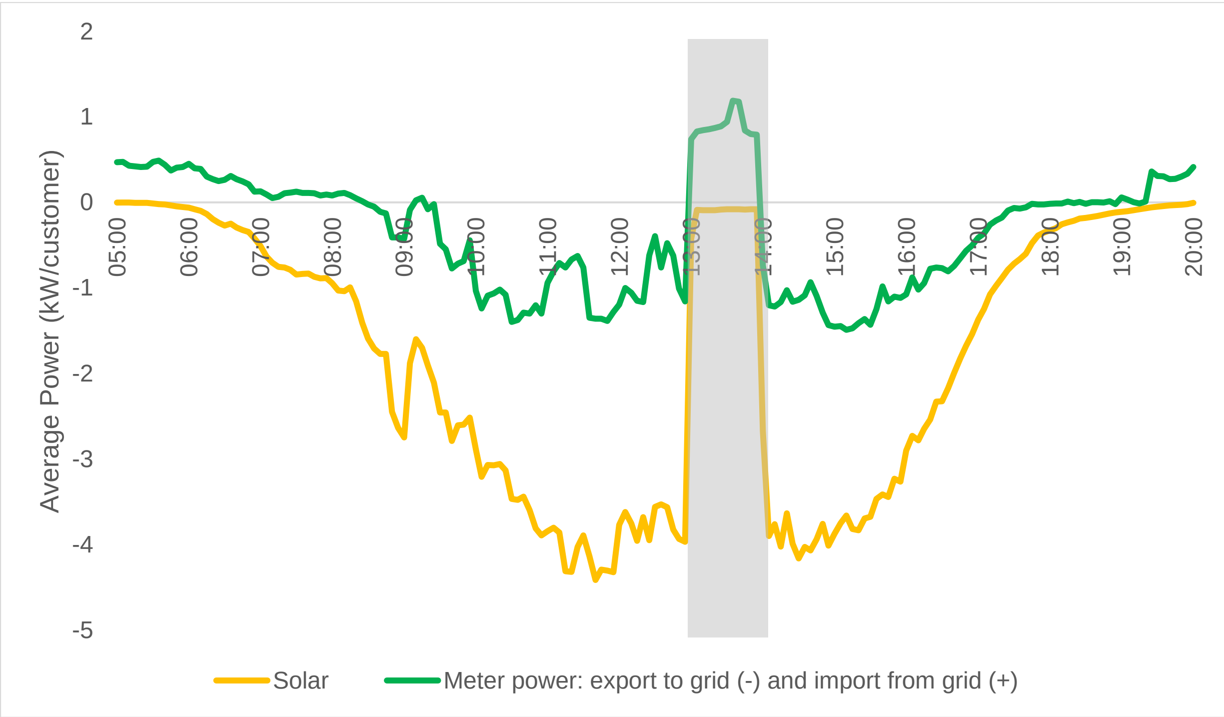


Figure 20 - Demand profile of customers that participated in net FiM event on 18/11/2021



The corresponding voltage chart for the Gross FiM test is presented in Figure 21, which shows that there is a reduction in voltage of about 1.5 volts during the gross FiM event.

Figure 21 - Voltage profile for gross FiM on 18/11/2021

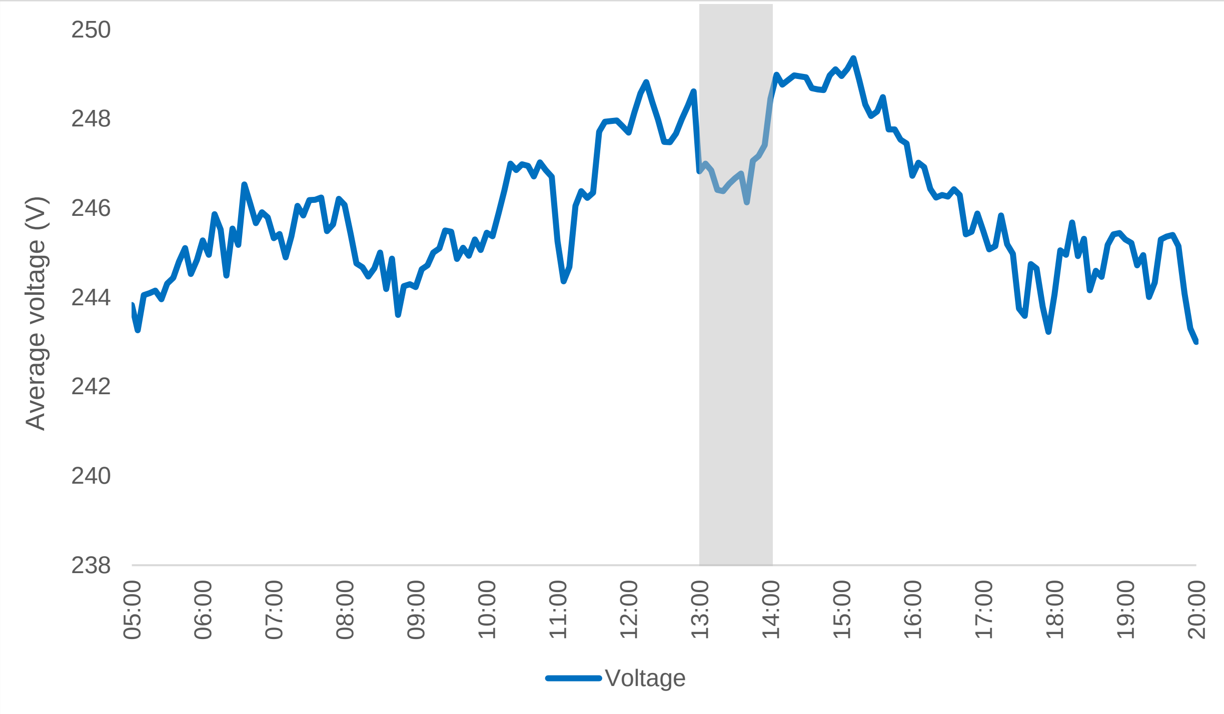


Figure 22 shows the results of a net FiM event where the export to the grid is set to zero. The corresponding voltage profile shows a reduction in voltage of about 1 volt that was sustained until the end of the FiM event (see Figure 23).

Figure 22 - Demand profile of customers that participated in net zero FiM event on 19/11/2021

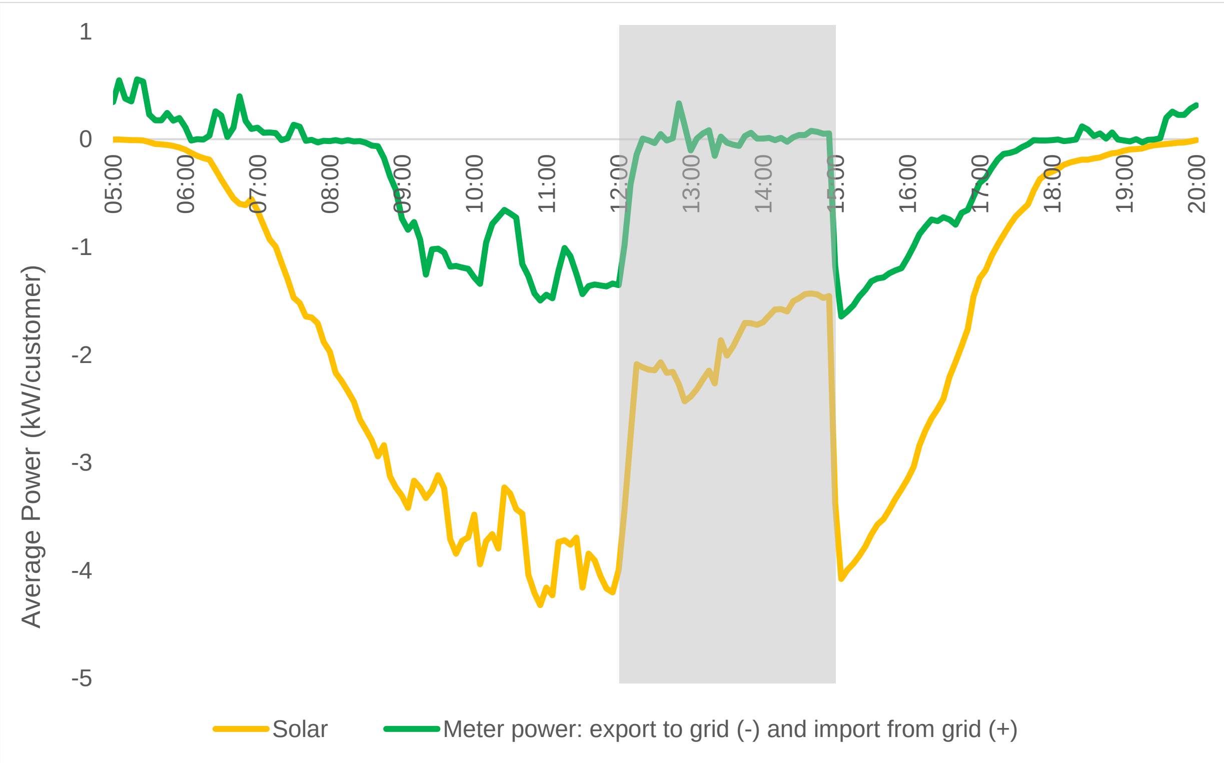
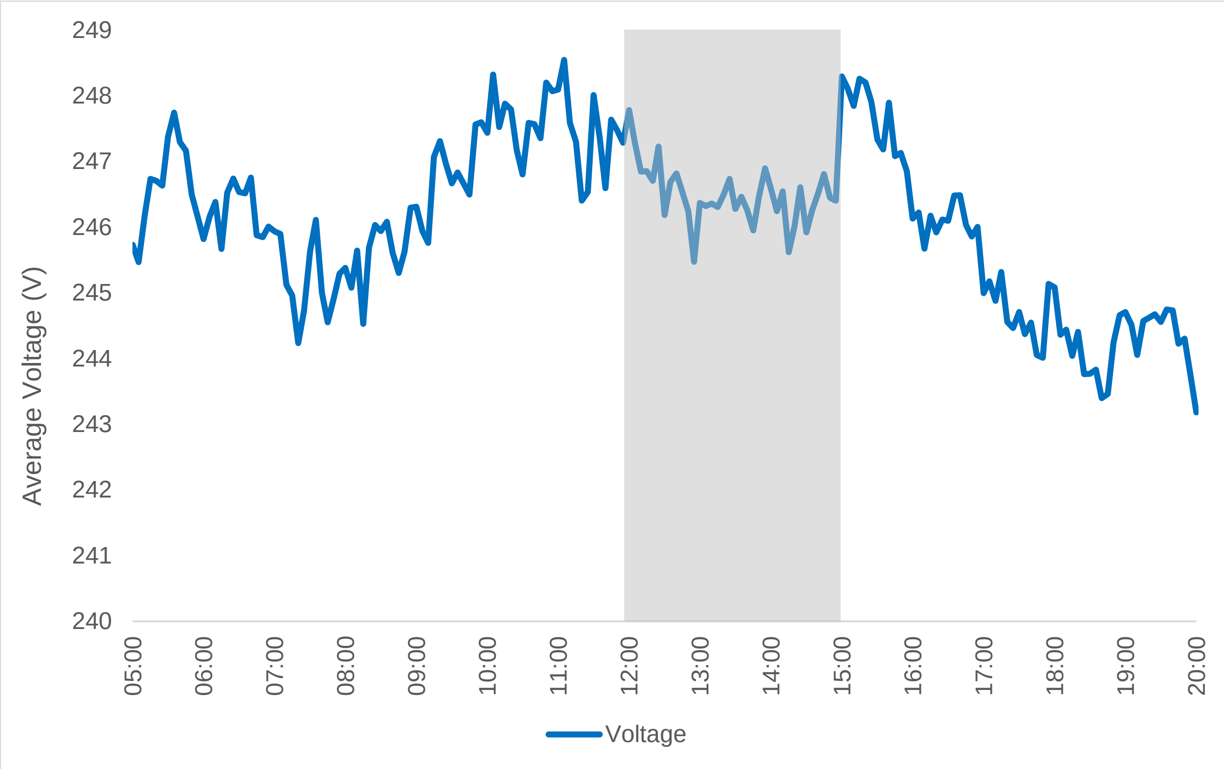
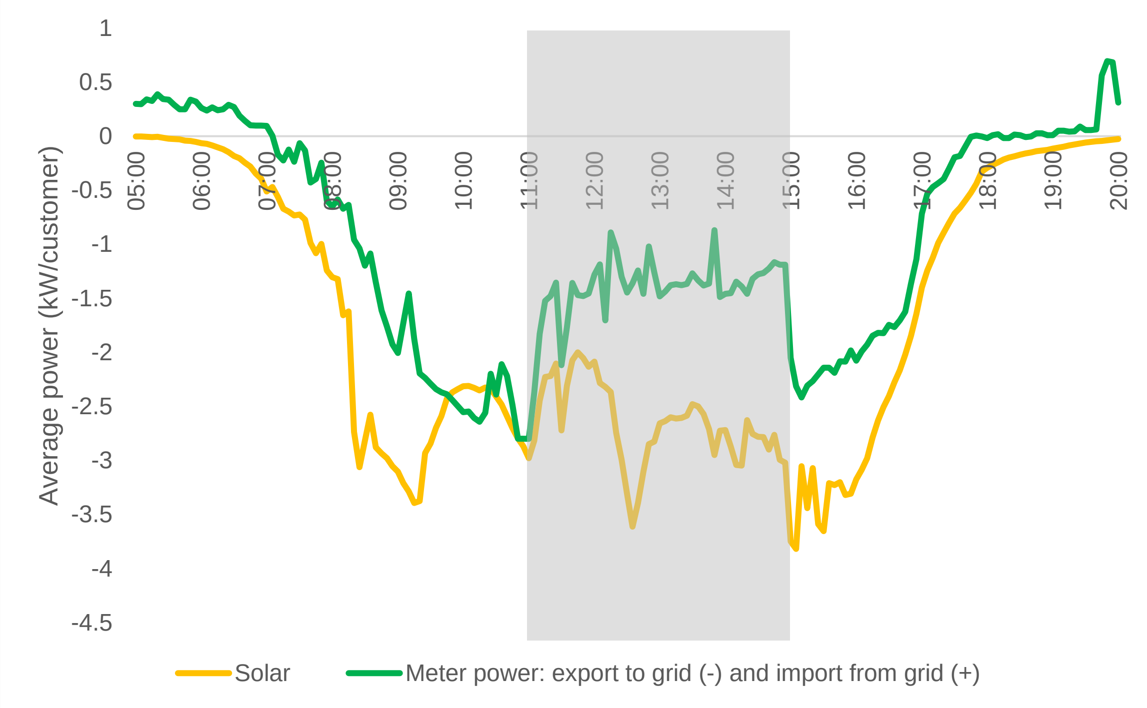


Figure 23 - Voltage profile for net zero FiM on 19/11/2021



The success of a net zero export FiM event depends on the control system being able to adjust the solar output to a level that meets the load consumption but not enough to export. There were a number of net zero export FiM events where the solar output exceeded the load and resulted in export into the grid (see Figure 24).

Figure 24 - Demand profile of customers that participated in net zero FiM event on 25/11/2021



6 Participant Survey

Participant engagement and satisfaction levels are critical to the success of the VPP trial. Results of a survey conducted in May 2021 with one of the VPP partners, which received 134 responses, are presented below.

Figure 25 - Survey result 1

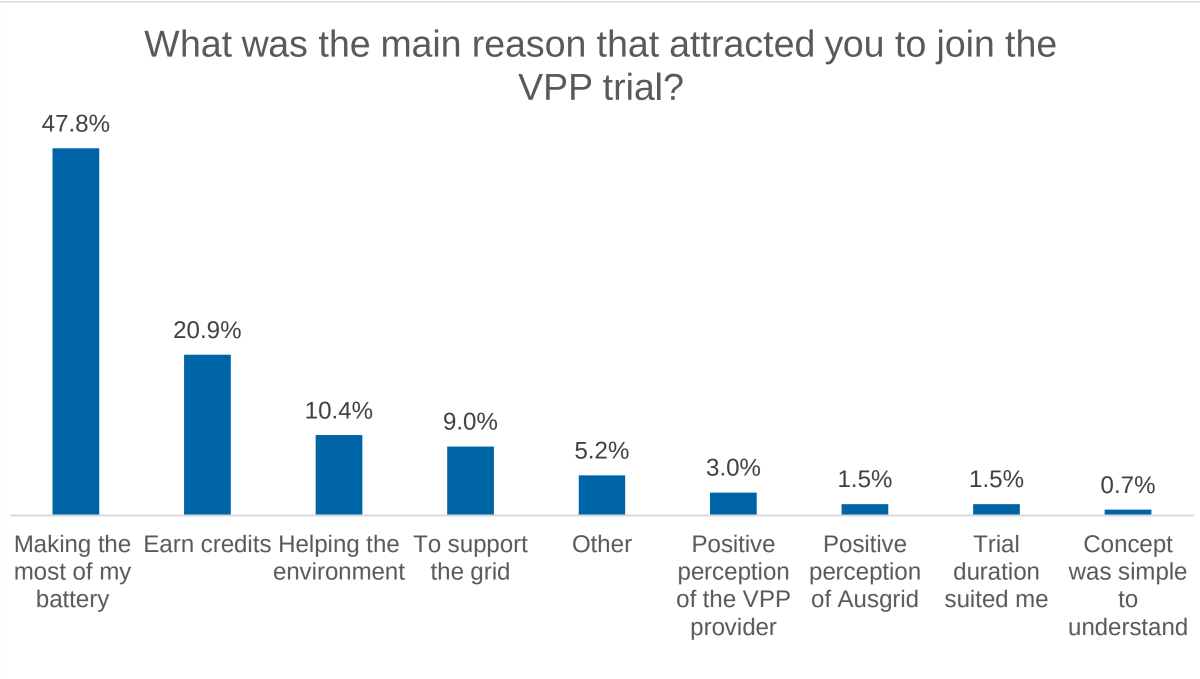


Figure 26 - Survey result 2

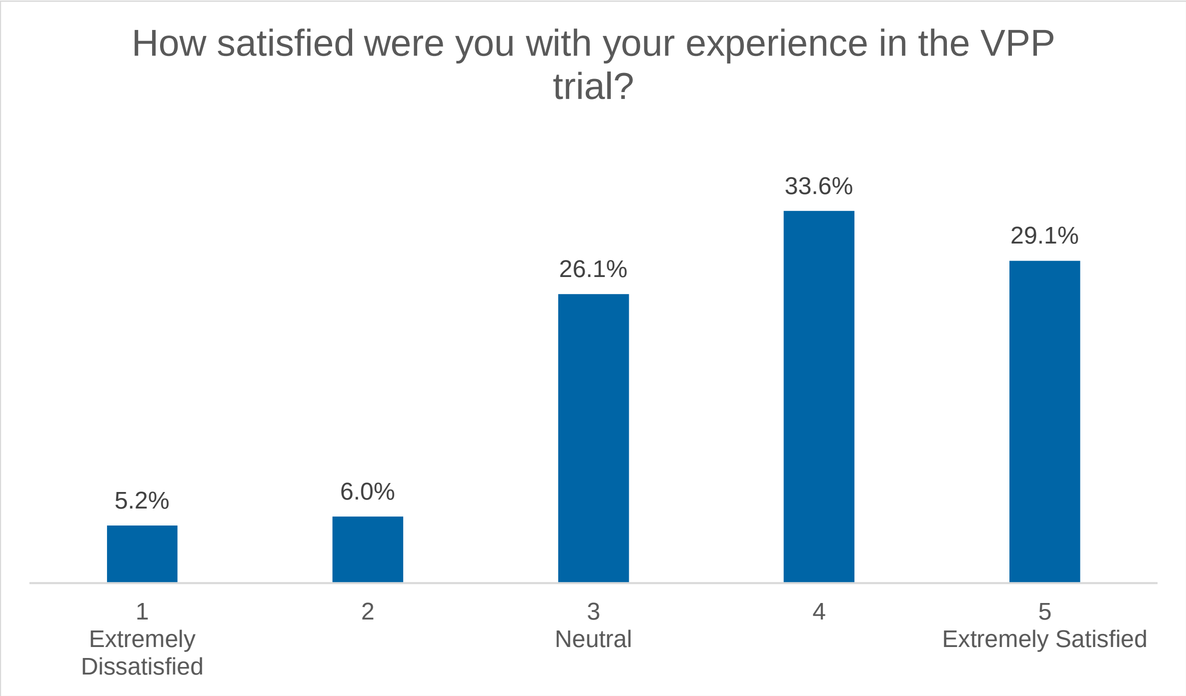


Figure 27 - Survey result 3

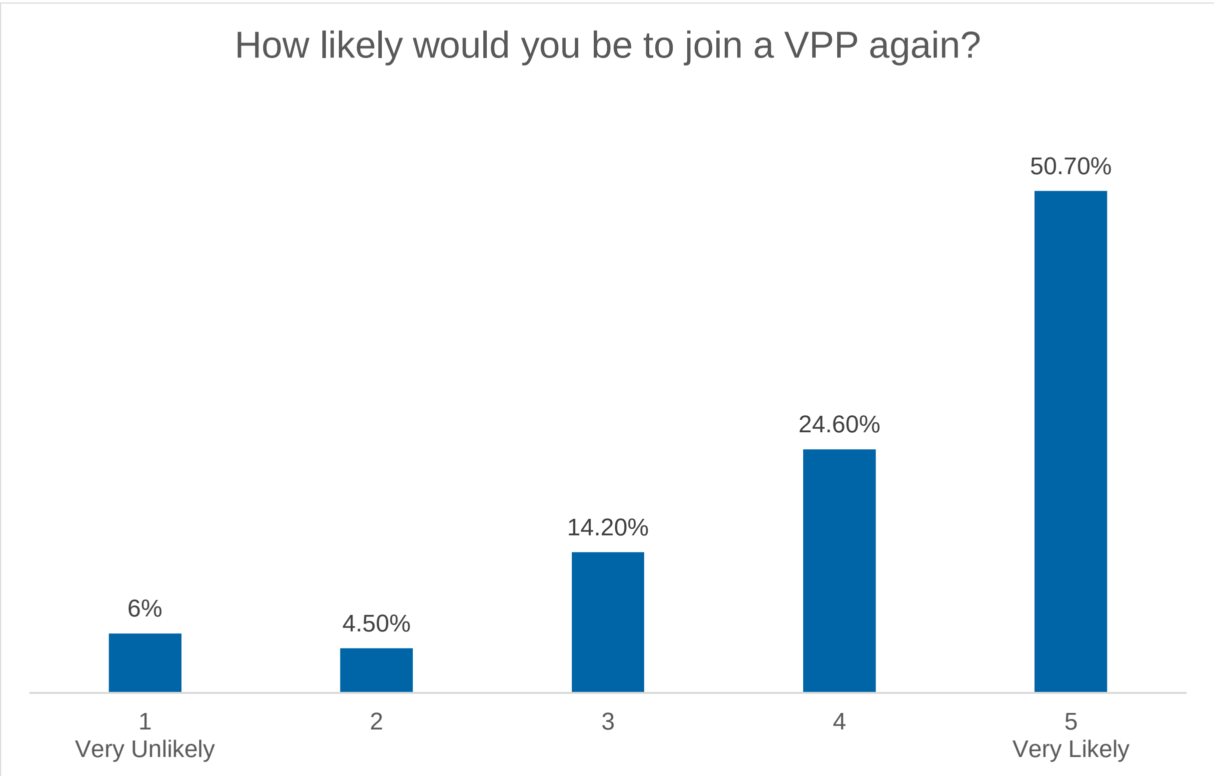


Figure 28 - Survey result 4

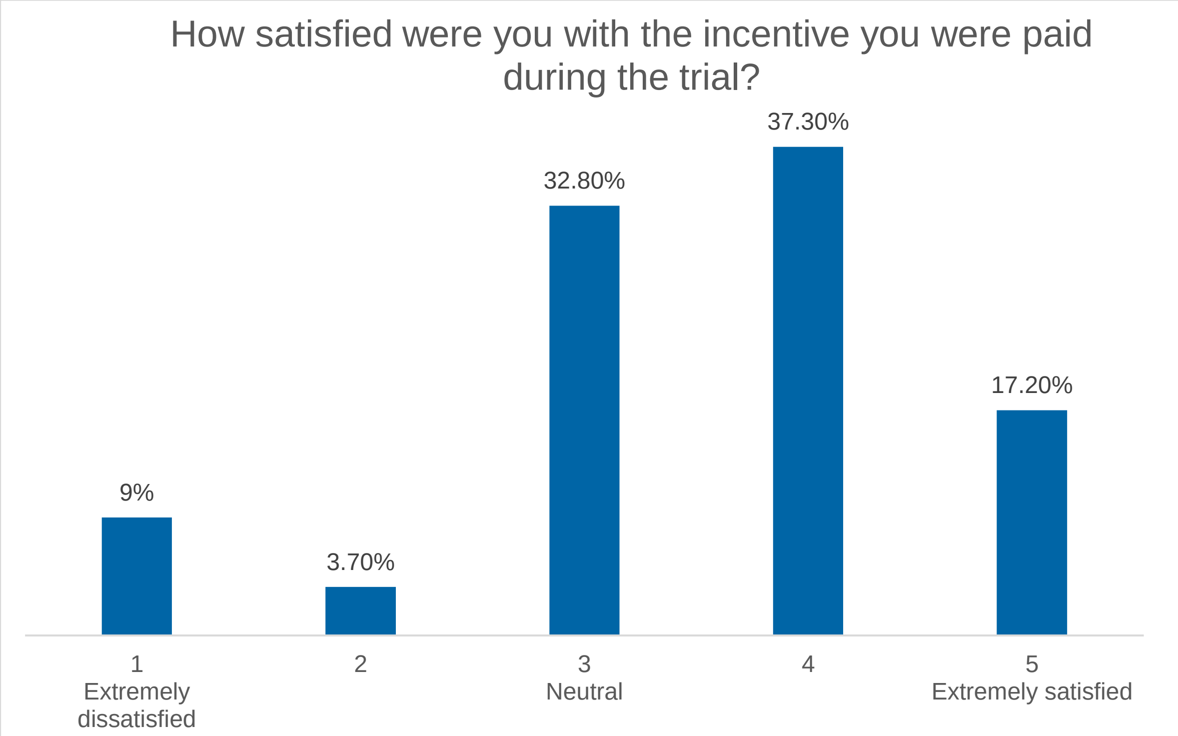
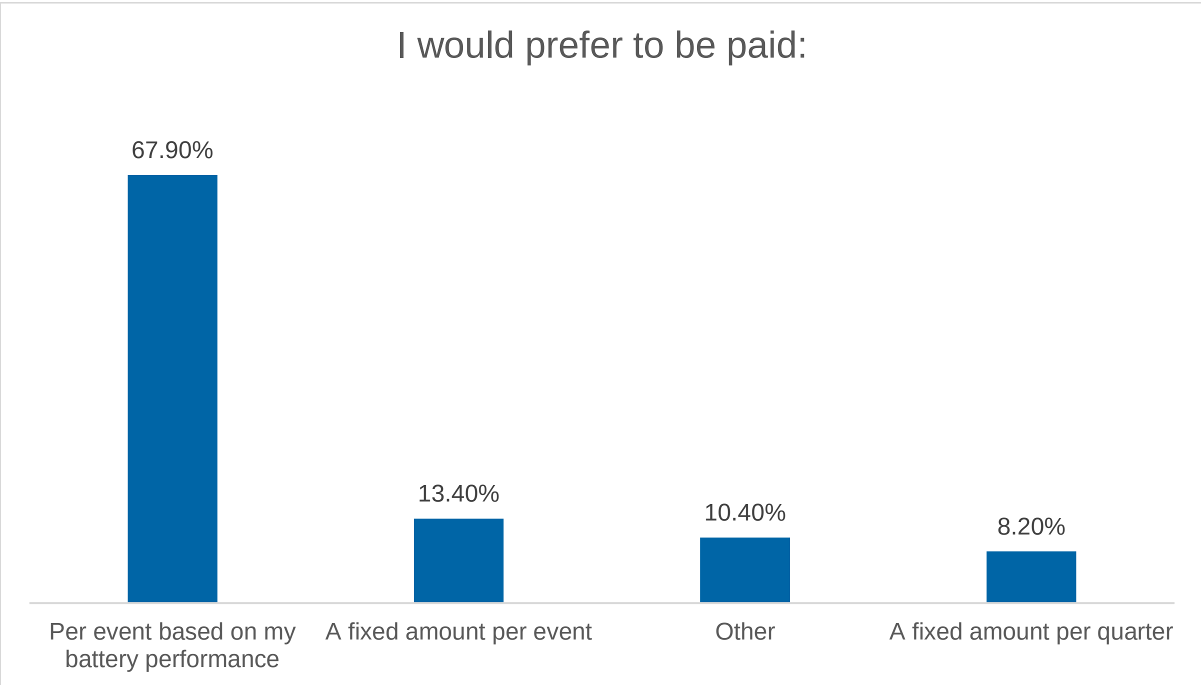


Figure 29 - Survey result 5



7 VPP Partners

We invited our VPP partners to provide commentary on the trial so far and the future of VPPs.

7.1 Reposit's Comments

Virtual Power Plants continue to demonstrate their capability in helping to deliver a more integrated, stable and resilient grid of the future powered by clean, green, and consumer owned electricity generation. The rapid, and ever accelerating deployment of rooftop solar and residential battery storage will continue to place increasingly material pressure on our national electricity infrastructure. Reverse power flows, voltage fluctuations, and degradation of power quality are all negative side effects that unfortunately come hand-in-hand with uncontrolled renewable electricity generation connected to our grid.

Projects such as Ausgrid's VPPs trial demonstrate, however, that it doesn't have to be this way. By having the ability to view, aggregate and orchestrate these assets in real time, the VPP will be an essential component of the safe, reliable and green grid of the future.

Reposit was the first VPP provider to join Ausgrid's VPP trial when it commenced in 2019, and has been an enthusiastic partner right throughout the trial. Following from the foundation set by the VPP trial, we are excited to continue our collaboration with Ausgrid in progressing VPP technology via Project Edith (see section 9).

Reposit congratulates Ausgrid on the operation of its VPP trials and for having the vision to undertake such important research work in combination with key industry partners. We look forward to continuing to work with Ausgrid in delivering the next evolution of the VPP and progressing toward our mission of making energy reliable, safe, green and abundant for all.

7.2 Evergen's Comments

The move from small numbers of large generators dispatching power, to many thousands of inverter connected devices doing so as part of a harmonious system is well underway.

As Ausgrid recognises, it requires new ways of thinking and new approaches to system management. Evergen has been pleased to be a part of the Ausgrid Virtual Power Plant (VPP) project, and to be demonstrating that a software led approach to controlling batteries to enable the grid to better integrate with renewables to this end is both viable and effective.

As this report outlines, over the course of this project Ausgrid have been able to show that VPPs comprised of residential batteries have the potential to deliver:

- *Demand reduction; and*
- *Voltage support services.*

Most importantly, the project confirms that Battery VPPs have the potential to help avoid or defer network investment, delivering greater value to consumers.

As well as potentially providing value in terms of avoided or deferred network investment, the VPP gives customers another chance to participate in the energy market.

The importance of visibility and control of distributed energy resources (DER) to help maintain grid stability will only increase as more and more homes install solar and batteries, and more and more consumers start to drive electric vehicles.

Projects like this give a perfect test bed to trial a variety of services and approaches, learn from them and develop new capabilities.

Heading into 2022 Evergen looks forward to working with Ausgrid on future research objectives. Ausgrid has investigated "feed-in management" to affect grid voltage. This control focuses on curtailing solar output. It is useful to explore this method as one of several approaches to using DER to mitigate minimum demand voltage issues.

Solar curtailment is a useful mechanism for reducing the impact of solar-only DER. However, it is a 'high impact' measure since it involves throttling an end user's solar output, temporarily removing utility to the customer.

An interesting avenue for future Ausgrid VPP research would be to compare whether batteries may reduce grid exports at times of minimum demand as effectively as the feed-in management solar-curtailment mechanism researched to date. This new research could compare:

a. Grid export reduction via Feed-in management for solar-only DER

b. Grid export reduction just via the default self-consumption mode of solar and battery DER

c. Grid export reduction with forecast, optimisation and control of batteries to determine the best profile for allowing batteries to charge to mitigate high grid voltages during times of minimum demand.

d. A combination of solar curtailment (feed-in management) and battery optimisation

e. Direct reactive power dispatches from VPP battery inverters to impact grid voltage.

Ausgrid identified challenges for feed-in management measures, especially with either older solar inverters or else AC-coupled systems.

These challenges are also mirrored in the management/configuration of AC-coupled solar-battery systems more broadly, with respect to behaviour under adverse grid conditions. For example, the solar inverter and battery inverter at a site could be independently configured according to the prevailing Australian Standard (AS/NZ4777) at time of install to respond to high grid voltages, especially if they were not installed at the same time. This is common for end users who have had solar for many years, and have more recently added a battery to augment their system. This independent behaviour may not always result in a response to high grid voltages that is good for either the grid or for the customer.

Evergen intends to further investigate these differences across our fleet of both AC-coupled and DC-coupled systems, to observe in practice responses to high grid voltages in local areas.

7.3 ShineHub's Comments

We have worked with Ausgrid in the VPP trial for the last a couple of years. Initially, the goal was simply to show that residential batteries can be orchestrated together to provide reliable grid support services. Once the basic VPP functionality was shown to be effective, we moved to more advanced VPP operation, building out custom features that would accentuate the value of VPPs for Ausgrid and successfully deploying them in the field.

The first feature we built on top of standard battery discharge was a smart pre-charge function that would ensure the batteries had enough power at the start of an event to sustain the desired power throughout the event time period.

The second feature was to model how an individual transformer could be supported to keep the load within a safe bandwidth. The goal was to only use battery power to the extent needed to keep the total power of a group of homes between a minimum and maximum power range. This required the VPP system to constantly monitor the threshold power levels in real time, and adjust the VPP output so that it provided enough power to keep within the desired ranges, but not overdo it and therefore deplete the battery resource unnecessarily. While this took a bit longer to build and roll out, it was very effective and first example of its kind in Ausgrid's VPP trial.

Finally, we are currently building a new template based discharge feature which would discharge the battery fleet on a proportional schedule over a given time period. It's similar to responsive dispatch because the dispatch power levels fluctuate over the course of the event. The main difference is that the dispatch levels are set from the start of the event, and therefore are easier to rely on when forecasting power support resources.

As a result of this VPP partnership with Ausgrid we have been able to develop new features and functionality for VPPs that has the potential to extend beyond the trial and into the normal markets.

I want to thank Ausgrid for their enthusiasm throughout the project and willingness to push into new VPP territory.

For all of you reading this, thanks for reading. I hope our efforts have helped you see the immense future of VPPs to unlock a new renewable energy future for Australia.

8 Future research objectives

- Further refine dispatch types and explore ways to delivery dispatch profiles that are customised to achieve maximum reduction;
- Compare variations in dispatch characteristics between different battery brands;
- Further exploration is required to assess the potential of using VPP in voltage regulation;
- Further explore how to manage pre-charging to maximise energy available for dispatch without interfering with peak demand; and
- Customer surveys: continue to engage with the customers that are part of the trial and learn from their feedback.

9 Future VPP trials

Project Edith is a demonstration project that is set to lay the foundations for a decentralised electricity grid. The project aims to demonstrate a decentralised and cost-effective way of managing network capacity in a growing two-sided market using dynamic network pricing, dynamic operating envelopes, and network services to deliver cleaner, cheaper, and reliable energy for all consumers. Ausgrid has partnered with Reposit Power to deliver the initial stages of the project which will be expanded to more VPP aggregators in the future.

A key feature of Project Edith is that both Ausgrid and Reposit Power will aim to leverage as much of their existing systems and process as possible, including from the current Ausgrid VPP trial to set out a practical pathway for the industry and VPP technology to mature over time.

10 More Information

More information about the VPP project, including previously published reports, can be accessed on Ausgrid's Demand Management web page from the Innovation Research and Trials link: https://www.ausgrid.com.au/Industry/Demand-Management/Power2U-Progam/Battery-VPP-Trial .