



**Victorian Microgrid Virtual Power Plant
Victorian Department of Environment,
Land, Water and Planning (DELWP)**

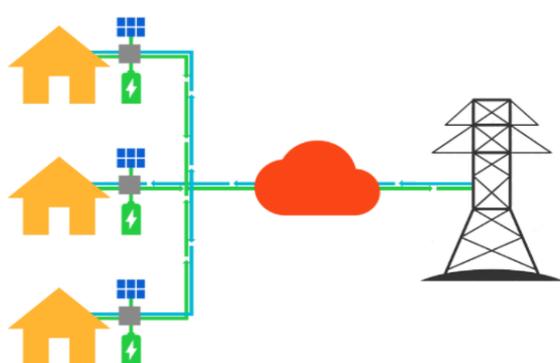
Milestone 9 Public Report

Origin

Executive Summary

In October 2018 Origin executed a funding agreement with the Victorian Government Department of Environment, Land, Water and Planning (DELWP) to design and deliver a Virtual Power Plant (VPP) pilot program under the DELWP's Victorian Microgrid Initiative. Under the terms of the Funding Agreement, with financial support from DELWP Origin sold, installed and virtually connected multiple batteries (and Solar PV systems) to homes and businesses in Victoria. Once connected, Origin remotely controlled this critical mass of solar and excess battery capacity, making a meaningful contribution to addressing energy market challenges and network challenges in the local areas.

For customers participating in the VPP, Origin was able to access and discharge surplus energy from their battery to the grid or choose to preserve the energy stored in the battery from being consumed in the home at different times to both optimise customer demand and monetise excess battery capacity at a time when it was of the most value. An example of the Microgrid proposal offered to Victorian residential customers is outlined in the below figure:



Join the VPP! You'll get:

- ✓ A discounted 6.5 kWh LG solar battery for \$5,895 (RRP \$10,795)
- ✓ **Guaranteed \$1,200 back in credit over 5 years.** You'll get credit of \$20 (incl GST) toward electricity charges on your bill every month for 5 years. You'll always get more value back in credits than we extract from your battery
- ✓ 24 or 60 month interest-free payment options (equal monthly repayments)
- ✓ Everything fully installed, including a compatible inverter
- ✓ More self-sufficiency - you'll be storing the solar power you generate

Find out more about eligibility and conditions below

Example of a microgrid proposal offered to Victorian residential customers under the program.

This report provides an overview of the completed Milestones and deliverables achieved. In addition, it describes the lessons learnt throughout the project and how these helped improve the processes involved in the rollout of VPP.

The key achievements of the Origin VPP Project include:

1. Creating a Positive Customer VPP Experience

Through a series of different channels, Origin identified marketing strategies that provided the largest customer engagement and response. The addition of the Origin App in 2021 proved to be another great initiative to improve the customer experience as it gave the customers visibility of their battery and therefore a greater sense of autonomy. Utilising these learnings was a benefit for future solar products and also future Virtual Power Plants offers as they aided in getting initial customer buy-in and ramping up sales.

2. Achieving Government Milestone Requirements

Origin Energy have achieved the Installation requirements set out by the DELWP. We have installed 657 systems totalling 6.87 MW. The sales and installation process has provided useful insights into the most effective marketing strategies, product preferences and customer demographics as well as highlighting potential improvement opportunities for customer, contractor and internal communication as the project moves into the maintenance phase.

3. Delivering Integrated 'Cloud' Based Solar Technology to Customers

Through the Origin Connect Platform reports were generated to track the participation rate of each site in the VPP, the rate of response and energy statistics on the entire fleet. With continuous monitoring of each site availability in addition to monitoring of sites that failed to respond, we were able to identify any site communication difficulties and proactively rectify before an event occurred. This continual 'cloud-based'

monitoring provided customers peace of mind that if issues arose with the battery's communication or performance, they would be informed, and the problem rectified.

4. Testing and Analysing VPP Performance

The VPP has been continually tested through a series of events over the past 12 months, demonstrating its functionality. These events, either triggered automatically or scheduled manually, have allowed customers to become comfortable with the idea of their battery being discharged. The VPP system response rate has increased from mid-70% (early 2021) to 94% (as of most recent event in March 2022) of devices successfully responding to events.

5. Managing Software and Hardware Updates

With technology constantly evolving and considering the duration of this project, it was inevitable that our product offerings, both in the software and hardware space, evolved. Origin's technical due diligence was always carried out quickly and thoroughly to ensure the latest information on the current hardware offerings could be not only relayed internally to Origin teams, but also to the customers. Software has been managed by the same team and over time, the use of third-party software management teams decreased as the use of 'cloud based' systems became closely integrated with the 'Business as Usual' practice.

Next Steps

Moving forward, Origin is committed to maintaining the VPP as it supports our move towards Decarbonisation, Decentralisation and Digitisation. The learnings discussed throughout this report provide a roadmap for possible improvements to the VPP as we move into future project phases.

As we progress, Origin's roadmap for improvements to the VPP include:

- Provide ways for customers to further benefit from their battery by taking advantage of time-of-use tariffs i.e. charging battery from the grid at off-peak times when electricity is cheaper, so customers have energy in their batteries to use during peak periods.
- Introduce a bring your own (BYO) battery proposition for customers who already have a battery
- Expand the Origin VPP to other states (Queensland, NSW, South Australia)

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1.0 Introduction

1.1 Background

Origin was tasked with delivering a 5MW capacity Virtual Power Plant (VPP) comprising of 650 systems (residential and commercial combined). The VPP was established across Origin's large and diverse network of residential and business energy customers in Metro Melbourne. This VPP development works in-conjunction with Networks to leverage the combined economic benefits of trading and network augmentation, as shown in Figure 1.

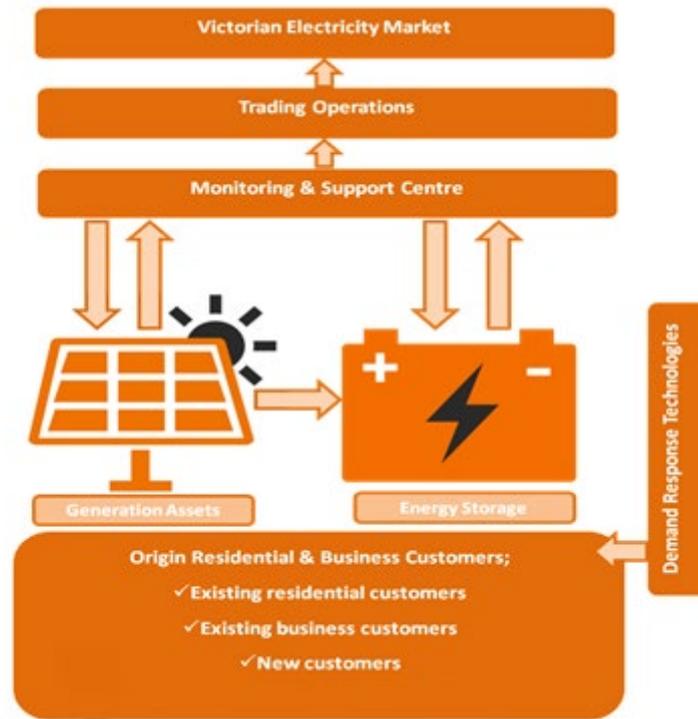


Figure 1: Origin VPP Model

The overarching goal of the VPP was split into 9 Milestones – each delivered progressively over the course of the Microgrid Demonstration Initiative term, and due for completion by June 2022:

- Milestone 1 – Pre-Microgrid Project Phase
- Milestone 2 – Initial Site Connections
- Milestone 3 – 10% Completion: 65 Sites or a total cumulative capacity of 500kW
- Milestone 4 - 20% Completion: 130 sites or a total cumulative capacity of 1MW
- Milestone 5 - 40% Completion: 260 sites or a total cumulative capacity of 2MW
- Milestone 6 - 60% Completion: 390 sites or a total cumulative capacity of 3MW
- Milestone 7 - 80% Completion: 500 sites or a total cumulative capacity of 4MW
- Milestone 8 – 100% Complete: 650 sites AND a total cumulative capacity of 5MW
- Milestone 9 – VPP Project Completion Report and Audit

The Program was further split into the following four key workstreams:

- **Government & Regulatory** – engagement with DELWP, Solar Victoria, AEMO and other regulatory bodies to ensure compliance and ongoing engagement
- **Network Engagement** - Origin identified early on that considered engagement with the appropriate (distribution) networks in Victoria was critical to the delivery of a successful VPP. The 5 networks

within Victoria, each have unique attributes and limitations when considered as a location for a VPP. Key criteria were determined, and this is managed at a program level

- **Product Architecture** (power and generation capacity including solar) which is split into
 - **Residential** is the proposition for most of the funding – a proposition that was sold to 600+ residential sites over the life of the program.
 - **Business** is a more customisable stream of work with the engineering team exploring options in the various sizing categories of 10-30kW and >30kW

This report provides an overview of the completed Milestones, deliverables achieved, and learnings made. In addition, it describes improvement opportunities as well as a description of the risks encountered throughout the project and how each of these were managed to ensure the project remained on track and safe.

1.2 Project Objectives

Per the Microgrid Demonstration Initiative Application Guidelines, the objectives of a Microgrid Project are:

“...fund and facilitate innovative, market driven commercial ready microgrid demonstration projects in Victoria, across various locations, building types, scale and business models so as to capture learnings enabling future rollout. In this regard, the Program aims to support local players in overcoming microgrid challenges and unlocking microgrid markets in Victoria.

The Program seeks to support projects that: strengthen the Victorian electrical system, encourage the development of clean and new energy technologies (including renewable energy and storage) and boost the local economy.”

To achieve these requirements set out by DELWP, Origin separated the overall project into three **key pillars**. Furthermore, to ensure progress on each of the key pillars was constant throughout the project lifecycle, each category was further broken down into **key objectives**.

KEY PILLARS		
Customer Value Proposition	Product Testing, Performance and Reliability	Consistent Communication
KEY OBJECTIVES		
Install, integrate, and commission 650 VPP Systems (5MW Capacity) - Residential and Commercial combined. This is the overarching objective of the project		
Demonstrate the value inherent in orchestrating the VPP to optimise energy affordability to Residential customers	Rapidly test and commercialise new and emerging technology to drive the adoption of distributed renewable energy resources to build the VPP (e.g., Battery and Inverter upgrades, Storage bundles, more efficient panels)	Establish clear communication with customers within the VPP Project and what is happening outside the project that may affect their product or service.
Demonstrate leadership in the adoption of renewable energy and its role in delivering accessible, affordable, and reliable energy solutions for customers	Overcome existing regulatory hurdles and barriers of VPP development by working with Networks and Government	Establish clear communication with the Contractors to relay feedback, updates on products and identify improvement opportunities.
	Solve the technological challenges and barriers relating to reliably integrating and orchestrating 100's of distributed asset types from a centralised dispatch command	Establish clear communication within Origins Project teams to coordinate changes within sales, inventory, installs and overall asset management. This allowed teams to understand upcoming targets, deadlines and overall VPP Progress.
Generate and disseminate learnings from the development of the Microgrid Project		

Table 1: Project Pillars and Objectives

1.3 Milestone Overview

One of the key objectives of the VPP Project as mentioned above was to install and commission 650 sites, cumulating to a total capacity of 5MW. The below table is an overview of each milestones objectives and the results achieved.

Project Milestone	Result Achieved and Learnings
Milestone 1	<p>Origin submitted a Project plan for the VPP detailing the business and residential roll out strategy (i.e., location, customer value proposition, network engagement and coordination, which DNSP).</p> <p>Origin developed a network engagement strategy to approach Victorian networks, and to provide a summary of learnings on the willingness of the networks to participate. Ongoing discussions were scheduled with two networks with an agreement put in place with the preferred distribution network that outlined a framework for developing non-network solutions.</p> <p>An initial kick off sprint was scheduled for mid-January 2019. This sprint followed learnings made from early customer research and a high-level proposition development focussing on delivering technical battery and improved pricing outcomes for customers.</p>
Milestone 2	<p>The initial 10 sites were safely installed, commissioned and visible on the VPP. At this stage, the program was delivering significant learnings with each phase. As progress commenced into the completion of Milestones, efforts were amplified around sales delivery and the scaling impacts of the VPP, with monitoring and measurement outcomes becoming more prevalent.</p> <p>Sales efforts were tightly coupled to solar rebate windows and their availability, as well as ensuring there was still a positive public perception of the battery subsidy. Through careful management of the installs and the incoming pipeline of sales, progress was made towards Milestone 3.</p>
Milestone 3	<p>The program continued to progress well with Origin meeting the Milestone targets and building a robust pipeline of installs moving into the next phase. At this stage, Origin had completed installation of 35 residential sites totalling 399kW (and a commercial battery installation with capacity of 264kW). The primary focus ongoing was to place a priority on delivery to sales and installation targets.</p> <p>We saw pleasing results emerging for our customers, with significant savings occurring for customers on their energy bill and positive metrics around self-sufficiency and self-consumption. These figures were used throughout the project to further enhance the customer proposition and messaging to support the sales process.</p>
Milestone 4	<p>The project met the target for Milestone 4, reaching a cumulative installed capacity of 1032kW and 71 systems. As demand increased, Origin expanded our installer base, working closely with our installation contractors to ensure lessons were shared throughout the remainder of the project.</p> <p>Changes in product offerings saw us accelerate our product innovation work to lower the entry cost for customers and release to market a solution incorporating a solar-battery hybrid inverter that reduced the system cost for customers by 10% to 17% (depending on system size).</p>

At this time, the COVID-19 pandemic began to effect Australia causing economic uncertainty and a sharp decline in sales. This was expected to cause an impact to the delivery of future Milestones, which prompted Origin to work with DELWP to revise the project schedule to account for the expected delays as a result of the pandemic.

Milestone 5

The project met the target for Milestone 5, reaching a cumulative installed capacity of 2158kW and 172 systems installed.

The changes in product offering from Milestone 4 provided much-needed price relief for customers under the COVID-19 economic climate. As for installations, stage 4 restrictions halted VPP installs in Melbourne metro, and this had a significant impact on the program. COVID-19 remained a major factor to the delivery of future Milestones and the Project as a whole.

Milestone 6

The project met the target for Milestone 6, reaching a cumulative installed capacity of 3120kW and 261 systems installed.

Although we remained watchful of any further deterioration of the economic climate, the achieved sales run rate for this phase tracked well against the revised Milestone due dates.

As restrictions eased in greater Melbourne and the demand for installs increased, Origin engaged new qualified installers to assist in reducing the installation backlog caused by the stage 4 restrictions.

Milestone 7

The project met the target for Milestone 7, reaching a cumulative installed capacity of 4317kW and installed a total of 383 systems.

Entering the final phase of the project, presenting new customers with the opportunity to join and save with the VPP became the focus. Updating customer offers and incentives to staff, volume of VPP customers dramatically increased - doubling the sales run rate reported in the previous Milestone. This targeted marketing campaign continued to evolve throughout the rest of the project. Origin implemented more third-party lead generation, social media campaigns, television advertisements and further updates and additions to the Origin VPP Home Page.

Milestone 8

Origin met the target for Milestone 8, reaching a total of 657 systems installed with a cumulative installed capacity of 6.87MW. Having completed the final target orientated milestone for the project, Origin started collating all learnings from the previous 7 Milestones to clearly and concisely piece together the best plan of action for any future projects of a similar nature.

Having achieved both the 5MW and 650 sites target it was clear that targeted marketing, product reliability and consistent communication were the three major areas which made the delivery of the project a success.

2.0 Project Overview

Origin has completed the installation and commissioning of 657 sites, totalling an overall capacity of 6.87MW. With the project in its final stage now, Origin has collated all learnings from the previous 8 Milestones (discussed above) to clearly and concisely piece together the best plan of action for any future projects of a similar nature.

Having achieved both the 5MW and 650 sites target it was clear that targeted marketing, product reliability and consistent communication were the three major areas which made the delivery of the project a success.

2.1 Product Offerings

Although residential battery technologies are still at a relatively immature stage in Australia, the industry is seeing a rapid evolution of product solutions to keep up with customer demand. Throughout the project Origin has continually researched available products to ensure we offer a reliable and customer centric solution.

Before the introduction of any new product, it must satisfy Origin requirements for safety, quality and functionality in addition to being commercially viable. Origin uses an internal team to perform product due diligence and governance taking into account:

1. Whether the product meets Origin quality and safety standards in addition to Australian and International Safety Standards.
2. A review of warranty terms and conditions in consideration of how the product is expected to be used and compliance with Australian consumer law.
3. Compatibility of product communication interface and controls with the current VPP hardware and software offerings.
4. Whether the product requires specialist installers or further training to be offered to current installers.
5. Whether the product is readily available in Australia (Local Vendors) or able to be purchased and shipped in a reasonable timeframe.
6. Whether the product is comparable commercially to what was previously offered, or will there be a large price increase / reduction that could impact current / future customers.

Following this initial investigation, a technical component of testing was undertaken. This involved making systems available to the operations team and running tests and simulations on the product. This process investigated whether the information supplied by the relevant vendor matched what the test system was exhibiting as well as the safety responses and performance. The test unit was also used as a basis for the compilation of an Origin installation manual.

Test systems were constructed and made available in Origin's test facility for verification of updates to control strategies, firmware updates and were also made accessible to field supervisors and install teams for training on installation and configuration requirements.

Product offerings throughout the project are detailed in the table below.

Inverter Brand	Inverter Model	Battery Brand	Battery Model
SMA	SBS 5.0	BYD	Battery Box 6.4H
SMA	SBS 5.0	BYD	Battery Box 10.2H
Sungrow	SH5K-20	BYD	Battery Box 7.0L
Sungrow	SH5K-20	BYD	Battery Box 10.5L
SMA	SBS 5.0	LG Chem	RESU 10HV

Sungrow	SH5K-20 / 30	LG Chem	RESU 10LV
Sungrow	SH5K-20 / 30	LG Chem	RESU 6.5LV
Sungrow	SH5K-20 / 30	LG Chem	RESU 13LV
Sungrow	SH5K-20 / 30	Sungrow	SBP 4.8

Table 2: Origin VPP Product Offerings

2.1.1 Product Offering Learnings

Evolving Hardware

With technology constantly evolving and considering the duration of this project, it was inevitable that our product offerings would evolve. By trialing different sized HV and LV Batteries, AC coupled or DC coupled systems, product offerings were selected based on reliability, best value for money for the customer and ease of installation.

Similarly, discontinuations and upgrades made to the battery and inverter offerings were managed through careful reconciliation of on-hand stock as well as reviewing monthly sales forecasts to ensure there was enough product available to sustain incoming sales. Paired with this, Origin’s technical due diligence was always carried out quickly and thoroughly to ensure the latest information on our products could be not only relayed internally to Origin teams, but also to the customers.

Origin set a precedent early that product being offered would reliably meet customer needs while providing the functionality required for the VPP. This has been supported through the monitoring of customer complaints and feedback relating to available product offerings through our sales channels.

System Understanding

For successful control of a customer’s battery during an event, Origin require communication to the VPP controller that is installed with the battery system and is connected to the internet via the customers home network.

We found that several customers were either disconnecting the network cable from the unit or powering it off completely. To mitigate this, Origin improved our customer education which included improved labelling of the controller device. The label acts as a reminder to the customer that the VPP controller needs to remain connected to their network and powered on for Origin to control their battery asset during a VPP event.



Figure 2: VPP controller Label

Customer Battery Expectations and Understanding

In the early stages of the project, customers did not fully understand that during a power outage, unless a back-up system was installed – the battery did not continue to provide them with their energy needs. Through training of sales agents to make this information explicit in the sales process, customers were receptive to this knowledge and the sales of our back-up system became more popular.

We also identified an opportunity to improve customer communication when it came to charging customer’s battery. To ensure there is energy available in customer’s batteries during a VPP event, the platform sends charge commands to batteries reporting a low state of charge. This process caused confusion with some

customers and required further work on customer communications to ensure they understood how the system operated and were being fairly compensated for system usage.

To mitigate any confusion and ensure the customers were aware of how we utilised their battery, the platform now sends out an automated text message to all VPP customers after a VPP event occurs. Further refinement of messaging continues, to tailor this message to customer's whose batteries were used during the event (as opposed to just being enrolled in the VPP). This has allowed customers to become more comfortable with their batteries being accessed and with the addition of the Origin App they are able to monitor the state of charge before, during and after an event.

2.2 Sales

Consistent training of sales teams and keeping them up to date with the ever-evolving nature of the project allowed Origin to be able to offer products that were best suited to each individual customer. With systems ranging in size from 4.8-13kW and the option to add a back-up feature or to bundle the battery with a new solar system, sales agents were able to make educated suggestions based on the customer's current usage (if they were an Origin customer already) and offer the best product based on both the usage and the price. This has shown to be a successful way to manage the constantly evolving product offerings.

The sales process involved:

1. Customers navigating to either our webpage or calling Origin sales team to enquire about the VPP Products
2. Sales agents performing an initial assessment of the customer's eligibility (living within 50km radius of Greater Melbourne, systems requiring use of the solar product, household size etc.)
3. Agents offered a quote to the customers with a 30-day closure period
4. After acceptance of the quote, the customer was offered and scheduled in for a pre-installation site assessment
5. Upon the completion of the pre-installation site assessment, customers were again communicated as to whether there were any required variations with their initial quote.
6. Final quote was issued by sales agents and an installation scheduled

2.2.1 Sales Learnings

Sales and Trends

Sales improved significantly in the second quarter of 2021 as we started some great initiatives. These included increased marketing (Electronic Direct Mail, Website, My account), incentives for agents and regular sales training sessions.

Assessing trends which came out of the project to date, it became apparent that rather than focusing on a few core demographics, increasing sales would come down to proactively offering VPP to all eligible customers through balanced conversation of cost and benefits. The majority of VPP customers, regardless of demographic, have great interest in the VPP project and are eager to learn more about new sustainability initiatives and participate where they can.

Sales Staff Knowledge

Agent learning plans were developed and reviewed throughout the project. In late 2020 Origin began to host dedicated briefing sessions on sales conversation and technical knowledge. These sessions helped in increasing confidence and product knowledge.

In addition to this, team leaders and agents were encouraged to take up one-on-one sessions with the coaching team to finetune their skills and technical knowledge. The increased focus on training and building sales staffs confidence resulted in higher quote and sales numbers.

Towards the end of the project as sales began to taper off, sales staff were offered a variety of in-house incentives to keep up sales moral. Incentives were offered on both quotes and sales which helped in building a good opportunity pipeline.

Sales Communication

Throughout the project, we have learnt that VPP sales were very much dependent on customers' awareness about the program. A common objection we get from customers is "Why VPP?". Hence, sales staff education was a key aspect as it allowed agents to further educate customers on the VPP program through a balanced conversation of cost and benefits.

Another aspect which was essential to generating quotes, keeping customers engaged and in turn closing sales was correctly estimating the savings. Sales agents were trained in this, and it became key to ensuring the customers are educated on the costs and benefits of VPP.

2.3 Contractor Management and Installations

Working across multi-disciplinary teams (marketing, technical, finance, installation teams etc.) communication was key in ensuring any changes to the project were understood by all. In October 2020, a VPP specific Project Manager was bought on to ensure these communication channels were kept open and everyone was kept informed. Through weekly meetings, training and team discussions Origin was able to ensure each of the Milestones was met with adequate stock on hand, budget appraisal, future marketing actions planned and installation schedules to ensure the project continued to track in a positive direction.

Contractor management and communication became an ongoing focus throughout the project. With hardware and software continuing to develop and change, installers were constantly exposed to new products and new ways of working (physical installation, onboarding, product knowledge).

As the project lifecycle went on, communication between the installation contractors and Origin became crucial in ensuring the installers were well versed in the process of installing and configuring the latest product offering – ensuring the install was undertaken correctly and the VPP system was visible on the internal network.

Contractors and Origin Project Teams became well versed in the communication processes especially as the project progressed and as the COVID-19 Pandemic began to control what installation actions could proceed. With lockdowns plaguing Greater Melbourne for a major part of 2020, installations became difficult to complete due to the restrictions placed on allowing visitors to residential properties. Origin started conducting virtual inspections to assess the customer's property and determine its overall suitability for a VPP system ahead of the restrictions being lifted. This allowed Origin to gain visibility over the number of active jobs which were sitting in the installation pipeline and gave the customers certainty of what they would be receiving.

This process involved installers communicating with customers and arranging a time to complete a video call where (with the customer's permission) the customer would walk them through the home to assess switchboards and discuss potential locations for equipment to be installed. Although more limiting than a physical site inspection, these virtual assessments allowed Origin to begin installing as soon as restrictions were lifted in late 2020 rather than having to start with an onsite inspection for these properties.

Stage 4 restrictions (halting of VPP installs in Melbourne metro), impacted progress of the project, however once lockdowns were lifted, there was a clear install pipeline. Communication was consistent at this time between Origin and contractors as initially there was a 4-month sold-to-install timeframe. This sold-to-install timeframe quickly reduced after training and bringing on additional qualified installers. Establishing an open channel for discussion between Origin and installation contractors was highly beneficial as all parties understood the uncertainty caused by stage 4 restrictions or any subsequent stage 4 level restriction.

2.3.1 Contractor Management and Installation Learnings

Installer Knowledge

With the ever-changing nature of installations and constantly evolving product offerings within the VPP, it was clear that continuous learning and development was crucial to the success of the project.

The continuous development and learning provided to the installers allowed them to seamlessly adapt to new systems as they were introduced. All installers brought on were continually offered training to further their knowledge on new products, especially any upgrades or installation nuances they may encounter. With installers continually refreshing their product knowledge to cover the installation of new systems, any challenges faced as a result of the dynamic nature of the project were mitigated.

Onboarding and Remote Connectivity

In conjunction with the improvement strategies mentioned above, site onboarding process also evolved over the course of the project.

Initially, the onboarding process required the installers to call the Origin team while on site and give them necessary information to onboard the site to the VPP controller portal. Factoring in the time constraints and the dependency on multiple teams to complete this activity meant this process presented opportunity for improvement.

Workshopping this process, provided useful insight leading Origin to transition to an app that allowed the installer to onboard the device themselves while still onsite. Installers were provided training by Origin and field supervisors on best practices with the new app so the transition into the new process was seamless.

Installers were also required to connect the VPP system to the home via a network cable to allow Origin to remotely control and monitor the system. The new onboarding process mentioned above also ensured that any network connectivity issues were identified and rectified before the installer left site, as a working network connection is required to complete the onboarding activity.

This process was well received and while it improved the efficiency of onboarding, the other major benefit was in giving the installers more autonomy and responsibility of the onboarding process.

2.4 Customer Identification and Marketing

Throughout the project, the marketing offer has varied. Initially, there was a high engagement around the idea of the VPP by our customers, but some uncertainty around the proposed Victorian Government Battery Subsidy. The uncertainty was articulated as a question around why customers would join the Origin VPP if they can access the proposed battery funding from the Victorian Government and have no requirements on participation in a VPP scheme.

Understanding this customer reluctance, along with what was currently working with our solar sales – Origin created a targeted marketing approach to engage customers for the VPP. Both above and below the line marketing activity was put in place by Origin throughout the entire project. A VPP-lead TV commercial was included in a brand campaign – to build awareness of our capability. We invested in digital media – testing various creative executions across search engine marketing, digital display and social platforms. We retargeted customers who visited our VPP and battery landing pages, with offer-lead messaging in our self-service portal, My Account. We updated our landing page to sharpen sales messaging and improve sales conversion. Finally, an Electronic Direct Mail campaign was rolled out to Origin customers, with and without solar. This resulted in an immediate uplift in sales, and it gave us the ability to test messaging and marketing approaches, to understand how to maximise the appeal of and engagement with the VPP proposition.

Research was conducted in the early phase of the project to determine who was best suited to the VPP product and the current uptake of these products in Metro Melbourne. This provided some useful insight into the most likely cohorts interested in purchasing and installing a VPP system. The findings were then implemented throughout the rest of the project and assisted by informing where to inject the most energy in quoting, selling and finally installing the 650 sales.

These findings showed:

- VPP customers were overwhelmingly male
- 69% aged 35-54
- Seem to be digitally engaged with almost 2/3 of the customers having downloaded the Origin App to track their battery usage
- Typically, a new customer to Origin

2.4.1 Customer Experience

Origin created a VPP proposition that was compelling for customers and enabled us to meet the aims of the VPP program. The Origin VPP offer was available to all customers, despite prior rebates or income, and provided further benefit by offering account credits for signing up (Initially \$300/year changing to \$20/month for 5 years in 2020). Further to this, customers took up the available VPP offer from Origin as it made them feel like they were making a positive impact on grid demand. The move to a \$20 a month structure was a result of research findings that showed that after signing up and receiving the upfront discount, customers quickly

forgot about the \$300 credit, and therefore, when we accessed their battery to support the grid, questioned the value they'd receive in return. Applying a monthly bill credit reinforced this value.

In an effort again to enhance the customer experience, we introduced several features in the Origin app that are available to only our customers on the VPP. This is in response to research we undertook with customers who wanted a higher level of engagement with the VPP. We showed customers their energy flows from their solar panels and battery, in almost real-time to help them understand what their system is doing, how much energy is being generated and how it is being used.

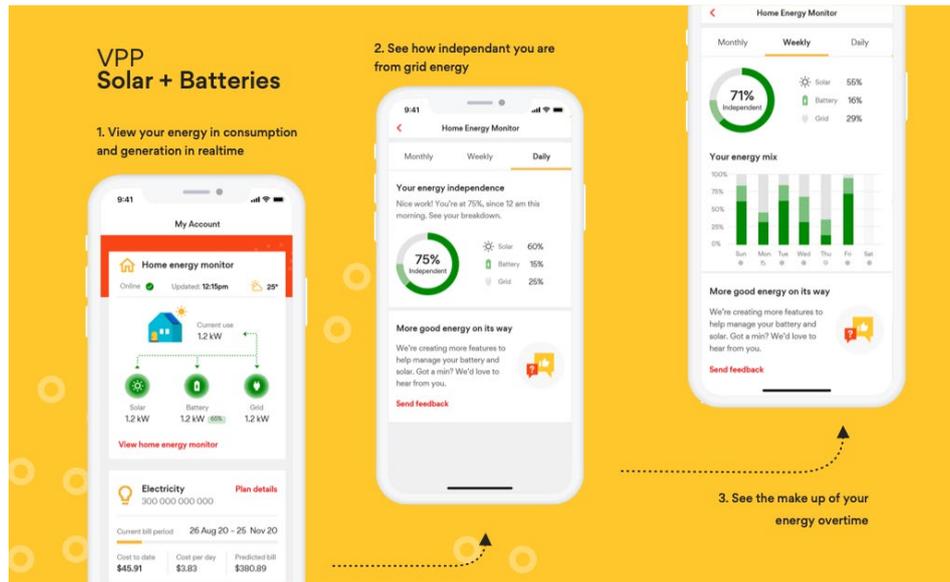


Figure 3: Origin App Example



Figure 4: Origin App Savings Tracker

We also introduced the Savings Tracker App which showed customers how much they have saved by installing a battery and solar system. The App showed savings achieved from solar self-consumption, export of excess energy to the grid and any financial benefits from being part of the VPP. Feedback from customers on these experiences has been overwhelmingly positive.

2.4.2 Customer Experience Learnings

Customer Savings

In orchestrating the VPP, residential customers were given the opportunity to not only optimise energy affordability but also create real savings. These included the reduction in the upfront cost of the battery, customers' saving from self-consumption from their solar and battery system, and through participating in the Origin VPP, given monthly credits on their electricity bill.

Customers on average save between 60-80% off their electricity bill depending on the size of the system installed and their individual consumption patterns. Not only are Origin making learnings in terms of how to ensure customers get the most value from their system, but customers are also proactively learning to monitor their own system and optimise their savings by charging their battery during off-peak hours, so they have a full battery to draw on during peak hours 7am-10am.

From the above learnings about how customers respond to the savings generated, Origin is looking into the future possibility to automate the time of use optimization as this would further increase customers' savings from having a battery connected to the VPP.

Customer Knowledge

During the early part of the project, customers tended to be those who were interested in adopting new technology. Customer demographics skewed towards male and older than 50 years, either early retirees or families with older children. As the project matured, we saw a broader and more diverse cross section of customers.

Essentially, it was found the main reason for participation in the VPP project was to reduce their energy bills and overall environmental impact of their energy consumption. In addition to this, the subsidised battery offer was also a strong reason for wanting to participate particularly for those customers who were not eligible for the Victorian Battery rebate.

As the project continued, sales staff became very aware of not only the trends in terms of demographic, but also geographic spread. Customer clusters became evident particularly in the areas where there are new housing developments; in the West (Tarneit, Point Cook, Laverton), Southeast (Cranbourne), and North (Craigieburn). These homes tend to be larger with higher energy usage.

2.5 VPP Performance

The performance of the VPP can be measured in different areas including the performance of the system on site and the performance of the orchestration system in the cloud which combined give an overall event performance.

Running VPP events became the main source of data in terms of how the system was performing. Through learnings and customer feedback, it was identified that customers wanted notification of an event's occurrence and through this insight, the efficiency and process of running events matured. Implementation of the delivery of communications to customers allowed Origin to run more demand events. These events are triggered automatically once the wholesale price exceeds a threshold or can be scheduled manually. While there have been some periods of extended low wholesale prices during the project, the manual scheduling of events allowed customers to become comfortable with the notification process and get used to the idea of their battery being discharged. The VPP system response rate has risen from mid-70% to 94% of devices successfully responding to current events.

To ensure effective management of the VPP systems, the Origin VPP Operations team works with customers daily to ensure the availability of the fleet is maintained and customer satisfaction and communication is upheld. Constant testing and monitoring have been beneficial to identify improvement opportunities for the VPP performance.

Root Cause Analysis

As mentioned above, the Origin VPP project team consistently works with customers to ensure availability, customer satisfaction and communication is maintained. A root cause analysis was conducted on sites that did not successfully respond during a VPP event.

With the results of the analysis, we were able to improve the participation rate of sites and generate valuable learnings on the onboarding and connection process. The analysis also provided important feedback on hardware and allowed us to fine tune our reporting algorithm. While conducting the root cause analysis, issues were categorised as follows:

Onboarding

Onboarding involves enrolling each site onto the Origin connect platform. Initially, the onboarding process required the installers to call the Origin team while on site and give them necessary information to onboard the site onto the connect platform. Factoring in the time constraints and the dependency on multiple teams to complete this activity meant this process presented opportunity for improvement.

Workshopping this process, provided useful insight leading Origin to transition to an app that allowed the installer to onboard the device themselves while still onsite. This process was well received and significantly improved the efficiency of onboarding.

System Faults

A system fault is a customer site equipment fault such as an inverter alarm. As the number of systems enrolled in the VPP increased, it became time consuming to identify system faults manually. While this is manageable for a small number of sites, it became inefficient at scale. We saw this as an opportunity and introduced automated reporting tools to help efficiently identify system faults so that these can be prioritised and resolved in a scalable manner.

Reporting

Origin has developed automated reporting systems to monitor and manage the VPP fleet. During the initial development phase of the system reporting, our software architects had to take into consideration complex use cases to ensure accurate and reliable system reporting. For example, our reporting algorithm was not initially

able to distinguish sites with special requirements or limitations such as sites with an export limit. This meant although these sites were operating as expected, it wasn't reflected as such in the reporting. This presented an opportunity for us to improve our reporting algorithm by considering site-based requirements and limitations. This enabled us to make informed decisions based on actual site performance.

Event Conditions

The VPP fleet is dispatched based around the wholesale price of electricity. Events are triggered based on preconfigured price thresholds. Ahead of an anticipated price event occurring, commands can be sent to pre-charge batteries that have a low state of charge, to ensure energy is available to discharge during the price event. Pre-charge commands are scheduled based on a forecast of customer's household energy usage and solar generation. If conditions on-site change, such as the customer energy demand increasing or solar generation dropping, the battery's state of charge can fall, and the site may not respond as the state of charge of the battery is too low. Similarly, if the customer energy demand onsite exceeds the solar generation at the time of the event, the energy discharged from the battery may be used to supply the customer energy demand instead of being discharged back into the grid.

Fleet Control

The VPP fleet is managed by a controller device connected to the customer's battery system. The controller needs to be online to receive commands from the Origin Connect platform and relay them to the battery system. Early on in the trial, we found communication failure of the controller to be common and proceeded to analyse common causes of failure.

We identified a high portion of communication failures to be when the controller device loses power, due to customers accidentally unplugging. This leads to the site being unable to participate should a VPP event be called on. To reduce the likelihood of this occurring, Origin introduced a label placed by the contractor during installation, to remind customers not to unplug the controller and if they noticed it was offline, to get in contact with Origin support. These measures in addition to improved customer education through our installers, greatly improved the availability of the fleet.

Root Cause Analysis
Sites that did not respond during VPP events

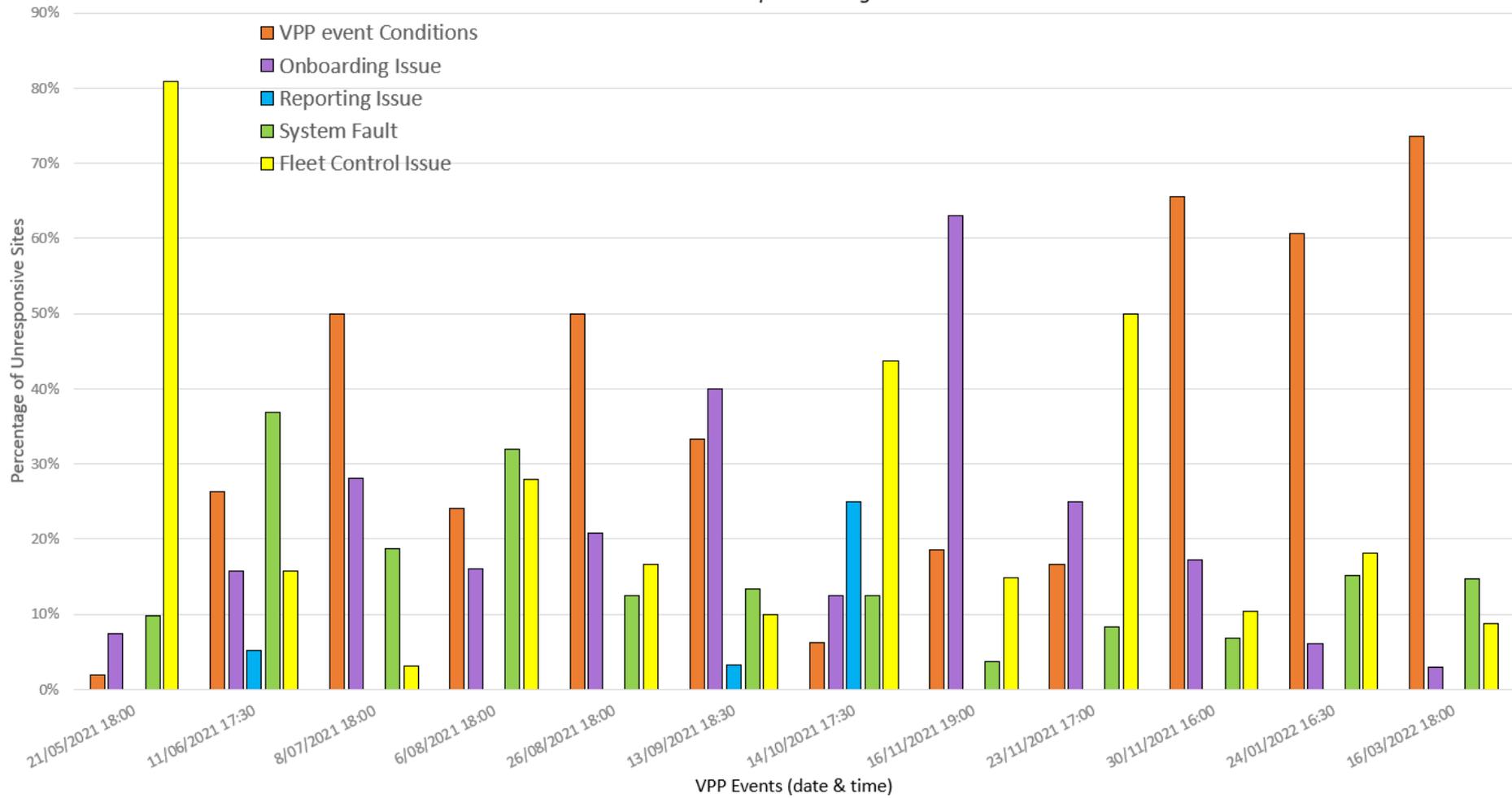


Figure 5: VPP Event - Root Cause Analysis

2.5.1 VPP Performance Learnings

VPP Events

Events are important for gathering ongoing learnings and improvements, to keep customers engaged and remind them that they are part of a VPP and where wholesale prices are high for revenue.

Figure 6 below provides a summary of each event. The graph depicts the number of sites that participated in the event, sites that were enrolled but did not participate were either offline, had higher forecasted loads than available battery capacity or excluded due to a zero-export limit. A site may be online prior to the event and hence be flagged as 'participated in event' but later go offline causing it to not respond.

The response rate steadily increased across the project, reflecting the lessons learnt and processes implemented to manage the expansion of the fleet. Additional checks prior to onboarding a site into the VPP and performing root-cause analysis on sites that did not respond, helped identify opportunities to improve the response rate of sites.

Over the course of the VPP program we have witnessed the response to many price events. One thing that we have learnt is that the AEMO pre-dispatch price is not the best signal to schedule an export event. On numerous occasions a high price was forecast, even as close as the next 5 minutes, however the price rarely materialised as the response to the price signal pushed the price down. We trialled pre-charging batteries to be ready for these events, however if the price signal diminishes just before the execution time, the result is pre-charging a customer's battery with no event taking place.

Origin is constantly aiming to provide the optimal outcome for customers. The learnings generated throughout the events that have taken place have allowed Origin to accurately take the best course of action, whether that be pre-charging or using our own price forecast to ensure the customer has the best VPP experience.

TOU Optimisation

For a period early in the program we trialled Time of Use (ToU) optimisation for all customers on a ToU tariff. However not all customers wanted this feature and we ultimately disabled it. Typically, customers that had a higher household load generally received the full benefit of shifting 1 cycle of their battery from peak into off-peak. Daily savings of up to \$2 were seen, however the average was closer to \$1 a day.

Looking at the data from the period where ToU optimisation was enabled, we could see a clear benefit, particularly in the winter months where solar generation was lower. As Origin continues with VPP product development future enhancements include a trial that would allow the customer to select ToU optimization as a option using the Origin App.

Wholesale Value

The capture of wholesale value is something that has been continuously evolving over the period of the program. Once we were able to scale up the size of the fleet and see a sustained high response rate from the batteries the challenge became about responding to forecast price events. We were expecting high price volatility in the early months of 2021 however the wholesale price remained very low resulting in very poor wholesale value and no automated dispatch events were triggered.

We are constantly looking to provide the best value for money for our customers which has led to a rethink in how the fleet is dispatched.

VPP Event Statistics
Sites that participated in Origin Vic VPP events

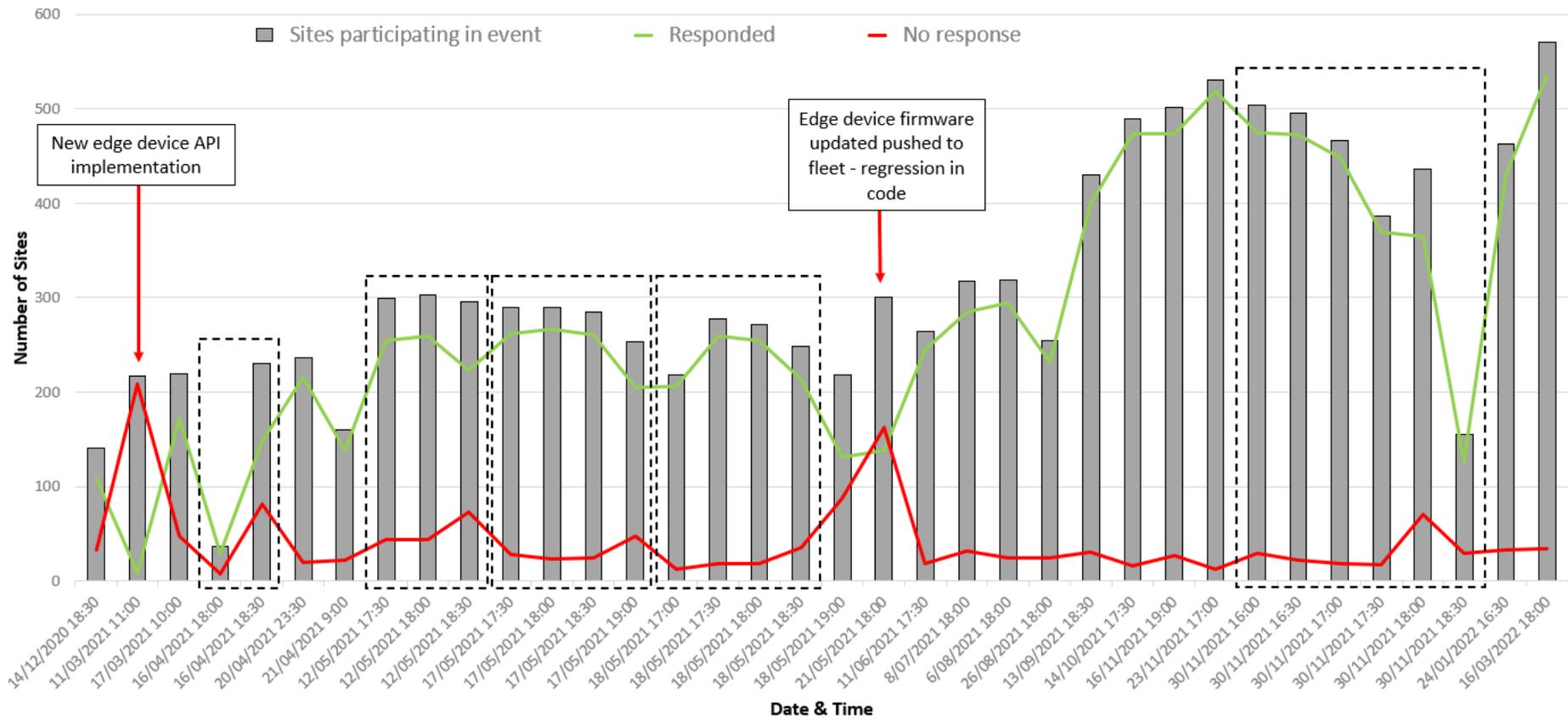


Figure 6: VPP Events Summary - Key Metrics

3.0 Risk Management

3.1 COVID-19

The ongoing COVID-19 pandemic coupled with uncertainty in the community remained the highest risk to the completion of the project. Despite lockdowns in mid-2021 halting installations for a brief time, learnings from previous restrictions allowed Origin to plan for these issues and cause as little delay as possible.

Customer communication remained a key focus during the lockdowns as they initially created a 4-month sold-to-install timeframe. This quickly became a 3-month sold-to-install timeframe after bringing on more qualified installers. Establishing an open channel for discussion between Origin and the customers proved beneficial as it helped customers understand the uncertainty caused by the restrictions and how that could affect the timing of their installation.

Origin took each lockdown as a learning opportunity to plan for these issues and cause as little delays as possible. Virtual inspections to assess customer properties along with open communication with customers proved to be the most successful way to not only continue to move forward with the project, but also ensure customers were aware that their purchase was being managed.

3.2 Health and Safety

This is Origin's number one priority and was reviewed and managed throughout the duration of the program up until the final install was completed and will undergo ongoing management throughout the warranty period.

4.0 Conclusion and Ongoing Commitments

The project met the target for all Milestones on or ahead of schedule, reaching a cumulative installed capacity of 6.87MW and 657 sites.

The ongoing engagement with the DELWP has enabled Origin to be transparent in terms of how Milestone progress was tracking throughout the entire VPP project. Although faced with a lot of uncertainty in the economic climate due to the COVID-19 Pandemic, our marketing campaigns, product offerings and communication throughout proved successful.

Enhancing our customers experience and value proposition was a key pillar and achieved through a clear and targeted marketing strategy. In doing this, learnings were made about the type of customer who would be interested in the VPP product, their common concerns, expectations and how to best train the sales staff to provide the customer with this knowledge at the beginning of their VPP journey. This in turn, achieved the following **key objectives** of the first project pillar and provided valuable learnings and insights to use in future projects and marketing campaigns.

- Demonstrate the value inherent in orchestrating the VPP to optimise energy affordability to residential customers
- Demonstrate leadership in the adoption of renewable energy and its role in delivering accessible, affordable, and reliable energy solutions for customers

In terms of our product offerings and VPP performance, Origin set a precedent early that the product being offered would be reliable and customer centric. Through dedicated teams monitoring the performance of the VPP systems, customers were ensured their system was working at the full potential and giving them the greatest benefit. Product due diligence and VPP system reliability testing continually undertaken throughout the lifespan of the VPP, achieved the following **key objectives**.

- Rapidly test and commercialise new and emerging technology and customer value propositions to drive the adoption of distributed renewable energy resources to build the VPP (e.g. battery and inverter upgrades, storage bundles, more efficient panels)
- Overcome existing regulatory hurdles and barriers to VPP development by working with Networks and Government
- Solve the technological challenges and barriers relating to reliably integrating and orchestrating 100's of distributed asset types from a centralised dispatch command

With the COVID-19 Pandemic altering the course of the project continually, communication channels with customers, contractors and the project teams were used to not only enhance customer understanding but also maintain a reputation as an open and honest company. This achieved the following **key objectives** and assisted in the ongoing success of the project despite lockdowns and changes in the economic climate.

- Establish clear communication with customers within the VPP project and what is happening outside the project that may affect their product or service.
- Establish clear communication with the contractors to relay feedback, updates on products and identify improvement opportunities.
- Establish clear communication within Origins project teams to coordinate changes within sales, inventory, installs and overall asset management. This allowed teams to understand upcoming targets, deadlines and overall VPP Progress.

The successful implementation of the VPP project in Metro Melbourne has increased renewable energy generation in Victoria, therefore contributing to the reduction of greenhouse gas emissions. Additionally, it has

developed a greater understanding within the community of the role individuals can play in further reducing carbon emissions and strengthening the National Electricity Market (NEM).

The incentives and discounts offered through the VPP, especially in a time of such economic uncertainty, has helped customers overcome the initial capital expenditure required to install solar and battery solutions. This has meant, all customers, regardless of socio-economic background have had the opportunity to contribute to lowering carbon emissions, have had access to lower electricity prices and additional revenue streams such as VPP involvement incentives.

The Origin VPP is an example of active and collaborative involvement from the community in helping to protect and future proof our energy market. As we move into the maintenance phase of this project, plans remain in place to continue to target affordability, accessibility, and resilience. The project as a whole will continue to complement and contribute positively to the Australian emissions reduction targets and will remain strongly aligned with Origin's purpose of getting energy right for our customers, community, and planet.