Resi-Flex Project

Phase 3 Report

February 2026

Orion

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Executive Summary

Three trials were conducted to test how different commercial mechanisms incentivise customer participation in demand-side flexibility. Orion and Wellington Electricity partnered with Octopus Energy and Ecotricity to deliver these trials.

Savings Sessions (Octopus Energy) & Shift to Win

Resi-flex tested customers' willingness to reduce energy use during peak or high-price periods using two incentive models: direct payments ($3/kWh saved against the baseline) and lottery-style rewards (entry into a $50 draw for customers who save against the baseline). Table 1 displays the average success rate (defined as customers saving against their 10-weekday average baseline during an event) and average energy savings for the two trials.

Trial	Session timing	Average success rate	Average energy savings (kW)
Savings Sessions	Morning	61%	0.71
	Evening	73%	0.84
Shift to Win	Morning	54%	0.52
	Evening		0.39

Table 1: Average success rate and energy savings (kW) of Orion opted-in customers split by time of session for Savings Sessions and Shift to Win

- **Scaling potential:** Energy saving of 0.7 kW across 2 million homes in New Zealand, with a 20% participation rate, gives **280 MW of reduced load**. The electricity network peaks around 7,000 MW, giving residential flex the ability to **reduce network peak load by 4%.**
- The most common additional feedback was a desire for **more frequent Saving Sessions,** with participants wanting Saving Sessions to occur between **2–4 times per month.** This is higher than anticipated and shows customers are willing to inconvenience themselves or break habits for a small incentive relatively often.
- Among Orion customers who took part in both Saving Sessions and Shift to Win, **67% said they preferred Saving Sessions.** A **3.6/5 satisfaction score for Savings Sessions** was given.
- **Saving money (70%)** was the top motivator for reducing electricity use.
- The most common actions taken were **delaying use of large appliances (oven, hot water heater, fridge, freezer) (81%),** followed by **reducing heating/cooling (55%)** and t**urning off lights and small appliances (38%).**
- The top suggestions for making Saving Sessions more engaging were **clearer rewards or payments (62%)** and **more information about individual savings (52%).**
- The most challenging times for customers to participate were **evenings (5–7pm/dinner time).**

EV Managed Charging Trial (Octopus Energy)

The trial tested how EV charging managed by Octopus could shift demand to off-peak periods. Orion provided a 5c per kWh, and Octopus contributed $10 per month. Over 30 customers participated in the trial. The total charging profile for the course of the trial is shown in Figure 1, and gives the following insights:

- Significant ability to charge off-peak was demonstrated, with **97% of charging occurring outside the peak network times** of 7–10am and 5–10pm.
- Managed charging peaked between 3:30 and 4:30 am with 2,467 kWh consumed over the whole trial.
- During the morning network peak period, 37 kWh was consumed, and during the evening network peak, an average of 95 kWh was consumed over the whole trial period.
- Minimal use of override ("boost") function, indicating trust in the system.

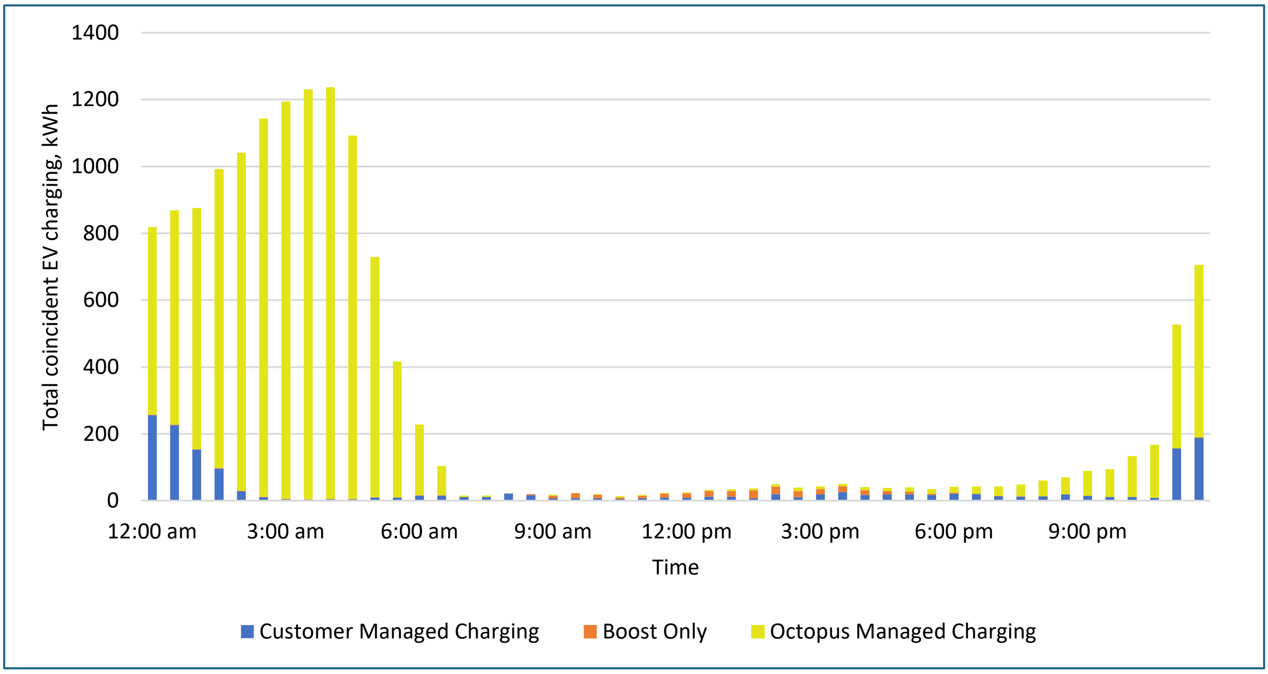


Figure 1: Total EV demand profile by charging mode

- Some individual customers exhibited habitual charging behaviours, often charging on the same days each week. While this makes it easier to predict customer behaviour, it reduces the value of managed charging, as customers are plugged in less often and require longer charging sessions.
- The **highest coincident load day occurred on the Sunday of Canterbury Anniversary weekend**, with another high day being the end of Waitangi weekend. The end of holiday weekends can drive concentrated charging demand as vehicles return home and charge ready for the Monday commute

Solar Export (Ecotricity)

The Trial tested how a 60c/kWh (Orion 9c + Ecotricity 51c) incentive for exporting solar energy from batteries at peak times (7–10am, 5–10pm) would influence uptake in solar and export behaviour. This trial is ongoing, targeting 100 customers.

Overall Considerations and Findings

- Mass market customers have not been represented in the trials so far. This is a gap that needs to be addressed to build an overall picture of residential flexibility.
- Trust between customers, retailers, and EDBs is critical for the adoption and success of residential flexibility incentives.
- Current barriers to nationwide implementation include device control limitations, pricing complexity from all parts of the value stack, and lack of controllable load.

1. Introduction

Decarbonisation is driving a growing reliance on electricity across all sectors. Reports such as *The Future is Electric* (BCG) highlight the critical role of demand-side flexibility in integrating renewables and optimising network use. Research by Concept Consulting shows that electric vehicle (EV) charging and hot water heating could account for nearly 90% of residential flexibility, yet most consumers remain unaware of the value this flexibility offers or how it could reduce their power bills. The Electricity Authority's Market Development Advisory Group has similarly stressed the importance of tariff and technology innovation to better inform and engage customers.

With this context, Orion and Wellington Electricity launched the Resi-Flex project, a partnership designed to test commercial mechanisms that incentivise residential flexibility and generate insights for the wider electricity sector.

Resi-Flex has followed a three-phased, learning-by-doing approach, beginning with engagement across consumers, stakeholders, and distribution companies to inform the design of flexibility mechanisms. These mechanisms were then co-designed with flexibility suppliers and trialled directly with consumers to test their practicality and impact.

- Phase 1 focused on understanding user requirements, (complete)
- Phase 2 concentrated on developing commercial mechanisms, (complete)
- **Phase 3 centres on the co-design and trial of these mechanisms with residential consumers (underway)**.
    - **Phase 3a** – activities up to 31 March 2025 (complete)
    - **Phase 3b** – activities and forecast costs from 1 April 2025 – 31 March 2027

This report focuses on Phase 3, presenting the results from these trials and their findings, to support ongoing Resi-Flex work and contribute to a more sustainable future network. An overview of the past phases can be found in Appendix A.

2. Phase 3: Co-Design and Trial

2.1 Phase 3 Overview

Phase 3 enables the research, findings and mechanisms from previous phases to be trialled to test real consumer responses to different incentives, with insights used to guide trial design and identify effective rewards.

The main **objectives** of the trials are to:

- Test the effectiveness of different commercial mechanisms at solving the network use cases and attracting residential consumer participation.
- Estimate the value required to unlock residential flexibility.
- Further understand the benefits of residential flexibility to our customers (including non-financial).
- Gain insights into the needs of both consumers and flexibility stakeholders regarding flexibility incentives.
- Inform the development of fair and effective distribution pricing, including appropriate spatial and temporal granularity.
- Analyse the responses from real-world consumers to customer offerings that reflect the value of flexibility.

The desired **outcomes** are:

- Test commercial mechanisms that increase participation in residential flexibility and consumer value.
- Collect quantitative data to assess the amount of demand flexibility.
- Collect qualitative data to assess customers response to the trials.
- Share insights.
- Increased participation in residential flexibility and consumer value.
- Optimised distribution network investment through insight into mechanisms to incentivise flexibility.
- Design mechanisms that enable value stacking to maximise whole of system value.

A summary table of the two parts of Phase 3 is shown below in Table 2.

Project phase	Phase 3a: Co-design and trials	Phase 3b: Co-design and trials
Start	**Year ending 31 March 2024**	**1 April 2025**
Completion	**Year ending 31 March 2025**	**Year ending 31 March 2027**
Progress	Complete	In progress
Key objectives	○ Co-design customer offerings with flexibility stakeholders	○ Co-design customer offerings with flexibility stakeholders ○ Trial and evaluate the effectiveness of the commercial mechanisms

Project phase	Phase 3a: Co-design and trials	Phase 3b: Co-design and trials
Activities / Steps by Phase	○ Partnered with one retailer (Octopus) after the EOI process (executed NDAs and MOUs ○ Co-designed trial specifications and customer propositions ○ Recruited residential customers and delivered one flexibility trial with participating households	○ Execute NDAs and MOUs with retailers, co-design trial specifications and customer propositions ○ Recruit residential customers to participate in trials ○ Deliver the flexibility trials with 400-800 households ○ Collect data from retailers on customer participation and DER information ○ Share early learnings ○ Refine trial co-design on initial results ○ Analyse trial data & report on insights & lessons ○ Implementation recommendations for scalable solutions

Table 2: Summary Table for Phase 3: Overview and Co-Design

This report shares the results and findings of Phase 3a, as well as some information from current trials that are part of Phase 3b.

2.2 Engaging Partners

Orion and Wellington Electricity sent out an Expression of Interest (EOI) to partner with Flexibility Stakeholders to turn the commercial mechanisms formed in Phase 2 into simple, appealing residential offerings that incentivised flexibility.

Partners that could design offerings, recruit participants, and deliver the trial were sought. Trial partners could be a single organisation or a partnership of organisations (flex supplier/aggregator and retailer, or end-consumer integrator, etc).

Five separate partners were signed up to carry out the trials alongside Orion and Wellington Electricity in Phase 3a, however this number was reduced with two partners withdrawing in light of changed company structures and priorities.

Octopus Energy and Ecotricity are the two partners currently involved in trials, with a third partner developing internal capability to control load.

Octopus Energy

Octopus Energy is a British renewable energy company known for using technology to drive innovation in the energy sector. They have already completed demand flexibility trials in the UK and bring experience and valuable knowledge in implementing trials and mass-market flexibility offers.

Ecotricity

Ecotricity NZ is an electricity retailer offering 100% renewable electricity. Ecotricity emphasises carbon-neutral electricity, strong solar buy-back terms, and flexible off-peak rates, which are especially useful for EV owners. They have experience in residential flexibility and partnering with hardware manufacturers, installers and EDBs to increase the uptake of solar and battery infrastructure. The Ecotricity brand is in the process of being consolidated into the Genesis Energy brand.

3. Savings Sessions and Shift to Win – Octopus Energy

3.1 Trial Overview

Trial Description

As residential electricity demand grows, individual customer efforts to shift usage off-peak can have a significant impact.

During this trial, we worked with Octopus Energy to carry out Savings Sessions and Shift to Win trials.

Savings Sessions and Shift to Win trials were designed to test customers' willingness and ability to respond to extreme demand or pricing events by signalling in advance the option to reduce load during the event in exchange for a payment incentive.

This trial tested two payment methods. For Savings Sessions, customers received a clear $3/kWh value for all kWh saved against their baseline during the session. For Shift to Win, customers were entered into a draw to win one of five $50 credits if they saved any amount of energy against their baseline during a session. It was assumed that Savings Sessions would appeal to more rational, value-driven customers, compared to Shift to Win which offers no certainty.

570 of Octopus Energy’s customers on the Orion network opted in to participate in the Savings Sessions trial, which equates to ~46% of their customer base within the Orion network. 230 signed up for Shift to Win, with approximately 120 of these actively participating and responding. Savings Sessions consisted of ten 0.5 – 1.5 hr sessions from May 2024 to March 2025. Shift to Win consisted of five 0.5 – 1.5 hr sessions from June 2025 to August 2025.

Trial focuses

- Enable participation from all customers.
- Test if small, direct payments were enough to motivate flexible behaviour, and how this compared to the Shift to Win approach, where customers were not ensured any benefit. Would customers have a stronger appetite and respond better when a larger sum of money was at stake, even if it wasn’t guaranteed?
- Explore if customers could save more in the morning or the evening, with the expectation that typical evening loads would be more shiftable.
- Understand how many events could be run before customers experienced ‘fatigue’ and stopped responding, with an assumption that one or two per month may be the practical limit.
- Interest in any insights or learnings we can draw from the data.

Incentives Payment Reasoning

<u>Saving Sessions:</u> For each kWh that customers saved during a session, Orion contributed $1/kWh. This value was derived from Orion's Major Customer Control Period Demand (CPD) as this pricing mechanism closely reflects the mechanism used in Savings Sessions. The CPD had a value of around $1/kWh when the trial was designed, this is now closer to $1.6/kWh. See Appendix B for more details around how this value was chosen and verified. Octopus contributed $2/kWh, giving a total incentive of $3/kWh of energy saved against a participant’s baseline.

Shift to Win: Five $50 reward credits, where available, and could be won per session. This was derived from the previous year's Savings Session results, in which approximately 250 kWh was saved per session. Assuming similar results, Orion forecasted to pay $1/kWh for this trial. Octopus did not contribute financially to this trial, as it was only used for network peaks. The five winners were randomly drawn from those who saved energy over the required period compared to their baseline.

Trial Implementation Considerations

- *Timing and clarity of communication with customers ahead of sessions.* It was unknown how long before the event that customers should be warned, and if the time of warning had an impact on the customer's response behaviour. 24 hrs was generally seen as adequate, though this time was varied.

- *Forecasting of high pricing events*. Predicting when electricity prices will peak was difficult, with Wholesale Information and Trading System (WITS) price forecasting being inaccurate for extreme prices. Comparatively, Orion's load forecasting was relatively accurate.

- *Baselining accuracy and complexity*. Since the energy saved was determined by comparing the energy used during the saving session with a baseline based on energy consumption at the same time over the previous 10 weekdays, this method may be inaccurate. This is because factors such as weather, occupancy, or other day-to-day changes are not accounted for, leading to potential misestimates of actual savings. This baselining methodology likely underestimates the energy savings customers achieve. The underestimation is due to saving sessions being triggered only when network load is high, which typically occurs on cold days when homes use more energy. This saving session day is then compared with the 10 workdays preceding it, during which saving sessions were not called. Because saving sessions were not run on the baseline days, those days will typically be warmer and have a lower household load, reducing the baseline load and making it harder to save against it.

3.2 Methodology

Octopus customers opted in to the trial and agreed to be contacted regarding Savings Sessions events via email, SMS and the Octopus Energy app.

The trials were set up so that Savings Sessions were dispatched when there was a combination of high network loading and a predicted high wholesale prices, which was decided on by the following steps:

1. Octopus identified a period when high wholesale prices could occur and contacted Orion.
2. Orion used its load forecasting in conjunction with weather forecasts to validate whether a high-load event on the network was expected and relayed this to Octopus.
3. If the two events were set to occur simultaneously and both parties agreed, Octopus sent notifications to participating customers to inform them of when the Savings Sessions event would occur and encourage them to adjust their electricity use accordingly.
4. If there were only network benefits to demand flexibility for a certain period, a shift to win was called. Likewise, if there were only market benefits to demand flexibility, then a saving session was called.
5. Events were run in 30-minute blocks, up to 1.5 hrs in total.

Customers saved energy by using less than their baseline, which was established using data from 10 weekdays before each session.

After a session, customers were automatically informed via the app how much energy they had saved, and therefore, how much they had earnt after each session. The earnings of Savings Sessions, or the $50 Shift to Win credit (if the customer won), were directly credited back to the customer on their next monthly bill.

Methodology Learnings/Issues

Network perspective:

- Price forecasts were often inaccurate, resulting in some Savings Sessions occurring when there wasn't an absolute need for them. Octopus would often see price forecasts of over $1/kWh; however, the price would end up not materialising (and would be a lot lower) than the forecast predicted.

- Weather forecasts were normally fairly accurate 1- 2 days ahead, however, predicting an event on Monday was difficult when using the weather forecast from Friday.

- The method used to establish customers' baselines made it harder for customers to save against their baseline. Load on days that saving sessions were called tended to be higher overall due to colder weather increasing heating demand. As a result, it was more difficult for participants to achieve reductions relative to the baseline, since their energy use was already elevated. Accurately comparing observed load during an event to what it "should have been" without the event is challenging, given the variability and unpredictability of residential load profiles. The baseline methodology is a very important part of rewarding customers for flexibility and will become more difficult as a larger part of a home's load becomes controllable.

Customer perspective:

Customers were surveyed after winter 2024 and 2025 so feedback could be incorporated into findings and used to inform the next set of trials. The following customer insights regarding *how* the trial was run are summarised below, with more insights about customer behaviour and general feedback in Section 3.4.

- There were no real issues with how the trial was run.
- During the trial, the warning time was varied. Normally customers were notified 24 hours ahead of the session, however sometimes this was reduced to less than 12 hours. No material difference was observed from a savings perspective, but results from customer surveys following the trial showed that when it came to notice, **52% preferred 24+ hours**, while **25% preferred 6–12 hours.**
- **Email (63%)** was the most preferred notification channel, with **SMS (58%)** close behind. Some participants commented that they would like to be reminded right before the event began.
- Participants sought more engaging information around Savings Sessions. Some ideas for improvements in this area were:
    - Share more information about the energy saved/shifted for each session, both individually and as a group. This could be achieved by notifying participants on how much other people saved following each session to encourage friendly competitiveness between participants.
    - Share energy savings as a % of baseline, not just an absolute value.

    - Clearly communicate the impact that shifting energy off-peak is having on the network and energy security in New Zealand.

- A variety of methods were used to save energy. Some of these methods may remain effective in the long term, whereas others may lose their appeal as the novelty fades. It is unclear which approaches would prove most effective if Savings Sessions were to become a regular occurrence.

  Methods used to save energy included:

    - Staying at work longer.
    - Only using the essentials during the event.
    - Planning activities such as cooking and showering around the event.
    - Switching hot water off.
    - Switching all power off.
    - Leaving the house during the event.
    - Exporting from BESS/custom programme BESS.
    - One household made a game of it with their children, by switching everything off, getting torches out and toasting marshmallows on the fire.

- A number of customers were already doing as much as they could before the trial to avoid using energy at these peak times, so it was difficult for them to reduce consumption further. This reduced the incentive to participate as the small savings they would achieve during this time were not worth the effort. Feedback was also received from current low energy users wanting to be rewarded for the effort they were already making.

- Some participants preferred Savings Sessions over Shift to Win because Savings Sessions felt collaborative, rewarded behaviour change directly and aligned with the idea of "doing the right thing." In contrast, Shift to Win was seen as a lottery-style incentive that distorted the message by focusing on profit, and encouraged minimal effort just to qualify rather than sustained behaviour change.

3.3 Results and Findings

Savings Sessions

The majority of customers who opted in to this trial realised energy savings. Success rate was defined as the proportion of opt-in customers who achieved energy savings relative to their baseline consumption. The average success rate over the course of the trial can be seen in Table 3. Table 3 also shows the average energy savings per hour for successful participants across all Savings Sessions events (kW).

Table 3 showed that participants were more effective at reducing energy from their baseline in the evening. This was likely because evening routines allow greater flexibility in scheduling energy-intensive activities than the morning, when most customers are constrained by the short window between waking and leaving for work.

Session timing	Average success rate	Average energy savings (kW)
Morning	61%	0.71
Evening	73%	0.84

Table 3: Average success rate and energy savings (kWh per hour) of Orion opted-in customers split by time of session for Savings Sessions

The average baseline energy consumption for participants, alongside the energy consumption of successful participants during one Savings Sessions event in 2025 is shown in Figure 2. Only one Savings Session event in 2025 occurred. This graph highlights the significant reduction that is possible at this peak evening period, with event consumption almost halving in some half-hour periods.

Note that where the baseline energy is negative, excess solar energy on customers' properties is being exported to the grid.

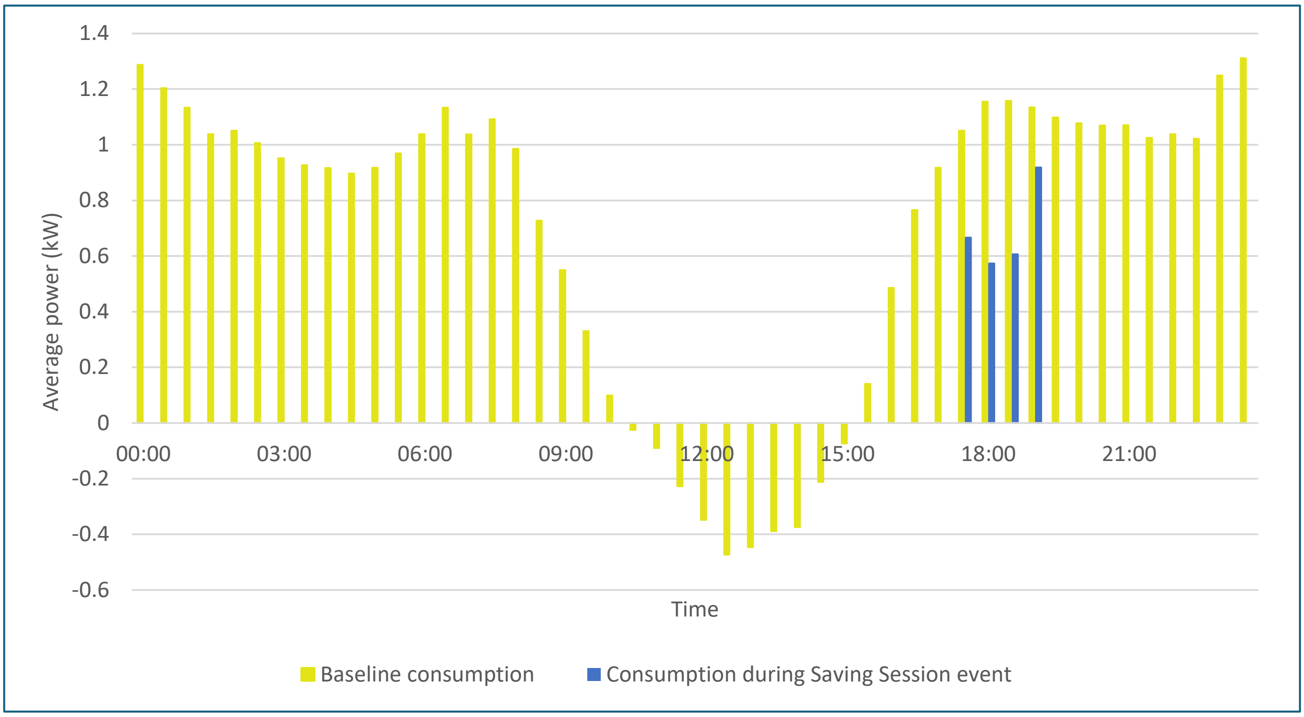


Figure 2: Average of participants' baselines compared to average energy saved by successful participants during a single 2025 Savings Sessions trial

Shift to Win

Results from Shift to Win are less promising than Savings Sessions, with lower success rates and average energy savings, see Table 4. This was expected due to participants not being guaranteed an incentive if they saved energy against their baseline, as well as only needing to save a minimum amount of energy to be in the draw, compared to Savings Sessions where every kWh saved earns a reward.

Session timing	Average success rate	Average energy savings (kWh per hour)
Morning	54%	0.52
Evening		0.39

Table 4: Average success rate and energy savings (kWh per hour) of Orion opted-in customers split by time of session for Shift to Win

Figure 3 shows the average baseline energy profile of participants compared to the energy use of participants who successfully saved against their baseline. Interestingly, more energy was saved in the morning (8:30-9:30am) which is opposite to the Savings Sessions findings. This may be due to Shift to Win events starting later in the morning than Savings Sessions when it would be more convenient for people to have left for work, lowering consumption.

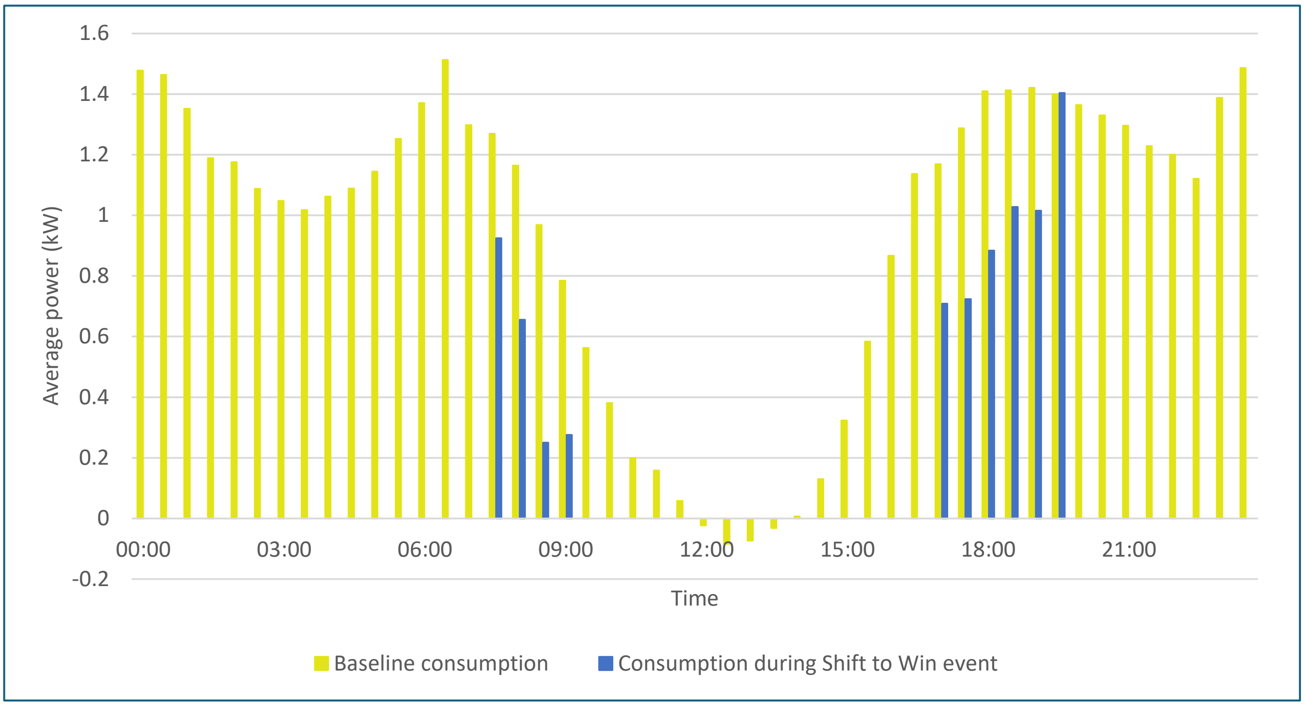


Figure 3: Average of participants baselines compared to average energy saved during Shift to Win trials by successful participants

Scaling Potential

The results from Savings Sessions are a positive indication that this mechanism can scale and deliver significant benefits. Using the average energy saved during morning Savings Sessions of 0.7 kW, and scaling this across 2 million homes in New Zealand with a 20% customer participation rate, yields 280 MW of load reduction. New Zealand's peak electrical load is around 7000 MW, giving residential flex the ability to reduce peak load by 4.0%. For the average energy saved in the evening of 0.84 kWh per hour, this equates to 336 MW, or reducing peak load by 4.8%.

The impact that electricity consumers reducing load can have on the network was showcased in May 2024, when Transpower called on New Zealanders to reduce power use from 7 – 9am due to a potential shortfall in electricity supply. The actions of thousands of people, along with major industrial electricity users and generators reduced demand by around 260 MW, comparable to saving the typical electricity use of Hamilton City. Saving Sessions provides a way for customers to get paid for this type of load response.

3.4 Customer Feedback

Surveys were sent out to all customers who opted in to Savings Sessions and Orion network customers who participated in Shift to Win. Two surveys were run, one for Orion customers and one for all other networks.

Engagement was strong, with over **570 responses across both surveys**. Overall, insights were largely consistent between Orion and non-Orion customers.

Key findings:

- The most common additional feedback was a desire for **more frequent Saving Sessions.**
- Participants rated their overall satisfaction with Saving Sessions at **3.6 out of 5.**
- Among Orion customers who took part in both Saving Sessions and Shift to Win, **67% said they preferred Saving Sessions.**
- **Saving money (70%)** was the top motivator for reducing electricity use.
- The most common actions taken were **delaying use of large appliances (oven, hot water heater, fridge, freezer (81%),** followed by **reducing heating/cooling (55%)** and t**urning off lights and small appliances (38%).**
- Most participants would like Saving Sessions to occur **2–3 times per month or about once per week.**
- The top suggestions for making Saving Sessions more engaging were **clearer rewards or payments (62%)** and **more information about individual savings (52%)**. Clearer rewards could entail running totals of how much you have saved over the period but that would require live smart meter data.
- The most challenging times for customers to participate were **evenings (5–7pm/dinner time).**

Customer feedback shows that the appetite for Savings Sessions is higher than originally anticipated (1-2 times per month), with feedback showing the want for more frequent saving sessions (3-4 times a month).

These survey results shows that people are willing to inconvenience themselves or break habit for a small incentive relatively often. Considerations should be made that a secondary peak is not caused by all appliances and actions that were delayed happening all at once, after the event has ended.

3.5 Future Trials Considerations

To further incentivise customers saving energy during peak periods, information about emissions at peak times during dry periods could be shared via an app, email or other form of communication. During these times, emissions are much higher as coal and gas are often used to support high demand levels. By raising awareness of this, customers who are motivated by environmental sustainability may be more likely to reduce their energy use, recognising the positive impact of lowering demand at these times.

As wind and solar becomes more prevalent on the grid, energy forecasts may become less accurate as volatility increases from these sources. Consideration into testing how customers can respond on shorter notice periods (1-3 hrs) would be useful for this future scenario when wind drops unexpectedly, or radiation is lower than predicted and rapid demand flex is required. An example of rapid fluctuation occurred in July 2025 when 800 MW of wind generation dropped to 200 MW within 30 minutes. This marked the most significant and rapid fluctuation in wind generation to date. Rapid demand response from residential consumers could reduce the impact this could have on the network.

To test the fatigue limit of customers to Savings Sessions, at some point in the next trial, sessions could be increased to multiple times a week, if possible.

4. EV Managed Charging – Octopus Energy

4.1 Trial Overview

Trial Description

Orion's 2024 report on Future Energy Scenarios[1] shows that transport electrification is likely to be the largest growth factor on the network between now and 2050, with herding of charging times already apparent. Unchecked, this could bring rapid growth in peak demand on parts of the network where EV uptake is high, so finding sustainable strategies to shift or reduce this load will be key.

The EV managed charging trial with Octopus Energy sought to test how EV charging could be shifted to reduce network peaks. This trial tested the managed service commercial mechanism, with customers allowing Octopus to control when their EV would be charged with a reduced tariff for this time.

The trial included 35 participants with EVs, and ran from the beginning of November 2024 to the end of February 2025.

Trial Focuses

- Understand how EVs could charge while optimising wholesale electricity prices with network prices. How well would charging demand match signals from optimisation demand?
- How tolerant are customers to having their charging controlled? How often did customers override Octopus' control, and why?
- How many kWh did customers charge at a time? Did this vary throughout the week?

[1] https://www.haveyoursay.oriongroup.co.nz/future-energy

- How often did customers plug in per week? Is there a pattern to this that we can take advantage of it from a flex perspective?
- Interest in any insights or learnings we can draw from the data.

Incentives Payment Reasoning

All prices include GST.

Each customer received 5c/kWh for the managed charging from Orion. This 5c/kWh rate considered the value that shifting charging off peak would provide the network – if the EVs on the trial could avoid charging at peak times, they are not contributing to network congestion, and the variable network charge could be 0 (or close to 0, which Orion already does through its TOU charge 3-5am).

To determine a reasonable incentive, a typical light EV charging load profile was multiplied by the Orion network TOU price to set the normal variable network charge for charging an unmanaged EV. If the variable network charge is set to zero and average EV uses 8 kWh per day, a 5c/kWh incentive could be provided.

Octopus contributed a flat rate of $10/month/customer.

Trial Implementation Considerations

- *Timing of the trial.* This trail was held over the summer months of 2024/25 when residential load is not typically high. Orion's assets that supply residential load are winter peaking, so to simulate winter, artificial network loading data from winter was used to optimise EV charging.
- *Customers maintaining autonomy over charging.* Customers placed high value in being able to override the external control of their vehicle's charging, so a "boost" setting on the Octopus app enabled customers to charge when necessary.
- *Types of chargers.* Residential plug-in chargers range from approximately 2 kW to 22 kW. The flexibility of the charging load depends on the type of charger. Chargers that deliver less power require the vehicle to be plugged in for longer periods, limiting how much charging can be shifted while ensuring an adequate charge in the morning.

4.2 Methodology

Octopus residential customers could opt into the trial if they met the requirements of owning an EV and approved wall charger and having a smart meter. A full list of requirements can be found in Appendix C. Using the Octopus app, customers input preferences around vehicle use and behaviours so Octopus could create a charging schedule within these parameters.

Octopus then connected to the EV smart charger or vehicle (if Tesla) through their integration software Intelligent Octopus[2] to manage the charging load.

[2] https://octopusenergy.nz/intelligent-octopus

Wholesale Information and Trading System (WITS) forecasts were utilised to estimate the future wholesale price to plan how to manage charging load, and Orion shared the load data of the Hawthornden zone substation so Octopus could optimise EV charging to avoid peak network times.

Octopus controlled charging loads when EVs were plugged in and worked within the parameters of each customer to shift load. Some customers had already set up managed charging off-peak, and Octopus did not interfere with this.

Savings from managed EV charging at lower rates were credited directly to customers on their next monthly bill.

Methodology learnings/issues

Network perspective:

Spot prices remained low throughout the trial due to high lake levels. This resulted in EV charging only responding to Orion's network signals. Next time, the trial will use live network data for increased variability and hold the trial over winter when there is more spot price volatility.

Customer perspective:

No issues were raised by participants during the trial. Customer surveys were not conducted, therefore there is no further data for this.

4.3 Results and Findings

Managed Charging Profile

This trial concluded that a high percentage (97%) of EV charging over the trial period was able to be managed and therefore occurred off-peak. Managed charging peaked between 3:30 and 4:30 am with 2,467 kWh consumed over the trial period, as shown in Figure 4. In comparison, during the morning peak period, 37 kWh was consumed, and during the evening network peak, 95 kWh was consumed.

The lack of "boost" charging shows that participants very rarely used the override function to charge their EVs unmanaged. This shows that most owners are comfortable with having their charging managed and trust that it will have adequate capacity when required.

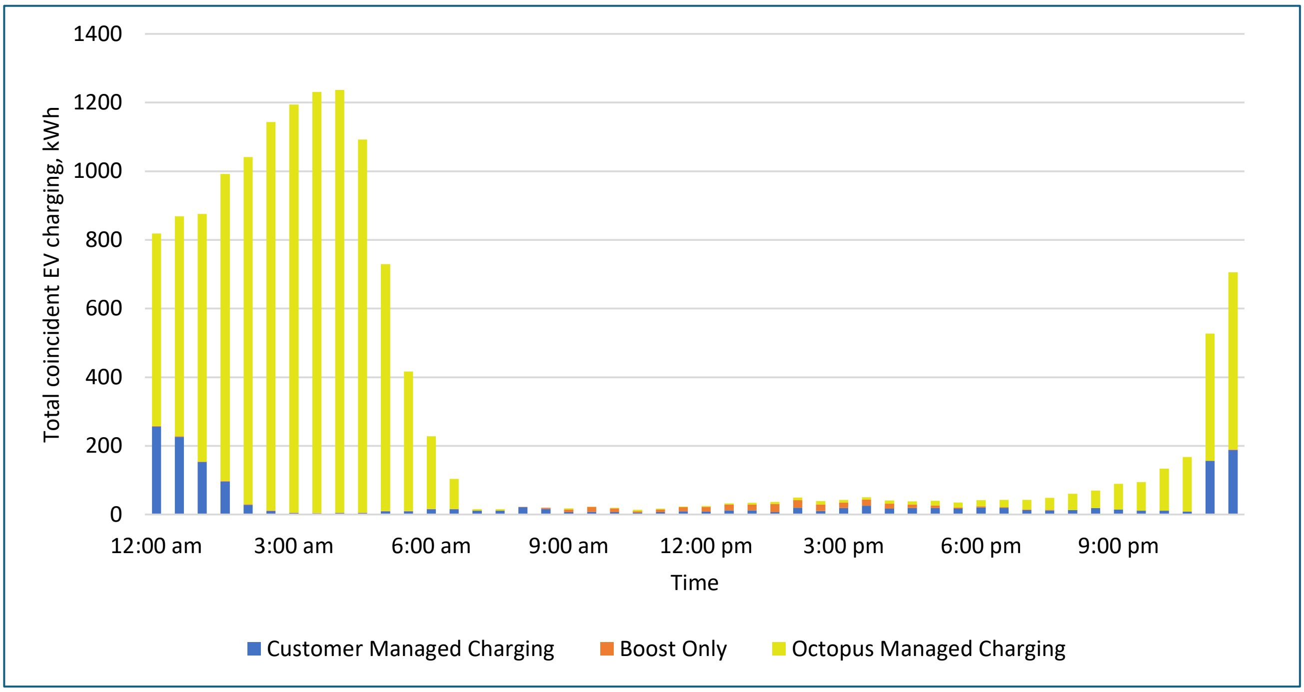


Figure 4: Total EV charging demand over trial period by charging mode

Those with trickle chargers offer limited flexibility, as their slower charging rates reduce the potential for load shifting. When scaling these results, it's important to account for the types of chargers utilised on a network, as this will influence the overall flexibility and ability to shift demand.

Charging vs. Spot Price and Network Demand

The following graphs show that managed EV charging was able to avoid peak times on the network, with the demand curve being the inverse of network load. It also reacted well to spot pricing. The consistency of these results show that it is realistic and achievable to shift almost all EV charging overnight, benefiting both the network as it shifts load to an unconstrained time, and the customer, as they can take advantage of lower energy prices overnight.

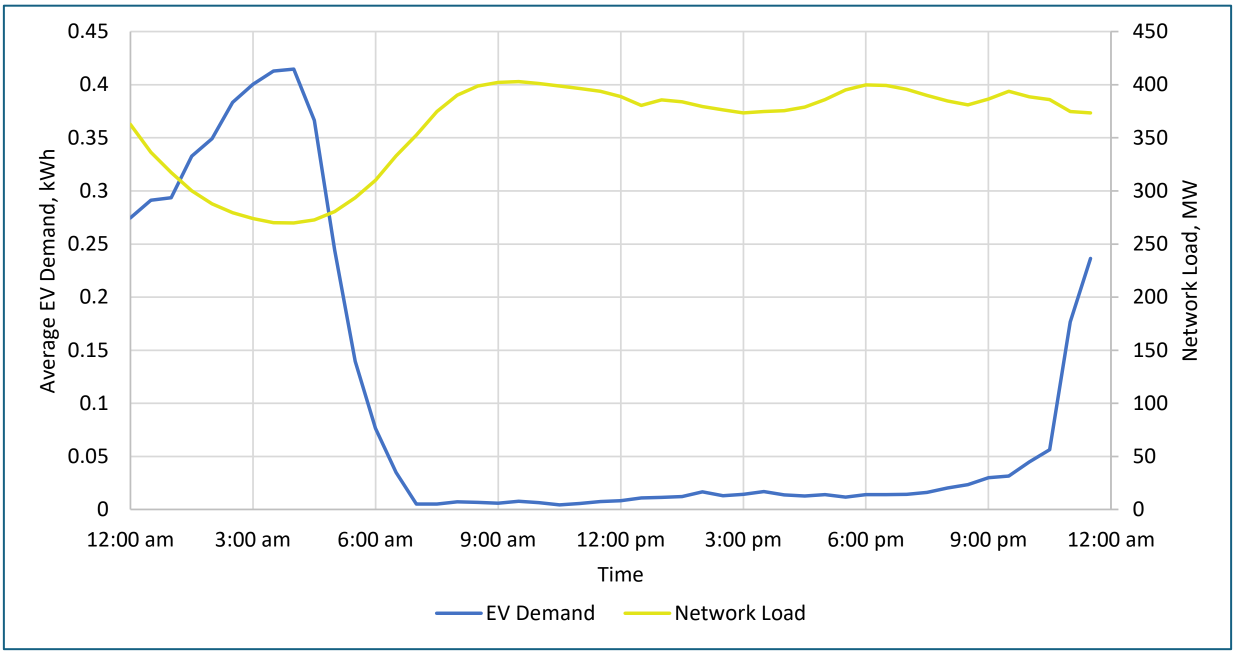


Figure 5: EV demand vs. network Load

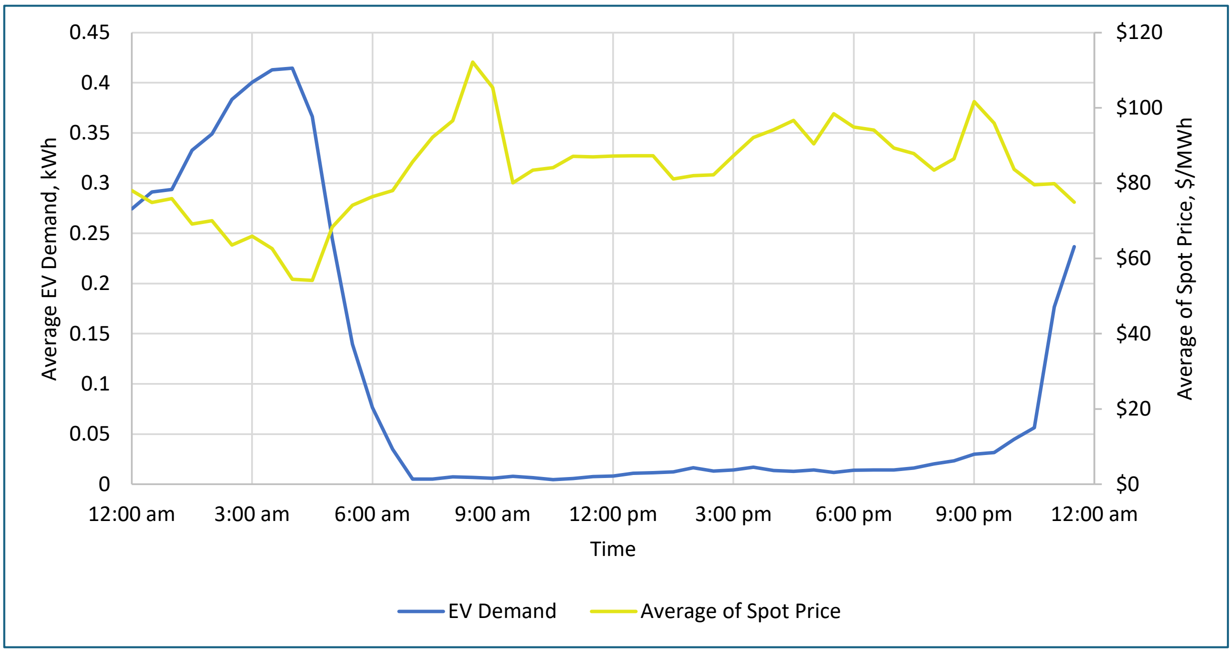


Figure 6: EV demand vs. average of spot price

Patterns in Managed Charging

Figure 7 shows the daily energy consumed from all ICPs over the trial period. No consistent pattern emerged, and charging was sporadic, with stretches of several days showing high demand and periods of very limited activity.

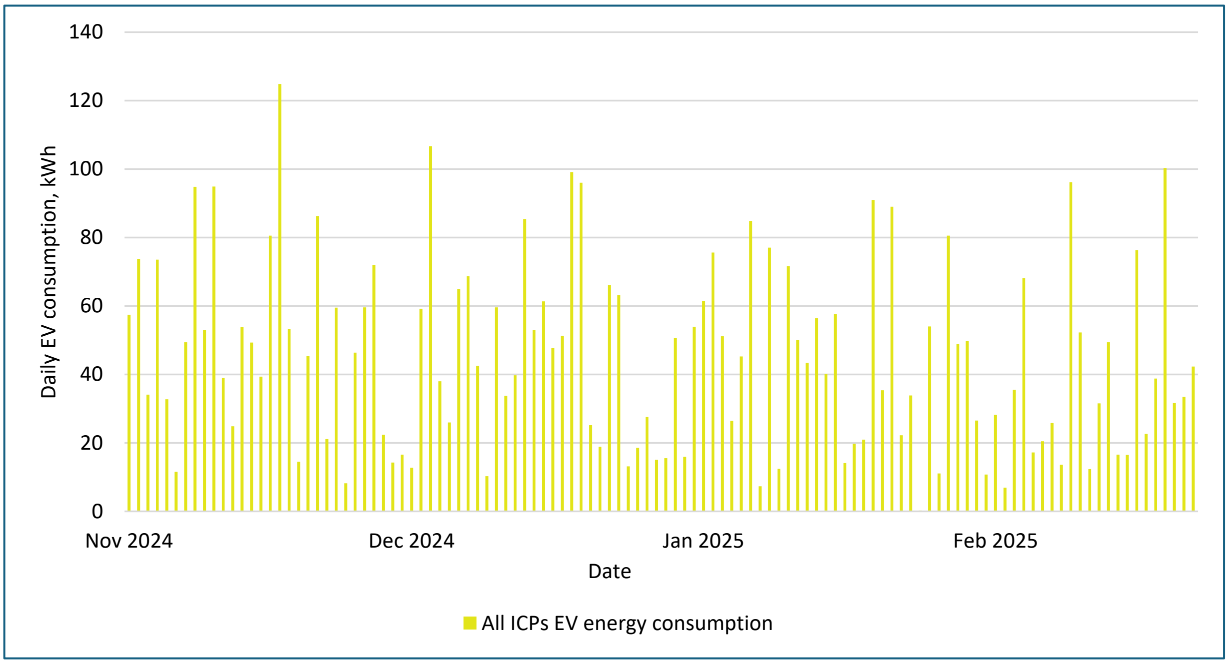


Figure 7: Daily coincident EV charging for all ICPs over course of trial

Days of note include:

- The highest coincident load day of Sunday 17th of November at the end of Canterbury Anniversary weekend – a popular time for travel out of Christchurch. This high load likely reflected vehicles returning from long journeys, with drivers opting to recharge at home using cheaper electricity rather than more expensive public chargers, while also ensuring their vehicles were charged for the Monday commute.

- The fourth highest coincident load day of Sunday 9th of February. This is the end of Waitangi weekend and likely has high charging for the same reasons as Canterbury Anniversary Sunday.

The key takeaway is that the end of holiday weekends can drive concentrated charging demand as vehicles return home, creating temporary spikes in load. Networks would benefit from strategies to anticipate and manage these surges to avoid system stress.

The randomness displayed in Figure 7 may be a factor of the small sample size, and when drilling into individual ICPs, patterns do emerge. Two examples where ICPs exhibited habitual EV charging behaviours are shown in Figure 8 where charging data from the trial month of November for ICP A and ICP B is displayed.

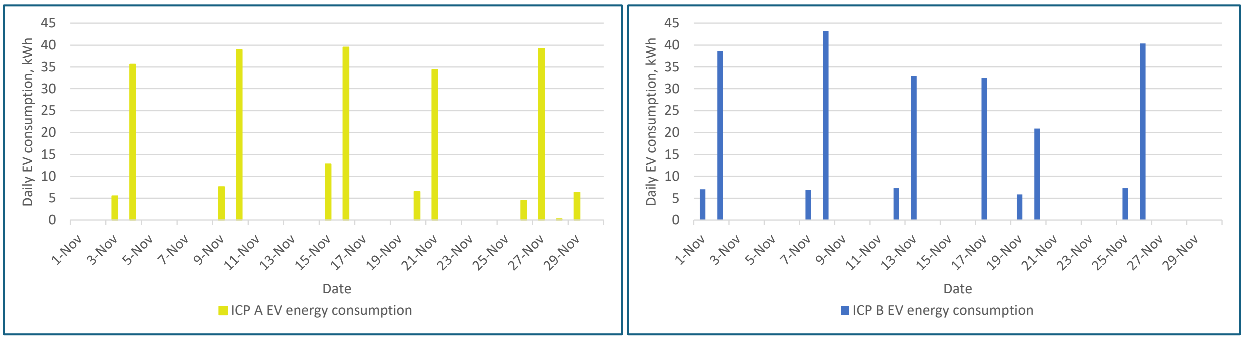


Figure 8: EV charging data from ICP A and ICP B for November which exhibits EV charging patterns

Cost of Delivery

The energy (no network charges) cost of delivery per customer comes from the wholesale electricity price at the time of charging. Over the course of the four-month trial, this averaged out costing:

- $24 per customer for Orion.
- $31 per customer for Wellington Electricity.

To understand the value of managed charging on the cost of delivery, the cost using a standard charging curve was estimated using the spot price over the trial period:

- $85 per customer for Orion.
- $80 per customer for Wellington Electricity.

The standard charging curve assumed EVs consumed 8 kWh per day with 20% of that occurring during peak times. This curve can be seen in Appendix D.

This shows the benefits managed charging aligned to the spot price can have on cost of delivery.

Trial Gaps

This trial had a small sample size which reduces accuracy when scaling the results. A larger sample size may show or confirm patterns or habits that would be useful for networks to know, such as when there is likely to be a spike in charging.

The consistently low spot prices resulted in only weak price signals to optimise charging. Consequently, it was unknown how well managed charging could respond/react to fluctuations in spot prices.

Comparison with Similar Trials

A similar EV managed charging trial was carried out in the UK. Key messages from UKPN Shift[3] trials show similar findings to our trial:

- Customers were open to smart charging, so long as their mobility requirements were met.
- Customers chose to smart charge for 85% of all charging sessions.

[3] https://innovation.ukpowernetworks.co.uk/projects/shift

- By achieving a significant reduction in the evening peak, a peak in demand occurs overnight.
- Secondary peaks should not be used as a reason not to smart charge as new products, increased network visibility and development of market mechanisms could be deployed over time to prevent these in the majority of locations.

5. Ecotricity Solar Export

5.1 Trial Overview

Trial Description

Understanding the profiles and value that residential solar and batteries can have on the electricity network will become more important as uptake increase. Therefore, a trial was initiated to gain further insight on how solar and battery customers can participate in demand side flexibility.

To test this, we sought to determine how much customers could export from batteries under large incentives during peak times. This utilised the Managed Service commercial mechanism, with customers given an attractive export payment for exporting at peak times (7 – 11am and 5 – 10 pm).

This trial began in July 2025 and is ongoing, with an end date set for September 2026.

The trial is targeting 100 customers to be fully signed up before winter 2026. There is currently a steady pipeline of customer signups.

Trial Focuses

- Test if customers would consistently export at peak times if given a favourable export rate and how this would change over different seasons.
- Test if this trial will incentivise residential solar uptake.
- Gain information, data and insights into solar and batteries on Orion's network and how they are utilised, as we currently have low visibility on these.
- Quantify if there are seasonal differences in the amount of energy batteries can export at peak times.

Incentives Payment Reasoning

All costs include GST

Customers receive an incentive payment of 60c/kWh of energy exported at peak times. Orion used their LRAIC of ~$100/kW/year to estimate a 9c/kWh payment. Ecotricity contributed the remaining 51c/kWh.

Ecotricity had previously offered a 51c/kWh peak buy-back rate as part of the LincolnFlex trial and felt ResiFlex was a good opportunity to offer it across the wider Orion network. At the combined rate of 60c/kWh, it is one of the highest rates offered in any jurisdiction and should provide a good base to test customer responses.

Trial Implementation Considerations

- *Unknown total payment amount*. Due to lack of data around battery use on our network, we were unsure how much energy customers would export rather than self-consume when given a large export incentive. This means there is a significant range in how much we estimate we will end up paying customers in the trial.

- *Participants modifying energy consumption.* Due to the attractive export rate, participants may modify their energy consumption behaviour to be able to export more solar back to the grid during peak times. This could mean shifting activities such as cooking off peak to take advantage of export rate. Therefore, this trial may have a secondary positive effect on the network if both energy is exported to the grid and energy consumption is reduced.

5.2 Eligibility

Ecotricity advertised the trial through their solar installation partners, with the first 100 customers that signed up able to participate if they met the following eligibility requirements:

- Ecotricity customer.
- Have solar panels and an eligible battery (see Appendix E for list of eligible devices).
- Located in the Orion Network Area.

More details about eligibility can be found on the Ecotricity website[4].

If customers met the requirements, Ecotricity checked that the customer's solar set up was adequate, then worked with them to apply schedules maximising the benefit of their systems according to their specific needs. Peak and Off-Peak export times are based on Orion network prices (weekdays 7 – 11 am and 5 – 10 pm).

5.3 Results and Findings

As this trial is currently still running, we cannot release any results or findings yet, however it appears at this early stage that this trial has increased the uptake of solar and batteries in the Orion network area.

[4] https://get.ecotricity.nz/resiflex-project?fbclid=IwY2xjawMvEiRleHRuA2FlbQIxMABicmlkETFXd3NrQ3RYeXZoanVnaHBxAR7D-9FqU8BKdfMIMeM-YV9JgR3mFgH-_4hbKUCzLSK82olAQtuElD7rgHYvfQ_aem_WIxsprE01aa8h8YV3QHTmA

6. General Challenges and Lessons Learned

General challenges found for the three trials are shared below:

- **Technology limitations:** The biggest challenge for Resi-Flex is the lack of platforms to control devices. Most retailers do not yet have systems that allow residential flexibility at scale, so setting up a flexibility trial takes significant time before any load can be managed.
- **Billing and tariff constraints:** Large retailers face difficulties with their existing billing systems, which makes implementing innovative tariff structures challenging.
- **Dependence on partners:** Since Orion and We* do not directly control the load in the Resi-Flex trial, the trials rely on retailers to act on our behalf, meaning timelines are largely dictated by our retail partners.

General lessons learned from the three trials are shared below:

- **Increase diversity of customers on the trials**: Future trials should aim to include a wider range of customers. Currently, Resi-Flex participants tend to be early adopters with higher technical ability and understanding of electricity. Savings Sessions demonstrates that flexibility can be accessible to everyone, as any electricity user can save against their baseline. We need to find ways to offer these initiatives to all households.

- **Visibility and accessibility to savings is key**: Customer feedback from Savings Sessions and Shift to Win trials show that customers are generally engaged and interested in these initiatives. Providing clear visibility of the savings achieved and associated environmental benefits will likely enhance engagement if customers can see the difference they are making.

7. Next Steps

With the conclusion of the first phase of Savings Sessions and EV Managed trials in Phase 3a, Phase 3b is now in full swing.

The next steps in terms of the Resi-Flex project are:

- Once the retailer systems are up and running, we will aim to control devices directly and use this control to test consumption bands.
- Collect results from the battery export trial.
- Use hot water and EV control together in a managed service for co-optimisation of wholesale and network.

Next steps for Orion and other EDBs interested in progressing these flexibility initiatives into business-as-usual operations include:

- **Leverage peak price signals**. Using these signals has proven effective and are accessible to all customers. We recommend utilising the success we have found and exploring how this could be achieved on other networks.
- **Enable and support EV charging**. The benefits of smart EV charging are real. EDBs will increasingly need the ability to provide signals to aggregators controlling EVs to ensure charging is optimised not just for wholesale prices, but also for networks.
- **Design EV tariffs that encourage smart charging**. Consider how EV tariffs can support smart charging by incentivising off-peak use and aligning customer behaviour with network needs.

8. Appendices

8.1 Appendix A: Overview of Past Resi-Flex Project Phases

Resi-Flex utilises a learning-by-doing approach and comprises three phases, described in Figure 9 covering three main objectives:

1. Understand the needs, preferences, and barriers of all stakeholders across the flexibility value chain and estimate the value of flexibility from those households to all households.
2. Inform the development of fair and effective distribution pricing and flexibility services.
3. Observe the response from real-world residential consumers to customer offerings that reflect the value of flexibility.

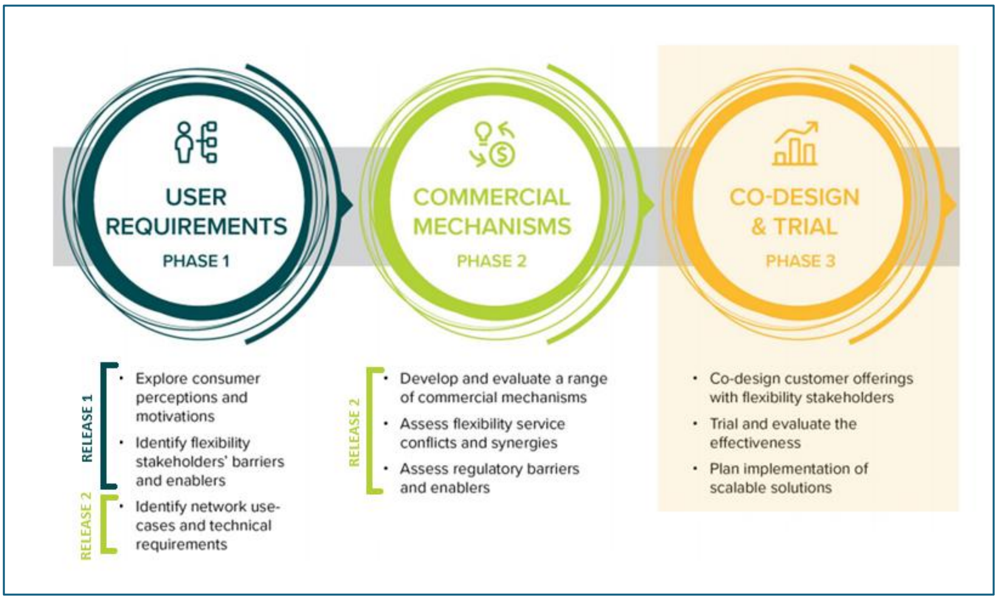


Figure 9: Resi-Flex Project Phases

Each phase is described in the following sections.

Phase 1: User Requirements

During Phase 1, we researched stakeholders and identified their needs, wants and challenges regarding Resi-Flex. Table 5 details Phase 1's timeline, key objectives and steps.

Project phase	Phase 1: User requirements
Start	**Year ending 31 March 2023**
Completion	**Year ending 31 March 2024**
Progress	Completed
Key objectives	○ Explore consumer perceptions and motivations ○ Identify flexibility stakeholders’ barriers and enablers

Project phase	Phase 1: User requirements
	○ Identify network use-cases and technical requirements
Activities / Steps by Phase	○ Defined consumer groups for flexibility adoption ○ Mapped potential flexibility journeys and user experiences ○ Analysed international flexibility trials and behaviour change ○ Gathered stakeholder feedback on flexibility barriers and enablers ○ Mapped flexibility stakeholders' roles and responsibilities

Table 5: Summary Table for Phase 1: User Requirements

Phase 1 Outcomes

Phase 1 findings highlight feedback from Flexibility Stakeholders on the barriers limiting flexibility adoption and the enablers needed for market growth. These insights helped define development priorities for EDBs when designing flexibility services or commercial frameworks, which were incorporated into the design of the Trial Commercial Mechanisms.

Phase 2: Commercial Mechanisms

Phase 2 explored how residential flexibility can be integrated at scale by developing commercial mechanisms, analysing how different flexibility services interact, and assessing regulatory settings needed to enable effective implementation. Table 6 details Phase 1's timeline, key objectives and steps.

Project phase	Phase 2: Commercial mechanisms
Start	**Year ending 31 March 2023**
Completion	**Year ending 31 March 2024**
Progress	Completed
Key objectives	○ Develop and evaluate a range of commercial mechanisms ○ Assess flexibility service conflicts and synergies ○ Assess regulatory barriers and enablers
Activities / Steps by Phase	○ Mapped EDB, stakeholder, and consumer relationships within the flexibility value chain ○ Defined commercial mechanisms to incentivize flexibility ○ Evaluated flexibility mechanisms for practicality, scalability, and fairness ○ Developed a calculator for EDBs to value flexibility ○ Assessed flexibility service conflicts and synergies ○ Identified regulatory barriers and enablers to flexibility

Project phase	Phase 2: Commercial mechanisms
Results shared	EEA Conference Paper for High-level summary[5] (June 2023) EOI for Trial Commercial Mechanisms[6] (March 2024) In progress with ENA[7] FNF for Commercial Framework and Calculator (outside of the Resi-Flex project)

Table 6: Summary Table for Phase 2: Commercial Mechanisms

Phase 2 Outcomes

The outcome of Phase 2 was the design of three commercial mechanisms that would be trialled and tested in Phase 3. These were designed through exploration of the flexibility value chain and nature of relationships between EDBs, flexibility stakeholders, and residential consumers.

Managed Service (standards-led): flexible devices participate in a managed service in exchange for a discount, enabling the EDB to manage devices when needed (dispatch or operating envelope). A schematic is shown in Figure 10.

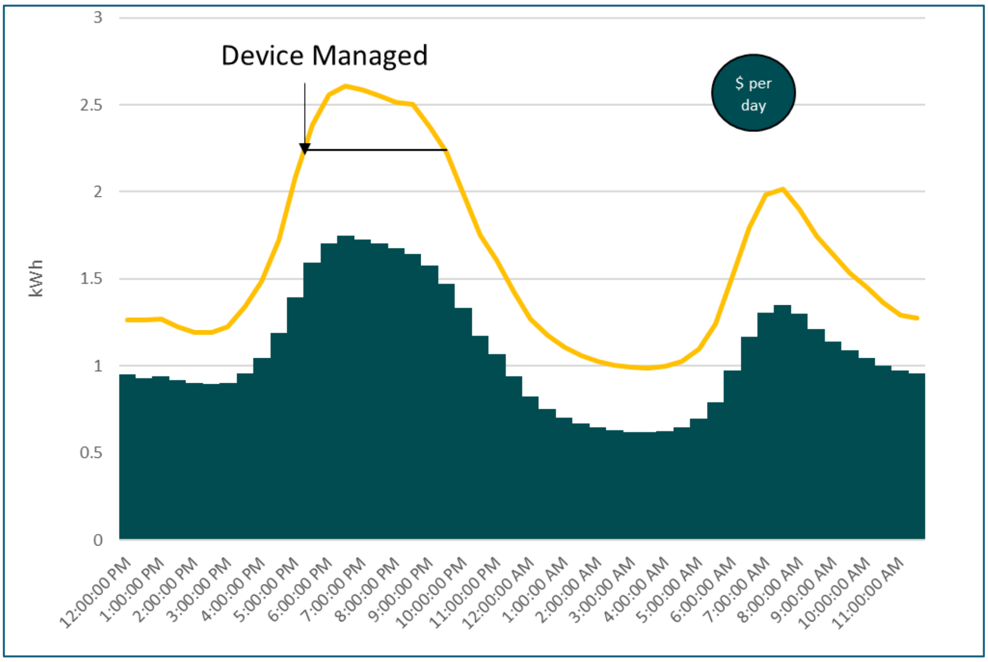


Figure 10: Schematic of how managed service commercial mechanism works

Procured Flexibility (payment led): Scheduled utilisation payments in areas of congestion with a $/kWh payment with contracted parties in addition to a ToU tariff. Capacity and timing pre-agreed. A schematic is shown in Figure 11.

[5] https://www.oriongroup.co.nz/assets/Your-energy-future/Resi-Flex-EEA-conference-paper-Jun-2023.pdf
[6] https://www.oriongroup.co.nz/assets/Your-energy-future/Resi-Flex-EOI-phase-3-trials-Mar-2024.pdf
[7] https://www.ena.org.nz/our-work/working-groups-and-forums

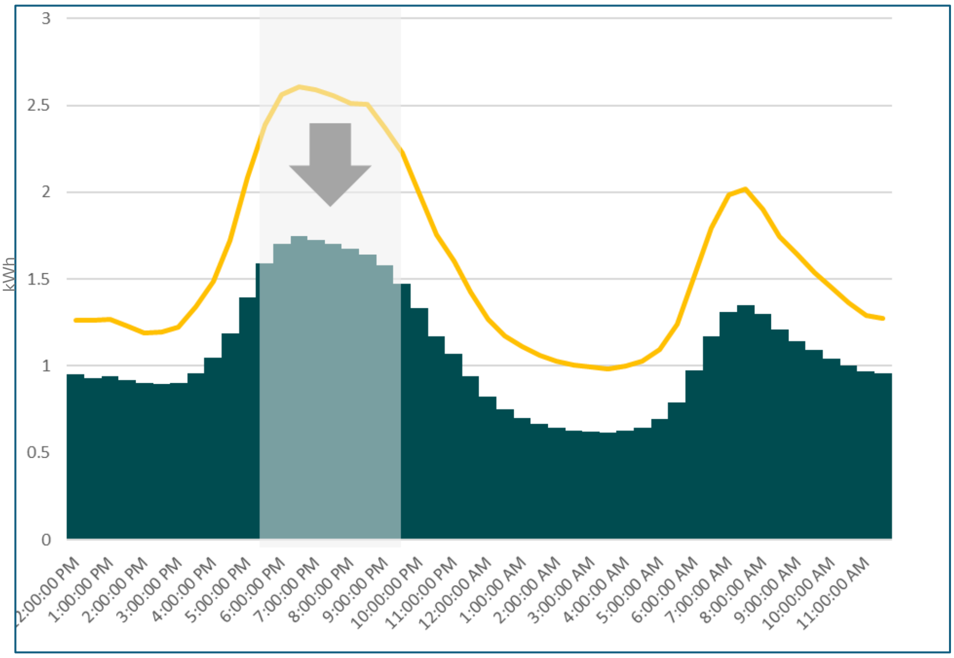


Figure 11: Schematic of how procured flexibility commercial mechanism works

Consumption Bands (price-led): tiered $/kWh charges on a retailer's aggregate consumption each half hour in a given area. Increasing rates for higher consumption to reflect the impact on network investment. A schematic is shown in Figure 12.

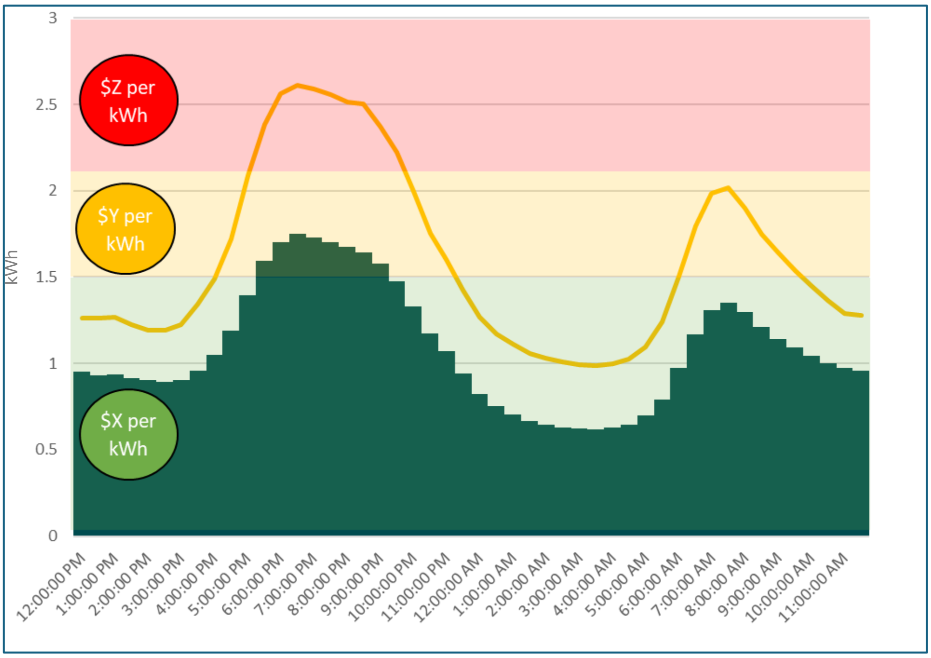


Figure 12: Schematic of how consumption bands commercial mechanism works

8.2 Appendix B: Saving Sessions Pricing Details

The method used to estimate and confirm the $/kWh saved value that customers participating in Savings Sessions would receive from Orion is detailed below:

- Payments were based on Orion's major customer **Control Period Demand (CPD)** price as this pricing mechanism closely reflects the mechanisms used in Saving Sessions.
- In FY25, the **CPD** price was $0.2974/kVA/day, equating to $1.21/kWh for the average **CPD** duration of 90 hours/year.
- Customers in this pricing category already receive financial benefits from reducing load during Peak TOU periods of $0.12/kWh. This indicates $1.09/kWh (= 1.21 - 0.12) order of magnitude value for load reduction, on average across the network at times of high load.
- A similar check can be done with **general customer** pricing. In FY 24, **general customers** had a Peak charge component; this equated to $1.07/kWh (based on $0.366/kW/day for an average of 125 hours/year), i.e. the same order of magnitude.

Some of Wellington Electricity's incentive payment calculations are based on different methodologies to Orion but have so far produced broadly the same outputs.

8.3 Appendix C: Intelligent Octopus EV Integration Requirements

There are two ways that Intelligent Octopus could manage charging – through the vehicle itself or through a smart charger. The integration requirements for each of the methods are listed below.

Electric vehicle:

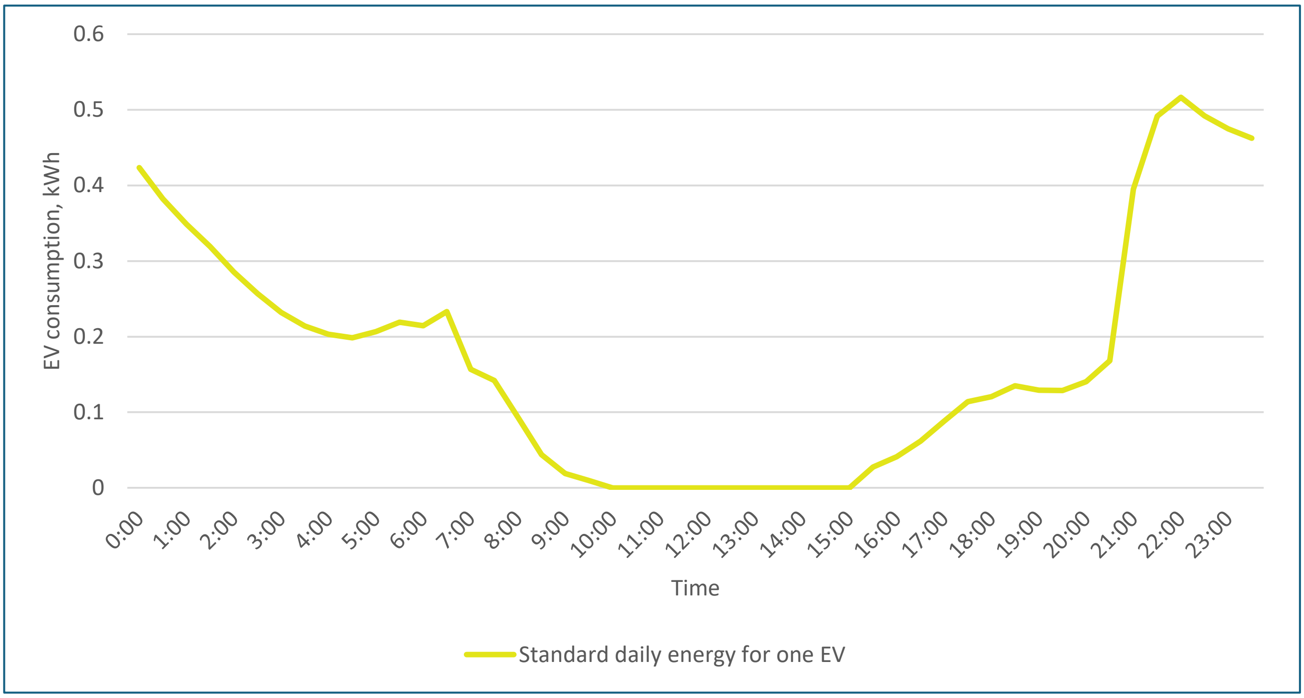
- To be an Octopus Energy customer.
- **Have a Tesla vehicle.**
- Have a smart meter.
- An iOS or Android smartphone.
- The latest version of the Octopus Energy app.

Smart Charger:

- To be an Octopus Energy customer.
- **Have a Wallbox or Myenergi Zappi charger.**
- Have a smart meter.
- An iOS or Android smartphone.
- The latest version of the Octopus Energy app.

8.4 Appendix D: Standard EV Charging Curve

A standard charging curve for an EV is shown in the figure below. Over a 24 hr period, 8 kWh was assumed to be consumed to recharge the EV.



8.5 Appendix E: Ecotricity List of Eligible Battery Devices

The list of eligible battery devices for the Ecotricity solar export trial are listed below:

- Huawei.
- AlphaESS.
- Redback.
- SolaX.
- Sungrow.
- Solis.
- SigEnergy.