Sustainable Energy Authority of Ireland

National Energy Research, Development & Demonstration Funding Programme

FINAL REPORT

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SECTION 1: PROJECT DETAILS

Project Title	Demonstration of a smart domestic energy flexibility platform
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Report Submission Date	

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Project Summary (max 500 words)
The aim of this project was to remotely control the power into and out of a residential house via one central platform. As the capacity of the installed battery was sufficient to meet the daily demand of the house, it was deemed only necessary to control the inverter (which controls the battery) and the electric vehicle charger. The aim was to charge these at the cheapest price. Cenergise produced a break-even dynamic import and export electricity tariff linked to the day ahead auction prices. The import tariff was fed into an optimiser to determine when to schedule charging.

Two separate optimisers were developed, one for the house battery and one for the car.
The car optimiser forecast the price for the coming week and notified the cheapest three days to plug in. Once the car was plugged in, the cheapest time in the following 18 hours was scheduled to charge.

For the house battery optimiser, we only wanted to charge the battery if there was insufficient generation from the installed solar panels to meet demand. We therefore forecast the solar and demand for the day ahead. If the demand forecast was greater than the solar forecast, we scheduled the net volume at the cheapest price. It was found more money could be made by importing power into the battery overnight, without considering the solar that would be produced later on, as the export rate during the solar hours was higher than the import rate at night.

Based on the results of the analysis, the use case for homeowners can be completely simplified: Purchase a house battery matched to the size of the house demand, schedule it to charge at night, and then consume this power during the day. If there is solar on the roof, it is more economical to export this back to the grid based on current export rates.

It was found that using an optimiser to charge the car gave a 50% reduction in price relative to the dynamic import price when the car was first plugged in. If there was a lot of wind on the national grid, rates of 6 c/kWh were achieved with dynamic tariffs. This only occurred when prices in the day ahead market were zero; otherwise, the rates were much higher than this. This demonstrates that the fixed price EV rate of 7 c/kWh offered by many suppliers in 2024 was a loss leader.

It was also found that the battery could be wired into the fuse board of the house via a change-over switch. Three power cuts were observed during the project, and the house ran off-grid during these power cuts.

Cenergise had several meetings with ESB Networks, Eirgrid and the Commission of Regulation of Utilities (CRU) throughout the project to discuss what a residential flexibility market could look like. Cenergise developed a mock-up platform to demonstrate what it could look like and how both ESB Networks and Eirgrid could use it to purchase flexibility. The proposed flexibility platform was prototyped using Streamlit, a Python-based framework.

Keywords (min 3 and max 10)	Dynamic tariffs, solar, batteries, flexibility, optimiser

2.1 Executive Summary

The aim of this project was to control the power into and out of a house remotely with one central platform.

As the inverter, diverter, car charger and other equipment within the house did not provide uniform interfaces for monitoring and control, GLAS developed custom firmware for their GET-2108MX data logger which provided the link between the various devices and the Cenergise platform. This allowed recording of the required data from each of the systems/devices and controlling the devices based on commands received from the Cenergise server.

As the capacity of the battery was sufficient to meet the daily demand of the house, it was found that it was only necessary to control the inverter and the electric vehicle (EV) charger. The aim was to charge these at the cheapest price.

Cenergise published a break-even dynamic import and export electricity tariff linked to the day ahead auction prices. This was fed into an optimiser to determine when to schedule charge. Import rates are substantially higher than export rates as they include ESB Network's Demand Use of System charges (DUoS) and Eirgrid's Transmission Use of System charges (TUoS), but these charges are not received when power is exported back to the grid. Therefore the approach taken was to use the battery in self-use mode and avoid pulling from the grid where possible.

Two separate optimisers were developed, one for the house battery and one for the car.
The car optimiser forecasted the price for the coming week and notified the cheapest 3 days to plug in. Once the car was plugged in, the cheapest time in the following 18 hours was scheduled to charge.

For the house battery optimiser we only wanted to charge the battery if there was insufficient solar to meet demand. Therefore we forecast the solar and demand for the day ahead. Our solar forecasts were very accurate, with a mean absolute error of 0.4kW. If the demand was greater than the solar forecast, we scheduled the net volume at the cheapest price. Based on the results of this project, more money could be made by importing power into the battery overnight, without considering the solar that would be produced later on, as the export rate during the solar hours was higher than the import rate at night.

The signal to charge was always at night, as the non-energy charges (particularly DUoS charges) were lower at night. Therefore, even if the wind was significantly higher during the day than at night, the signal was always to charge at night due to the non-energy charges. This highlights the potential need to restructure how DUoS and TUoS charges are levied. They should be lower in periods of high renewable generation to ensure smart tariffs give the right signals for customers to increase consumption and help reduce curtailment when there is excess wind on the system.

Based on the results of the analysis, the use case for homeowners can be completely simplified – purchase a house battery matched to the size of the house demand. Schedule it to charge at night, and then consume this power during the day. If there is solar on the roof, it is more economic to export this back to the grid based on current export rates.

Based on the break-even dynamic rates, the payback for a 5kWh battery was 9 years assuming a cost price of €2,550. However, based on domestic suppliers' tariffs in 2024 (EV rate versus Day rate), the payback was 5 years. This was because most suppliers were offering EV rates of around 7 c/kWh, which is below their cost price, and their peak rates were much higher than the dynamic import rate.

For the car, the signal was always to charge at night post 23:00. With the Zappi EV charger, the car was set to **Eco+** mode so that it only charged from excess solar. Then when the optimiser activated, the mode was automatically changed to **Fast** to pull from the grid. It was found that using an optimiser to charge the car gave a 50% reduction in price relative to the dynamic import price when the car was first plugged in. If there was a lot of wind on the system, rates of 6 c/kWh were achieved with dynamic tariffs. However this only occurred when prices in the day ahead market were zero. Otherwise the rates were much higher than this. This demonstrates that the fixed price EV rate of 7 c/kWh offered by many suppliers in 2024 was a loss leader.

It was also found that the battery could be wired into the fuse board of the house via a change-over switch. Three power cuts were observed during the project and the house ran off-grid. During the power cuts the following were tested: all lights in the house, TV, internet, kettle, microwave, power shower. All operated for the duration of the power cuts.

Cenergise had several meetings with ESB Networks, Eirgrid and the CRU throughout the project to discuss what a residential flexibility market could look like. ESB Networks was mostly interested in locational flexibility and longer term contracts, while Eirgrid was more interested in national flexibility. Cenergise proposed a residential flexibility market design similar to the DFS (Demand Flexibility Service) in Great Britain. However, it would facilitate both demand turn down or turn up auctions. Cenergise proposed using a rolling historical baseline and comparing this with smart meter data to determine if the customer had delivered a demand reduction / increase. As ESB Networks is linking in with customers directly in their pilots, it is proposed that they only interact with suppliers / aggregators / Flexibility Service Providers. It is suggested to have one platform that can be used by Eirgrid and ESB Networks to centralise the registration process. The Flexibility Service Providers would only be paid out if there was a minimum 50% reduction / increase in demand across their portfolio. Cenergise developed a platform mock-up to demonstrate what the platform could look like and how both ESB Networks and Eirgrid could use it to purchase flexibility. The proposed flexibility platform was prototyped using Streamlit, a Python-based framework.

2.2 Introduction to Project

I. <u>Project setup and installation</u>

The house had the following installed: 22 solar panels on the roof (4.32kW west facing (Longi) and 4.35kW east facing (Jinko)), a 5kW Solis Hybrid inverter, six 3.5kW Pylontech batteries connected in parallel providing 21kWh of storage, a myenergi Eddi diverter on the hot water immersion, a myenergi Zappi EV charger and Netio smart switches.

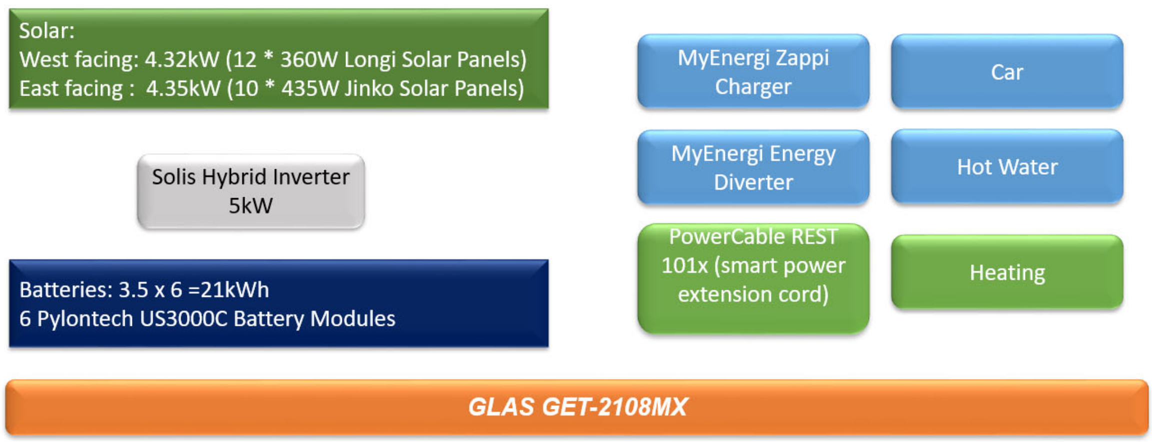

Figure 1 (Setup diagram)

Figure 2 (Pictures of installed devices)

The solar panels and batteries were connected into a 5kW Solis inverter.

The myenergi Eddi diverter on the hot water immersion worked by reading the power exported back to the grid via the myenergi Harvi wireless sensor. It then turned on the immersion to heat the hot water until power was no longer exported back to the grid. If the thermostat in the immersion reached its maximum temperature, the energy diverter turned off. Therefore the water was always heated first before power was exported back to the grid.

The myenergi Zappi EV charger has several modes. **Eco +** mode charges the car from excess solar. This worked by reading the power exported back to the grid from the solar and then increased the power to the Zappi until power was no longer exported back to the grid. It also has a **Fast** mode which will import power directly from the grid at maximum power when plugged in.

Netio smart switches were purchased, and a portable blow heater was plugged into a smart switch. This smart switch presented challenges. If the smart switch was set by default to be on, this created a safety risk. However, if the smart switch was set by default to be off, this created issues if the internet wasn't working, or if there was an issue with the controller, as there was no heat. Therefore, it was decided to disable the smart switches but keep the data logging element so that we could track the power used by the blow heater for demand forecasting.

Before the project commenced, the idea was to schedule each device within the home at the cheapest price. We discovered that each device had separate interfaces, controls and APIs. This made the project difficult to visualize at scale.

The idea was therefore simplified. As the battery could meet house demand (with the exception of the EV), we only needed to control the battery's charge / discharge and to control the charging of the EV. To visualize this at scale, this means communication is only required with the inverter (which controls the batteries) and the car charger.

In this project setup, the solar panels and batteries were controlled by the Solis inverter. We communicated with the Solis hybrid inverter via a hard-wired connection.

Glas Energy Technology installed the GET-2108MX data logger to communicate with the Solis hybrid inverter via MODBUS. A custom version of the GET-2108MX firmware was developed to support the data collection and device commanding required for this project. Cenergise passed commands to the GET-2108MX data logger to charge or discharge the battery. Readings were also retrieved via this connection.

The myenergi Zappi EV charger did have an API. It was therefore possible to communicate directly with the Zappi without the need for a hard-wired connection. This was also the case with all of the myenergi devices.

For this setup, Cenergise passed commands to the GET-2108MX data logger, and this controlled charging of the car, plugs, energy diverter and battery.

The Solis inverter was set to self-use mode. This meant that the battery would be used first before pulling from the grid.

During the project, the battery isolator switch tripped in June 2024. What initially appeared to be a short across the batteries turned out to be a short across the battery terminal of the inverter. A replacement inverter was installed in July 2024. However, it was discovered that there were very few companies that we could contact to diagnose the issue. Most of the installers we contacted did not respond, and this highlighted the limitation with new technologies if there is a problem.

II. Off-grid setup

The initial installation of the solar panels, inverter and batteries came with an off-grid double socket which could be used in the case of a power cut.

This was of limited benefit in the case of a power cut. Therefore, it was decided to wire this into the fuse board with a change-over switch.

When there was a power cut, the house was disconnected from the grid via the changeover switch and was then powered by the battery.

In Sutton there were two power cuts in May on the 03/05/2024 and the 21/05/2024 and one in June on the 07/06/2024. During the power cuts the following were tested: all lights in the house, TV, internet, kettle, microwave, power shower. All operated for the duration of the power cuts. As the house had to be manually taken off-grid via a change-over switch, it was not reset to on-grid until the following morning. The house worked fully off-grid.

The car was plugged in accidentally during the power cut and it tripped the switch on the fuse board. Once the fuse was reset and the car was plugged out, the house continued to operate off-grid.

III. Data Cleaning and Analysis

The data we received from the GET-2108MX data logger was on a minutely basis. For analysis, we looked at data to the nearest 5 minutes. The data from the controller at times gave erroneous data. In most instances, the erroneous data came from the inverter as the Modbus TCP link occasionally returns incorrect values.

Therefore the first thing we did was filter the data and removed obvious erroneous data. This was done by removing values above 15,000 or below -15,000 W. Then the data was resampled on a half-hourly basis to get an average.

IV. Optimiser

Two separate optimisers were developed, one for charging the car and one for charging the house battery.

Initially it was considered having an optimiser to decide when to discharge the battery back to the grid. However, given the export tariff was much lower than the import tariff, it did not make sense to export back to the grid from the battery. Therefore, the battery was discharged on a needs basis – when the house needed it.

Car Optimiser

The import tariff was forecast for the week ahead on a dashboard. An alert was automated to indicate what days to plug in the car.
The default setting was set to **Eco+** mode (pulling from excess solar). The export margin was set to 150MW and the minimum green level to 100%. This was to avoid draining the battery in **Eco+** mode when there was no solar.
Once the car was plugged in, the optimiser looked at the cheapest hours to charge in the next 18 hours. It fed in both the import dynamic tariff for today as well as the forecast tariff for tomorrow to ensure the schedule was optimised. It did not consider any free excess solar, which would charge the car if available.
When it was the cheapest time to charge the car, the charging mode was automatically set to **Fast** to pull from the grid.

House Battery Optimiser

The aim of the house battery optimiser was to charge at the cheapest time.

If more solar power was generated than the house demand, there was no need to charge the batteries from the grid. The batteries would fill from the solar during the day and discharge back to the house at night.

If less solar power was generated than the house demand, the batteries were charged from the grid in the cheapest hours based on the dynamic import tariff. This was determined by the optimiser and scheduled automatically.

Therefore we needed to forecast solar power for tomorrow and the house demand.

V. Forecasts

Solar Forecasts

We used the coordinates of the house and slope of the roof to forecast the solar output of the panels for the next day. We forecast direct and diffuse solar output and then aggregated them to a central forecast. Below are the forecasts versus actual on a half-hourly basis. As can be seen below, the solar forecasts were very accurate.

Solar Forecast versus Actual

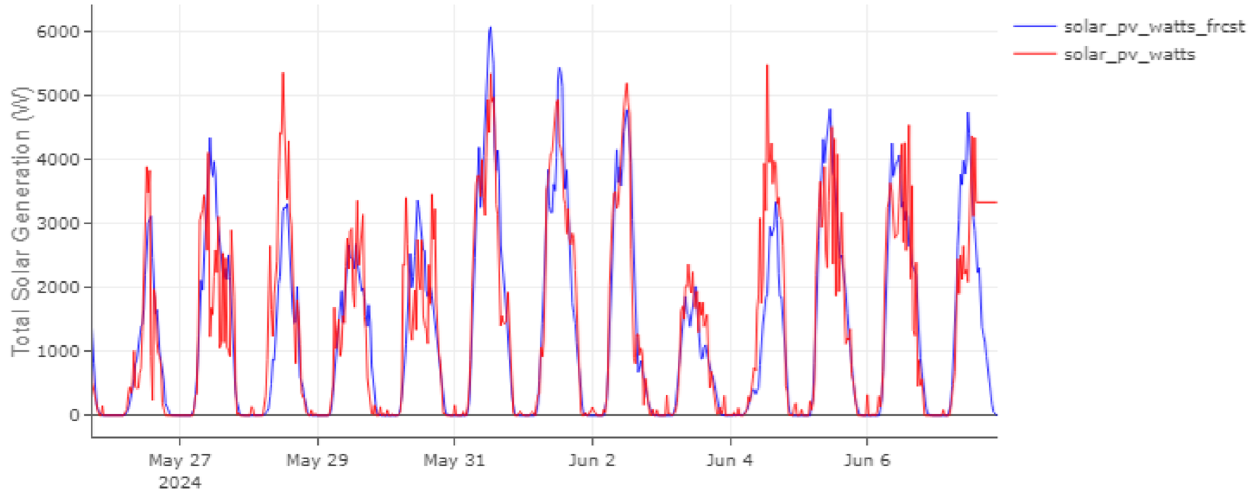

Figure 3 (Solar Forecast versus Actual)

Demand Forecasts

We took the house demand **(house_load)** and subtracted the demand from the car and the demand from the immersion (if we were exporting power) to give a base house demand. We did this because:

1) Demand from car: This demand would change based on price, so we put the car demand on a separate optimiser
2) Demand from the immersion (if we were exporting power): This is not true demand for hot water, as the hot water is only heated as there is surplus solar

We used the historical base house demand to train a model based on representative groupings (day of week, time of day, etc.) to predict the demand for the next day.

2.3 Project Objectives

The objectives of the project were to:

1) Control and integrate devices within the home remotely
2) Feed in a dynamic smart tariff and optimise the running of the devices based on the price
3) High level design of the future residential flexibility market, and payment mechanism
4) Develop a high-level demonstration of what a residential flexibility platform could look like and how ESB Networks could use it to balance the grid.

2.4 Summary of Key Findings/Outcomes

1) Data Integrity:

Overall the Glas data logger readings, the inverter meter readings and ESB networks smart meter readings were within range of each other. The mean absolute error between the Glas data logger readings and the ESB networks smart meter readings was 0.04kW.

2) Import and Export Tariffs:

There was a big difference between the weighted average import and export price during the solar hours as demonstrated in the table below. The difference between the import and export price was due to the TUoS charges applied by Eirgrid and the DUoS charges applied by ESB Networks on suppliers. These are charged on import, but they are not received on export.

Although the battery was not scheduled to charge if more solar was forecast than house demand for the following day, it was cheaper to fill the batteries at night from the grid and receive the export tariff for the solar during the day than fill the batteries with the solar, as demonstrated in the table below.

Month	**Average Import Price during solar hours (c/kWh)**	**Average Export Price during solar hours (c/kWh)**	**Average Import Power Price during 02:00-05:00 (c/kWh)**
Jun-24	22	15	14
Jul-24	24	17	13
Aug-24	21	14	13
Sep-24	22	15	12
Oct-24	27	17	15
Nov-24	33	23	16
Dec-24	29	20	14

Figure 4 (Average monthly dynamic price comparison)

Given this, while a house battery optimiser was developed, a much simpler version could be implemented by charging the house batteries daily from 2-5am. This is because the non-energy charges are lowest at night.

3) Performance of the Optimiser:

It was found that using an optimiser to charge the car gave a 50% reduction in price relative to the dynamic import price when the car was first plugged in. If there was a lot of wind on the system, rates of 6 c/kWh were achieved with dynamic tariffs. This only occurred when prices in the day ahead market were zero; otherwise, the rates were much higher than this. This demonstrates that the fixed price EV rate of 7 c/kWh offered by many suppliers in 2024 was a loss leader.

4) Payback:

Solar

A price of €8,750 was used in the analysis below for the Solar panels (8.8kW) and Solis inverter install (net of SEAI grant).

Based on data from July-December 2024, the average import price during solar hours was 26c/kWh and the average export price was 17c/kWh.

The solar generated each month was multiplied by the average price per month and then summed. This value was then doubled to estimate the annual revenue.

Based on this, the payback was 6.46 years based on the import price and 9.79 years based on the export price. Note, however, that the tariffs displayed here do not include supplier margin, and as such, the payback on the import tariff will be less.

It was discovered that the incremental cost of adding more solar panels was low relative to the installation costs (€400 per kW). Therefore, by adding more solar panels, it decreased the number of years payback.

Battery

The cost of installing a 5kW battery was taken as €2,550 in the analysis below.

Based on the difference between the night import price (from 02:00-05:00) and the peak import price (from 17:00-21:00) from July-December 2024, the payback period was 9.08 years. Given these tariffs do not include supplier margin, the payback period will be shorter.

Observing the fixed price rates suppliers were offering in 2024 (EV rate and the Day rate), if a battery was charged at the EV rate and discharged at the Day rate, with certain suppliers the payback was 5 years. This demonstrates that the fixed price rates offered by suppliers in 2024 offered more value to customers with batteries than dynamic tariffs as the EV rates were below cost price and the peak rates were much higher than the dynamic import rate.

5) **Residential Flexibility Market Design:**

Cenergise had several meetings with ESB Networks and Eirgrid in 2024 to discuss what a residential flexibility market design could look like.

A separate report titled "Residential flexibility market design" discusses Cenergise's proposed design of a residential flexibility market, as well as screenshots of what the platform could look like.

The proposed design of the residential flexibility market is similar to the DFS (Demand Flexibility Service) in Great Britain. However, it would facilitate both demand turn down or turn up auctions. Cenergise proposed using a rolling historical baseline which uses data from the middle of the last 8 of 10 working days but also applies a same day adjustment. Smart meter data would be compared with this to determine if the customer had delivered a demand reduction / increase. One of the lessons learned from the "Beat the Peak" initiative run by ESB Networks was that the tender application process was onerous. As ESB Networks is linking in with customers directly in their pilots, it is proposed that they only interact with suppliers / aggregators / Flexibility Service Providers. It is suggested to have one platform that can be used by Eirgrid and ESB Networks to centralise the registration process. There would be central vetting of suppliers / aggregators / Flexibility Service Providers as part of the registration process. This would apply to both ESB Networks and Eirgrid. The Flexibility Service Providers would only be paid out if there was a minimum 50% reduction / increase in demand across their portfolio.

2.5 Project Impact

In the Climate Action Plan 2024, the Government set a target of 8GW of solar in Ireland by 2030. This includes both rooftop solar and utility scale projects.

One of the issues with the increasing penetration of renewables is the increase in curtailment. This occurs when there is more renewable power on the system than the grid can facilitate. In these instances, the renewables are dispatched down. The installation of batteries can help reduce curtailment as they are charged in periods of high renewable generation.

This project demonstrated the advantages of installing solar and battery systems in the home including:

1) The payback period
2) How they can be used during power cuts
3) How they can be paired with an EV to charge the car from excess solar and not pull from the grid

The Government targets to have approximately 1 in 3 electric vehicles on the road by 2030. As EVs can be charged at different times, and in time will be able to give back to the grid, this clearly shows the potential of homes to provide flexibility to the grid.

In July 2024 the CRU published the National Energy Demand Strategy. This focused on progressing initiatives that can contribute towards demand flexibility.

This project explored how the residential sector can be used to provide flexibility to the grid. We demonstrated communicating with an inverter and EV charger remotely, which can be used at scale to provide flexibility to the grid.

2.6 Recommendations

Project Changes
In this project, six 3.5kW batteries were installed in parallel. If this project was to be repeated, we would install two or three 5kW batteries instead of six 3.5kW batteries. This is because:

1) Cost implications
2) In a typical household 10-15kWh would be sufficient to meet most of the daily needs of a house if there was a power cut.
3) If the instantaneous demand of the house is greater than 3.5kW, additional power is pulled from the grid. A 5kW battery matches the rating of the 5kW inverter.

Device Changes
It was considered that if a residential flexibility market was to work at scale, both inverters and car chargers should have APIs that do not require a hard-wired connection. This is paramount as home owners would not pay for the installation of a secondary device to communicate with the inverter and EV charger just to participate in a residential flexibility market.

The natural home for the control and monitoring in this type of application is the inverter or other smart device such as the diverter as this avoids the need for additional devices which require expert knowledge to configure. Unfortunately, there is a lack of standardisation in terms of data interfaces for these types of device which makes integration of such systems difficult. There are some standards for inverter data registers such as the Sunspec standard based on the inverters from SMA but this is not universally available and the feature sets supported by each inverter tend to differ. The GET-2108MX was used in this instance to insulate the Cenergise server from the details of the individual devices and provide a single channel for interfacing to the house.

Much of the Smart Home equipment available today is designed to work within its own ecosystem and very often uses proprietary, closed protocols. Options for open protocol integration are limited or non-existent at both the local device level and at the service backend systems. Whilst many of these systems perform their own tasks well, getting them to cooperate to provide a house level solution is difficult.

It is also recommended that the APIs should facilitate control of both import and export of power from these devices. Across Europe, the installation of rooftop solar has caused prices in the wholesale markets to go negative during summer days, and power grids have struggled as they cannot dispatch down rooftop solar. Installing inverters with APIs that can limit the export of power alleviates this problem.

Policy Changes
There is a potential need to restructure how DUoS and TUoS charges are levied. Currently the rates are much higher during the day than at night, regardless of the level of renewables on the system.
They should be lower in periods of high renewables, to ensure smart tariffs give the right signals to customers to increase consumption and help reduce curtailment.

2.7 Conclusions and Next Steps

It was discovered that a house can be fully powered by a battery. This was demonstrated during three power cuts in 2024 when the house ran off-grid.

It was found that in order to reduce electricity costs, rather than turning on and off smart plugs and devices within the home with different APIs, we only needed to focus on when to charge the house battery and the electric vehicle at the cheapest time. A dynamic tariff was fed into two optimisers to determine when to charge the car and the battery.

The signal to charge was always at night, not day, as the non-energy charges (particularly DUoS charges) were lower at night. Therefore, even if the wind was significantly higher during the day than at night, the signal was always to charge at night due to the non-energy charges.

The payback period on installing solar panels was in the region of 6 years based on the breakeven import tariff, and it was found that over-installing solar reduced the payback period. This is because the incremental cost of installing more solar was low, and the surplus solar received an export tariff.

For over 6 months of the year, the house could be fully powered by the rooftop solar, with excess sold back to the grid or used to charge the electric car in Eco+ mode.

For the winter months, a house optimiser was developed which forecast the house demand and solar generation for the following day. If the demand was higher than the solar forecast, the battery was charged at the cheapest time. Based on the results of this project, more money could be made by importing power into the battery overnight, without considering the solar that would be produced later on, as the export rate during the solar hours was higher than the import rate at night.

Given the size of the battery was sufficient to meet the house demand, the only time we pulled from the grid was to charge the battery or charge the car. This was except for periods when the instantaneous house demand was higher than the 3.5kW rating of the house battery.

The payback period for a 5kW battery was in the region of 9 years based on the breakeven dynamic tariffs (assuming they were charged at night and discharged at the peak). Observing the fixed price rates suppliers were offering in 2024 (EV rate and the Day rate), if a battery was charged at the EV rate and discharged at the Day rate, with certain suppliers the payback was 5 years. This demonstrates that the fixed price rates offered by suppliers in 2024 offered more value to customers with batteries than dynamic tariffs as the EV rates were below cost price, and the peak rates were much higher than the dynamic import rate.

House batteries can provide resilience to the grid and export power back to the grid during times of system stress. They provide more resilience to the grid than electric vehicles as they are always plugged in.

For large scale participation of house and car batteries in a residential flexibility market, it is paramount that these devices can be controlled remotely via API. If additional equipment needs to be installed to communicate with the devices, it will kill the business case for participating in a residential flexibility market. It is also proposed that the APIs can control both import and export of power from these devices. All inverters should have the functionality to limit exports back to the grid in an automated way. This is to protect the grid as the adoption of rooftop solar increases.

It is hard to see at the moment, how this type of functionality could be integrated into a wide range of inverters without the involvement of a number of companies and electricity suppliers to design and implement the required protocols and functionality. The concept of a Smart Home Energy Management System is still very much in its infancy and even if standards do emerge, there will remain the issue of the large number of legacy systems which currently exist and would require upgrades or replacements to allow them to participate. Our experience from this project is that getting these systems to work properly at the moment is not a simple feat.

Overall, this project showed that the power into and out of the house could be controlled remotely. The readings taken from the project were within range of ESB's meter readings, with the exception of when the internet or the controller went down. The project also highlighted the limitations with new technologies if there is a problem and who to contact to diagnose the problem.

An optimiser was developed to determine when to charge the car. It delivered a 50% saving relative to the price when the car was first plugged in. This project also demonstrated that a car could be fully charged from excess solar via the myenergi Zappi car charger.

Cenergise had several meetings with ESB Networks and Eirgrid in 2024 to discuss what a residential flexibility market design could look like. The proposed design is similar to the DFS (Demand Flexibility Service) in Great Britain. However, it would facilitate both demand turn down or turn up auctions. Cenergise proposed using a rolling historical baseline and comparing this with smart meter data to determine if the customer had delivered a demand reduction / increase. The Flexibility Service Providers would only be paid out if there was a minimum 50% reduction / increase in demand across their portfolio. Cenergise developed a platform mock-up to demonstrate what the platform could look like, and how both ESB Networks and Eirgrid could use it to purchase flexibility. The proposed flexibility platform was prototyped using Streamlit, a Python-based framework.

Next Steps

The next plan is to explore how inverters and EV chargers can be remotely scheduled at scale and ensure the flexibility markets are developed to facilitate them. Further work is required by ESB Networks and Eirgrid to develop these markets.