# Carbon-Adjust: An innovative marketplace for rewarding electricity demand flexibility in homes

**Sub-heading:** Making payments for flexibility services available to more people

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**Partners:** Energy Systems Catapult (research trial design, participant feedback management, impact assessment), Furbnow Limited (Retrofit advisory and home energy plan provision), Lendology CIC (financial product design and homeowner financing support) and Modirect Limited (carbon credit aggregation and end-user education)

**Funding Received from GHFA:**

- Discovery Phase: £159,040
- Pilot Phase: £1,067,152

**Project duration:**

- Pilot Phase: February 2024 – June 2025

**Innovation overview:**

Carbon-Adjust aimed to create an innovative marketplace enabling homeowners and renters to receive financial incentives for flexibility. For example, adjusting their electricity usage to enable the electricity network providers to balance the electricity grid, or performing specific activities such as laundry or EV charging when the grid has lower carbon energy sources. The service utilised 'Internet of Things' (IoT)-connected smart devices, including proprietary smart plugs, to automate appliance management in response to flexibility payments or advanced signals on the "cleanliness" of grid electricity. Initially, rewards from both flexibility options were intended to take the form of credits towards home retrofit measures. Ultimately the service focused more on offering direct financial rewards from grid-balancing flexibility calls due to user feedback and practical constraints.

**What were the objectives of the project?**

The project initially pursued three main objectives:

1. **Enable greater domestic participation in flexibility markets**: Provide smart plugs for households to engage actively in demand response and receive financial rewards.
2. **Provide accessible finance for smart home connectivity**: Offer diverse financing options for easy customer purchase of smart devices.

3. **Develop an online marketplace platform**: Simplify customer access to smart devices, low-carbon technologies, and flexibility payments.

The pilot intended to operate in Southwest England and South Wales, aiming to demonstrate at least 1MW of flexibility capacity when aggregated across all users.

However, challenges in meeting these objectives emerged:

- Approval processes, notably unexpected administrative complexity when preparing authorisation materials for Financial Conduct Authority (FCA) consideration, significantly impacted timelines.
- Off-the-shelf smart plugs proved unsuitable, requiring proprietary devices to be developed.
- Original partnership-based strategies encountered limitations, shifting focus toward single party, independent delivery, and necessitating significant rescoping of the project deliverables.
- Qualifying to become a licenced Virtual Lead Party (VLP) was a lengthy process that also impacted the project's launch timelines.

Consequently, the project's objectives focused significantly on:

1. **Increased focus on proprietary smart plug technology**: As well as independent fintech integrations.
2. **Financial benefits and creative business models for grid-balancing flexibility compared to carbon offset flexibility:** This shift was supported by focus group users, who were more amenable to upfront significant compensation. Grid-balancing flexibility was found to generate higher financial benefits than carbon offset flexibility.

## Activities funded by the Green Home Finance Accelerator:

The project utilised Green Home Finance Accelerator funding for the following activities:

- **Development, design, and certification (UKCA) of proprietary smart plugs**: To facilitate household participation in flexibility markets outside of the smart meter infrastructure.
- **Creation of web and mobile marketplace applications and relevant hardware**: Enabling the management of domestic devices by customers.
- **Securing Financial Conduct Authority (FCA) authorisation:** To enable credit brokering and longer-term financing arrangements.
- **Securing a VLP licence:** To enable the offering of flexibility services to UK households.
- **Securing ISO 9001 and ISO 27001 certifications:** To demonstrate quality management and compliance with rigorous security protocols.

- **Integration with FinTech platforms:** Specifically utilising Klarna for consumer credit solutions and Stripe for financial transactions and payment of customer benefit.
- **Undertaking consumer engagement trials:** To test appetite for the product offering, refinement of customer demographic targeting, and optimisation of the business model based upon user feedback.
- **Marketing and promotional activities:** Educating potential users about carbon credits, demand-side flexibility, and the financial benefits of participating in the Carbon Adjust platform.

## What did the project achieve?

The project developed the Carbon-Adjust platform, an online marketplace for smart in-home devices and flexible trading, with integrated finance options available to spread the upfront cost of equipment for customers. The online marketplace was completed and due for imminent launch in September 2025, pending the successful registration of the asset (smart plug) with the National Energy System Operator (NESO).

Key achievements include:

- **Developed and secured UKCA certification:** For proprietary smart plugs.
- **Achieved FCA authorisation within four months of submitting application**: This was considerably faster than typical regulatory approval timelines, validating the innovative financial model and detailed preparation.
- **Secured VLP certification from ELEXON**: To enable the project to offer flexibility to UK domestic residents outside of the smart meter infrastructure.
- **Successfully integrated FinTech solutions:** For flexible payments (Klarna) and compensation via bank transfer (Stripe).
- **Secured ISO 9001 and ISO 27001 certifications**: Demonstrating and evidencing commitment to design quality and approved information security processes.
- **Secured a U.S. patent for the Carbon-Adjust platform and business model:** Strengthening credibility and protecting intellectual property.

Preliminary project projections suggest substantial consumer benefits post-launch. This included up to 16% energy bill reductions, carbon offset savings of approximately 0.1 tonnes $CO_2$ per household, and a return on investment (RoI) over 317% within two years, based on Escrow-Tech's provisional financial modelling of a typical UK house with 3 smart plug units.

## Key challenges and learnings for the wider sector

- **Regulatory complexity:** The project team highlighted that the lengthy FCA authorisation process (ten months preparing to submit and four months

awaiting authorisation after submission) could indicate a need for streamlined regulatory approaches, including potential soft-touch or provisional frameworks for innovative finance.

- **Technology integration and scalability:** Off-the-shelf IoT devices were not easy to integrate into the proprietary Carbon-Adjust systems as they did not provide robust application programming interface (API) interfaces that allow for 3rd party enterprise operations such as aggregation and customisation. Therefore, the project team developed proprietary technology. This highlights the challenge of interconnectivity and common standards for smart devices.
- **Iterative user-centric design:** Continuous user feedback significantly reshaped the business model, underscoring the value of early and ongoing consumer engagement to enhance market fit and product desirability.

## What's Next for Carbon Adjust?

At the time of reporting, Carbon-Adjust was preparing for full commercial deployment, pending final registration of its assets with NESO. The project is focused on completing the development of its vertically integrated firmware infrastructure with AI capabilities at the chip level for deployment on its future IoT devices. Future development will focus on leveraging Carbon-Adjust in unlocking grid capacity in constrained electricity networks, especially for large energy demand users like data centres.

## Contact and Links

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