SIF Round 3 Project Registration

Date of Submission

May 2024

Project Reference Number

10061344

Initial Project Details

Project Title

Carbon Flex

Project Contact

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Challenge Area

Novel technical, process and market approaches to deliver an equitable and secure net zero power system

Strategy Theme

Consumer vulnerability

Lead Sector

Electricity Distribution

Project Start Date

01/03/2024

Project Duration (Months)

3

Lead Funding Licensee

UKPN - London Power Networks Plc

Funding Mechanism

SIF Discovery - Round 3

Collaborating Networks

UK Power Networks

Technology Areas

Low Carbon Generation

Condition Monitoring

Fault Level

Voltage Control

Project Summary

CarbonFlex will demonstrate how socially-inclusive demand-side flexibility can be used to support a net zero secure urban energy system. In turn, enabling surrounding communities to electrify and decarbonise quickly, cost-efficiently and equitably.

'Carbon flexing' algorithms will be coupled with smart controls to match electric residential space and hot water heating demand in multi-occupancy buildings with periods of low carbon electricity and an expected high network flexibility demand. We will engage with landlords and tenants to co-design a carbon flexing service that delivers value to low-income households whilst cultivating a dynamic resource for DSOs to manage local grid congestion.

Add Third Party Collaborator(s)

Energy Unlocked

Connected Response

Peer Carbon

Royal Borough of Kensington and Chelsea

Project Budget

£152,645.00

SIF Funding

£129,727.00

Project Approaches and Desired Outcomes

Problem statement

Flexibility is the cornerstone of a clean, affordable and secure energy system (Flexibility in Great Britain, 2021), worth billions of pounds in system savings annually. Electric residential space and water heating is set to become the greatest source of demand-side flexibility (DSF) by 2030 (smartEn, 2022).

Today, market barriers, existing regulations and unequal access to new technologies prevent low-income households from accessing opportunities for flexibility provision. Simultaneously, there is no current incentive for flexibility markets to prioritise the use of low carbon-intensive electricity. As we rapidly electrify, we must ensure that flexibility markets are accessible to all, whilst conducive to achieving Net Zero targets.

Our target usergroup are registered social landlords (RSLs), such as councils and housing associations, within London boroughs, in particular those whose tenants suffer with high heating costs. CarbonFlex will develop a novel technical process and market approaches (Challenge 2) to unlock flexibility potential in low-income homes and disadvantaged consumer segments as part of a secure net zero power system (focus area 4). Unlike traditional DSF, which relies on electricity prices reflecting local system conditions, carbon flexing optimises for carbon avoidance directly, frontloading rewards for carbon-savings whilst the existing market catches up. DSF could offer social landlords a powerful tool for addressing energy poverty, enabling families to become active flexibility participants through automation. Such a framework incentivises flexibility providers and RSLs to reduce demand during carbon-intense periods.

Simultaneously, through facilitating flexibility uptake, additional flexibility capacity is provided to the DSO. Currently, there are 166,000 flats in London (and 1.5 million nationally) with smart electric heating system capabilities which remain an untapped flexibility capacity for the system. This project aims to test carbon flexing using Trellick Tower, a housing block with 187 social housing tenants, to establish an incentive framework to derive benefits of this carbon flexing for RSLs and the network. NIA-funded project Flexible Tower (2021-22), undertaken by CarbonFlex project partner Connected Response and SPEN, verified that real-time load-shifting and cold-start services could be accessed by smart-enabling existing electric heating, without significant capital expenditure. CarbonFlex will also build on learnings from 24/7 Carbon Free Energy (Arup, Energy Unlocked).

The learnings from CarbonFlex will have wider application as more buildings electrify their heating, and can be rolled across London and nationally.

Carbon flexing offers a 'value bridge' to align consumer, DNO and climate needs faster, future-proofing distribution systems and creating pathways for socially-inclusive innovation.

Video Description

https://youtu.be/8fHJU_c6h8M

Innovation justification

DataMate aims to crowdsource data from devices connected at the grid-edge, i.e. those near the electricity network boundary, by establishing an ecosystem including LCT providers and other stakeholders. This industry-first approach will enable DNOs to obtain the data to proactively identify and effectively manage voltage challenges stemming from the increasing number of LCTs connecting to the network.

Although grid-edge data exists, currently there is no market proposition or platform to allow DNOs to unlock and harness this data to improve granular visibility. Hence the current TRL, IRL and CRL remain low.

Discovery seeks to establish interest and participation from necessary stakeholders, develop data requirements and mapping, and explore potential open data sharing models. It is anticipated that the TRL, IRL and CRL will reach 3-4 at the end of Discovery.

Preliminary engagement has shown interest from stakeholders in providing such data.

Understanding data requirements and the technical and commercial feasibility of data sharing are crucial first steps in ensuring the viability of developing a data sharing framework or platform. The scale and scope of Discovery will enable delivery of these key steps ahead of development and testing.

Considerable investment, partner engagement and innovation will be required to develop DataMate into a full solution, which would not be achievable as part of business-as-usual activity. Given the phased nature of the SIF, we believe the project is well suited to this mechanism as it will enable upfront engagement and feasibility assessments ahead of proposition development and testing, before any scalable or widespread deployment is delivered.

To date, when voltage complaints arise, UKPN provide self-serve voltage recorders to customers to capture data. Also, voltage management innovation projects exist like Stratus, EcoVAR, voltage regulators and CLASS. However, these will only be considered after identifying an issue and hence, they remain a reactive response to a complaint process, often involving numerous customer visits and slowing down the speed of resolving complaints. DataMate will reduce the number of customer complaints by proactively identifying voltage incursions.

The fragmented nature of LCT providers' data and systems, paired with unprecedented LCT uptake, means that without the development of solutions through DataMate, DNO's will remain in the dark about causes of voltage issues and be left to continue reactive response to voltage management. DataMate will help define DNO proactive approaches and potentially an automated voltage management response, reducing the need for manual process such as on-site visits.

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

Environmental - carbon reduction – direct CO2 savings per annum

Revenues - creation of new revenue streams

New to market – processes

Others that are not SIF specific

Impacts and benefits description

We will use current voltage complaint data as our initial counterfactual against which we will evaluate success. However, as the project evolves and the visibility of data extends, other metrics will also be established to serve as counterfactual for evaluating impact. We envisage the following key benefits:

Financial - future reductions in the cost of operating the network

Better-informed voltage management (i.e. proactive vs. reactive response) will lead to reduction in cost from reduced site visits/voltage record equipment, and obtaining a more resilient network.

· Metrics: number and cost of voltage related site visits, resolution time of voltage issues, updated processes around voltage management

Environmental - carbon reduction – direct CO2 savings per annum

One of the aims of the project is to facilitate the roll-out of LCTs and not being a blocker by having a well-managed and prepared network. Ensuring LCTs are connected and by preventing excursions due to voltage issues we will ensure carbon emission reductions are delivered.

· Metrics: for the future trial, assessment of LCTs deployment within the selected area and associated carbon emission reductions enabled as a result

Revenues – creation of new revenue streams

Creation of a new market proposition to crowdsource data from various stakeholders.

· Metrics: cost to acquire data from stakeholders

New to Market – processes

A better understanding of the LCTs impacts onto the network, i.e. identifying the relationship between LCTs and voltage may have implications for network planning and voltage management.

· Metrics: decreasing rate of voltage management complaints, demonstration of LCTs impact on voltage variations

New to market – services

The project will develop a new data service for DNOs to use. Although grid-edge data exists, currently there is no market proposition to allow DNOs to unlock and harness this data.

· Metrics: New services developed and launched

· Metrics: Number of voltage alerts and issues identified (ongoing measurement metric also linked to new revenues benefit category)

Others that are not SIF specific (benefits for the consumers)

Reduce voltage complaints and improved quality of supply, leading to a greater customer satisfaction.

· Metrics: decreasing rate of voltage management complaints, customer satisfaction scores

Reduced failures (e.g. tripped EV charger so vehicle not charged in the morning or PV inverter tripped)

· Metrics: decreasing rate of voltage management complaints, data analysis on one specific area

All benefits are linked to the deployment of Data Mate solution into business-as-usual following Beta, although some may be realised during the Project.

Teams and resources

Carbon Flex has two key Project Partners:

UKPN: UK's largest electricity distributor delivering power to 8.5 million homes and businesses across London, the east and south east of England. We are responsible for owning and maintaining the cables and assets in our licence area. We will be the main end user of the innovation, using crowdsourced data to better understand LCTs impact, grid-edge devices, identify voltage

issues and develop a proactive voltage management response.

Role: UKPN will lead this project and be responsible for overall project management and dissemination of information across the industry. Our network operations, planning and customer services teams will contribute with relevant information and subject matter expert support related to voltage issues and complaints.

Sia Partners: management consultancy firm with extensive expertise in the Energy & Utilities sectors, in addition to essential capabilities in developing open data partner ecosystems and data science solutions for utilities.

Sia Partners' team will combine Energy consultants, Growth & Innovation experts and Data Scientists to bring together sector together knowledge, open data expertise and technical capability with digital tools and techniques. Sia Partners has successfully delivered several innovation projects involving data solutions for DNOs and water companies in recent years. This includes SPEN's Predict4Resilience project and SSEN's Project TRANSITION, both of which have brought innovative data science and software development capabilities into DNO network planning and control room operations. Sia Partners is also currently working on Stream, which is building out an open data ecosystem to facilitate data sharing across the water sector.

Role: Sia Partners will lead on the stakeholder mapping and engagement and establish a set of use cases for the solution, including an assessment of costs and benefits. They will also support UKPN with mapping data requirements and the required enabling infrastructure to deliver the solution.

We are confident in having the relevant resources between the two main project partners, to deliver the Discovery phase of this project. The phase will include literature review, workshops organisation, data analysis and qualification, assessing voltage management processes and ways of optimising these (such as automation).

Additionally, a key success factor to Data Mate lies in engagement with LCT providers, aggregators, energy suppliers and end-users. Initial engagement has shown interest and willingness from these stakeholders in providing such data to UKPN. Beyond that, this engagement must demonstrate relevant participation rate and ensure stakeholders' interest to secure partners for future phases and trials.

Project Plans and Milestones

Project management and delivery

There are four work packages proposed for Discovery:

WP1: Ecosystem mapping and engagement (Sia Partners)

· Aims: Gain understanding of ecosystem's view on LCT voltage issues and use of data, validate interest for development of market framework and tools to utilise data from grid edge devices

· Success criteria: Understanding of the size the problem and potential solutions to address it, establish a Crowsourcing Stakeholder Group (CSG) to derive meaningful insights and enable future engagement

WP2: Establish potential solution options and benefits (Sia Partners)

· Aims: Determine use cases offered by LCT data sharing and develop options for route to market, including potential data platforms and commercial models

· Success criteria: List of use cases identified including cost benefit assessment, identification of solution requirements to inform design in Alpha

WP3: Data requirements and enabling infrastructure (UKPN)

· Aims: Identify LCTs partners to collect data from, define possible ways of data sharing and management

· Success criteria: Understanding of data available and accessible, deliver clear mapping of enabling data infrastructure, achieve active participation from workshops

WP4: Project Management (UKPN)

· Aims: Deliver the project on time, to budget, ensuring objectives and learnings are achieved.

· Success criteria: Project delivered on time, in budget and to quality

Work packages follow each other sequentially with some in parallel, as learnings from deliverables inform subsequent deliverable, as detailed in the Gantt Chart.

Project management will be led by UKPN using standard best practice methods and tools, including fortnightly management meetings and status reporting, more frequent stand-ups as required for design sprints, and a stakeholder governance schedule aligned with project timelines.

The project has progressed through UKPN's internal innovation and project governance and control governance processes and will continue to be managed under this governance. This includes robust stakeholder engagement, weekly programme manager reviews and regular monthly meetings with a dedicated planning resource to support programme adherence, and mitigation of delays if any occur.

All risks and mitigations are set out in the risk register. We will manage risks and issues using a standard risk management approach. Key risks for Discovery are:

· Low stakeholder availability and accessibility of data

· Low participation rate from identified stakeholders and potential reluctance to share information and data.

At this stage, there are no identified risks in relation to policy and regulatory changes with regards to deployment. There is also no potential for supply interruptions to customers as Discovery focuses purely on engagement and feasibility.

Key outputs and dissemination

The key objectives for Discovery are to:

· Identify LCTs partners to collect data from, define possible ways of data sharing and management

· Gain understanding of ecosystem's view on LCT voltage issues and use of data, validate interest for development of market framework and tools to utilise data from grid-edge devices

· Determine use cases offered by LCT data sharing and develop options for route to market, including potential data platforms, commercial models and benefits

Key outputs from Discovery

By the end of Discovery, Data Mate aims to complete the objective of each work package and produce the following key outputs which will be disseminated effectively:

WP1: Ecosystem mapping and engagement

· Outputs: Literature review, ecosystem mapping, Crowdsourcing Stakeholder Group (CSG) design and findings report

· Responsible: Sia Partners

WP2: Establish potential solution options and benefits

· Outputs: Report with list of potential use cases, benefits assessment, high level commercial models and route to market assessment (including stakeholder validation)

· Responsible: Sia Partners

WP3: Data requirements and enabling infrastructure

· Outputs: Data requirements report, high level design of enabling system architecture (data mapping and integration)

· Responsible: UKPN

WP4: Project Management

- Outputs: Discovery Show & Tell and final report
- Responsible: UKPN

Knowledge Dissemination

Our project outputs will be uploaded to the Smarter Networks Portal and feature on the UK Power Networks' website with specific project learnings being disseminated at the IUK Show & Tell events. The project will be presented at other UKPN events should the opportunity arise.

UKPN will look to share project successes and discoveries via its social media channels with the possibility of publishing external media where appropriate.

As detailed above the outputs of Data Mate will be made available to all networks and therefore does not undermine competitive markets. Similarly, the end use of the project will source data from many stakeholders and potentially create new services and revenues for external users, so it does not undermine competitive markets.

Some outputs may have commercially sensitive information which will be either redacted for external sharing or made available upon request.

Commercials

Intellectual Property Rights (IPR) (not scored)

The parties agree to adopt the default IPR arrangements for this project as set out in Section 9 of the SIF Governance document.

Value for money

The total project cost for Discovery is £127,275 and the total SIF funding requested is £114,547. This is balanced across the project partners as follows:

UK Power Networks

- Total costs: £38,075
- Total contribution: £3,808 (10%)
- Total SIF funding requested: £34,267

Sia Partners

- Total costs: £89,200
- Total contribution: £8,920 (10%)
- Total SIF funding requested: £80,280

The project will meet the minimum 10% compulsory contribution from the Project Partners as an in-kind contribution via labour.

There will be no sub-contractor costs, nor any other additional funding from other innovation funds.

Key points in relation to value for money:

Effective market engagement: Through both Sia Partners' and UKPN's subject matter experts and connections to industry, substantial engagement with stakeholders and potential partners will be considerably easier and cheaper than partners less engaged in the industry. For example, securing time with potential partners may incur longer response times and potential fees. This relatively higher participation and engagement rate enables a more well-informed and developed solution for the cost.

Centralised expertise: the use of Sia Partners' in-house teams (Energy & Utilities, Growth & Innovation, Data Science) provides sector expertise tied with key technical capabilities. By having all necessary capabilities under the same partner, the potential high costs of separated, sole providers are avoided.

Competitive labour rates: Sia Partners are suppliers on UKPN's business consultancy framework and were appointed following a competitive procurement exercise which included rates negotiations and an assessment of value for money.

The project will drive down costs to monitor and resolve voltage issues on the network. The alternative is continuation of a reactive and manual approach to resolving voltage issues which can be time consuming and costly or deploying widescale monitoring along feeders, again which is not cost effective.

To ensure new solutions and services can be quickly adopted into business-as-usual, the project will work closely with UKPN and other stakeholders throughout the project lifecycle to ensure the solution is fit for purpose and scalable across networks. Also, many of stakeholders the project will engage operate nationally which will support scalability across GB. The route to potential commercialisation of the innovation, as well as the development towards business-as-usual, are key learnings from Discovery and future phases.

Supporting documents

File Upload

SIF Round 3 Project Registration 2024-07-08 10_37 - 63.5 KB
SIF Round 3 Project Registration 2024-05-13 9_38 - 63.4 KB

Documents uploaded where applicable?

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