

SIF Round 3 Project Registration

Date of Submission

May 2024

Project Reference Number

10061349

Initial Project Details

Project Title

SizeWise

Project Contact

Innovation@ukpowernetworks.co.uk

Challenge Area

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

Strategy Theme

Flexibility and commercial evolution

Lead Sector

Electricity Distribution

Project Start Date

01/03/2024

Project Duration (Months)

3

Lead Funding Licensee

UKPN - Eastern Power Networks Plc

Funding Mechanism

SIF Discovery - Round 3

Collaborating Networks

UK Power Networks

Technology Areas

Energy Storage

Project Summary

Propositions for residential batteries are targeted at affluent customers, with large batteries that are expensive. However, no simple tools exist to support customers in choosing the optimal mix of low carbon technologies (LCTs) to suit their needs. Smaller, cheaper batteries coupled with solar arrays or other LCTs may make for more investable propositions with shorter payback periods. They are also accessible to more customers and more easily integrated into the electricity system. SizeWise seeks to define the optimum use of batteries with LCTs for different households and develop tools to make it easier and more affordable for customer to engage.

Add Third Party Collaborator(s)

baringa

Imperial Consultants

Project Budget

£171,890.00

SIF Funding

£145,937.00

Project Approaches and Desired Outcomes

Problem statement

UK Power Networks have seen a fivefold increase of new residential battery systems since 2022. Despite reducing costs for batteries, some customer segments are at risk of being left behind (48% of customers are low income or vulnerable (LIV)). SizeWise focuses on creating more investable propositions through right-sizing batteries and optimising their use for a range of customer types and needs.

Residential battery propositions are in their infancy; smaller batteries can optimise self-consumption of rooftop solar arrays and larger batteries can also provide back-up power, energy arbitrage, or flexibility services to networks. Many propositions in the market focus on larger batteries, but high electricity prices and poor winter utilisation may reduce investment return. Smaller installations coupled with solar or other LCTs may provide more investable propositions with shorter payback periods, making them accessible to more customers. However, no simple tools exist to support customers in choosing the optimal mix of LCTs to suit their needs.

DNOs lack insight into how domestic batteries may be operated in the long term, which introduces risks regarding their operational effect and network impact, worsened by under-reporting of the connection of new technologies (~70%). As decarbonisation accelerates, the growth of domestic batteries and other LCTs could result in new and unpredictable peak loads, particularly on the LV network, which may hamper future integration.

Our approach aims to use domestic consumer archetypes to understand the optimum combination and size of LCTs and identify a range of strategies to optimise their usage. The project seeks to support Challenge Theme 3 by:

Identifying the data required to optimise the effect of batteries and LCTs on the electricity network;

Understanding peak loads for domestic customers by defining the needs of house types/occupancy combination today and how these could change by optimising different combinations of LCTs in the future;

Understanding how flexibility could be provided from a combination of LCTs to manage peak demand, enabling connection of increasing numbers of LCTs and renewable generation; and

Enabling more consumers to participate in the decarbonisation of demand by improving project returns.

The users of this innovation would be a wider range of consumer types, who otherwise would not have access to affordable home battery propositions.

These issues have been discussed in several innovation projects (Urban Energy Club, LEO, Low Carbon London, FUNLV and Dynamic Networks) though none have developed recommendations or tools to support development of more optimal customer propositions.

Video Description

<https://youtu.be/Y7jMreGSfmY>

Innovation justification

The key innovative aspect for this project is in developing new insight and data on how home batteries can optimally support the integration of home LCTs, and how business models can be evolved to enable more investable propositions through right-sizing batteries and optimising their use for a range of customer types and needs.

Innovative aspects include:

- Generating new insight into the optimal sizing and operation of home batteries in combination with a range of LCTs and customer/home archetypes, building on existing work from Ofgem and ClimateXChange and the Microgeneration Certification Scheme;
- Identifying barriers that inhibit large scale uptake of home batteries, including technical barriers relating to network integration and market barriers relating to the investability of propositions, and proposing solutions to these barriers;

Identifying propositions that are more suited to the needs of consumers at lower cost and with a more attractive return on investment that appeal to investors and market participants who wish to support large scale rollouts of LCTs, particularly to LIV consumers at risk of being left behind the energy transition.

The counterfactual is a slower uptake of home batteries – initially by the affluent, and then other (but potentially not all) customer segments, with associated potential for sub-optimal sizing of installations, restrictions on equitability of access for customer types, and the potential for new and unpredictable peak loads in the network, necessitating additional network investment per battery on average.

The technology for this project exists, hence integration and technology readiness levels are IRL6 and TRL6. The project will focus on developing the commercial readiness of DSO incentives, propositions, and business models, which currently stand at CRL2 and will need to move through CRL3 in Discovery and further through Alpha and Beta phases.

Whilst the technology exists, given low uptake of home battery technologies and nascency of propositions it is too risky for service providers to invest at scale in propositions across all customer types. If viable propositions can be demonstrated and the investment case validated, this could build further interest from service providers, encouraging further investment.

A full demonstration is necessary to prove viable propositions that enable investment and uptake of home batteries as the solution needs to be delivered by market participants. The SIF Beta fund sizing matches the size and scale compared to other innovation funding sources.

Impacts and benefits selection (not scored)

Financial - future reductions in the cost of operating the network

Financial - cost savings per annum on energy bills for consumers

Financial - cost savings per annum for users of network services

Environmental - carbon reduction – direct CO2 savings per annum

Environmental - carbon reduction – indirect CO2 savings per annum

Revenues - improved access to revenues for users of network services

Revenues - creation of new revenue streams

Impacts and benefits description

The Flexibility in GB report by Imperial College and the Carbon Trust estimates flexibility can drive annual savings of £16.7bn per year by 2050, with the majority of additional flexibility vs. today coming from smart use of domestic assets.

Today, only motivated, and more affluent customers are engaging with flexibility propositions, with others left behind. This will need to be solved to deliver these benefits.

For networks, limited data exists on the economics of domestic batteries and their effect on the network, and future combinations of batteries and LCTs that will exist in homes. Limited visibility of the growth and use of these technologies has the potential to create new peak loads, driving network reinforcement and supply issues, such as voltage fluctuations or power interruptions, particularly at LV.

SizeWise aims to drive the following benefits through improved battery propositions:

Financial - future reductions in the cost of operating the network

The improved understanding of how combinations of batteries and LCTs affect the network and the resulting flexibility could enable DNOs to avoid or reduce net peak load increases, alleviate voltage fluctuations, and avoid unpredictable or new peaks. It will also inform strategic investment planning and deliver savings through reduced reinforcement.

Financial - cost savings per annum on energy bills for consumers

The insights and propositions developed will inform consumers of the optimal sizing and combination of LCTs and provide optimisation strategies to reduce energy costs and earn revenues. This will make LCTs more attractive to new investment and encourage new propositions for all consumers.

Financial - cost savings per annum for users of network services

The optimisation strategies and potential flexibility will enable energy suppliers, aggregators and DNOs to access flexibility at a lower cost due to increased competition.

Environmental - carbon reduction – direct CO2 savings per annum

Consumers will have access to LCT combinations that enable them to maximise their self-consumption of solar generation and consumption of low carbon energy from the network when available.

Environmental - carbon reduction – indirect CO2 savings per annum

The use of flexibility from consumers provides carbon reduction from avoided new infrastructure and offsets the use of higher carbon solutions in the wider system.

Revenues - improved access to revenues for users of network services

The project will assist market participants in understanding how to access the most optimal combination of cost savings and revenue streams in the management of home batteries and LCTs.

Teams and resources

The partners for this project UKPN, Baringa and ICON, have worked on innovation projects together since 2010. This partnership has a proven track record in developing insights into the requirements of electricity systems in the future.

UKPN is the DNO providing key input on service/incentive design, as well as manage the co-ordination of UKPN's stakeholders. They will be crucial for informing sessions with industry participants to define flexibility use cases and business models and providing their expertise into DSO service opportunities now and in the future.

UKPN will support:

- Provide oversight of progress
- Provision of network data and interaction on network issues and growth
- Provide guidance during the development of archetypes and tools
- Support stakeholder engagement
- Review and approval of deliverables

Baringa Partners are a specialist energy sector consultancy with deep commercial and market expertise specialising in the energy industry. They are ideally suited to these activities given their role advising government, regulators, and networks on flexibility market development, as well as their work for a wide range of market participants building customer propositions and business models in the energy services industry. They also bring specific IP for use on the project, for instance in the form of energy market modelling software and price projections that they will use to model the potential value from flexibility. Finally, Baringa bring an independent viewpoint that will serve to protect against bias toward any solution or market opportunity.

Baringa Partners will manage the project and support:

- Assessment of the current range of battery propositions and their use;
- Development of customer and household archetypes, including LCT combinations, use cases and scope for tools and optimisation strategies;
- Design of a domestic property battery sizing analysis approach and tool;
- Identification of barriers and enablers, including proposition and business model opportunities to be developed further in the Alpha phase, and
- Will drive stakeholder engagement.

ICON's energy system research group have a long history in innovation, and bring a wealth of experience, expertise, and existing analytical tools focusing on modelling the impact of flexibility on the energy system.

ICON will support in the following areas:

Simulate the future GB energy system with and without SizeWise;

Evaluate the whole-system benefits from SizeWise and of optimising LCT use to:

manage network loadings (particularly peak demand);

avoid infrastructure investment;

enable further LCT and intermittent renewables growth; and

provide services to DSO / ESO.

Project Plans and Milestones

Project management and delivery

Baringa will run project management using standard their established framework for delivery of innovation projects including best practice methods and tools including:

Regular management meetings and status reporting

Frequent team stand-ups

A RAID log, and

A stakeholder governance schedule aligned with project work package timelines as detailed in the accompanying project management plan.

The partners will use learnings from their experience with previous SIF Discovery phases and wider award-winning innovation portfolio to ensure the project is delivered successfully.

Six work packages (WPs) are proposed in the Discovery Phase:

WP1: Project Management (Baringa) – managing the delivery of the Discovery Phase.

WP2: Existing Battery Penetration (Baringa) - determine the extent of battery penetration, data availability and how their effect is modelled by UKPN.

WP3: Develop Housing Archetypes and LCTs Combinations (Baringa) – define housing archetypes for the energy needs of differently sized domestic properties with variable occupancy rates and define use cases for each based on a combination of LCTs.

WP4: Domestic Property Battery Sizing Tool (Baringa) – develop the scope for a domestic property LCT tool to support optimal sizing and usage of battery or battery-solar systems for each archetype.

WP5: Stakeholder engagement (Baringa) – determine the interest in and scope for DSO commercial incentives to encourage more LCTs on to the network and / or to influence optimisation strategies and outline the market business models required to achieve these goals.

WP6: Outline CBA (ICON) – quantify the counterfactual of unoptimised LCTs, quantify the benefits of optimised LCTs to domestic consumers, and the benefits to DSOs by reducing the effect of LCT growth on the network. This will include assessing the key barriers to overcome and enablers needed to ensure success in the Alpha/Beta phases and beyond.

Key interdependencies between the workstreams include a need for WP3 and WP4 to proceed in tandem and provide the basis for WP6. WP5 will be required to inform WP2, 3, 4 and 6.

Risks and mitigations are set out in the risk register. Risks and issued will be managed using a RAID log, refreshed and reviewed continuously. Key risks are:

Access to data to inform existing battery penetration and use;

Securing engagement with stakeholders to inform barriers and enablers; and

Ability to identify viable LCT combinations and optimisation strategies that outperform propositions currently in the market.

No planned or potential unplanned supply interruptions are anticipated at Discovery Phase.

Key outputs and dissemination

The key outputs from the Discovery Phase include:

Validation of the key hypothesis that current battery propositions are not optimised to deliver best return on investment (RoI) as they are focussed on affluent customers (Baringa);

An improved understanding and analysis of the economics of domestic batteries, how they can be used in conjunction with wider home LCTs, and how they affect the network (UKPN, Baringa, ICON);

Identification of potential propositions that optimise the RoI of domestic batteries when used alone or in conjunction with LCTs for different housing archetypes to promote improved investability and uptake (Baringa);

An outline scope for a domestic property LCT tool to inform optimal sizing for each housing archetype and strategies to optimise their use (Baringa).

Understanding of the level of market interest in (i) potential DSO commercial incentives to encourage more batteries/LCTs on to the network, (ii) utilising a limited number of optimisation strategies, and (iii) understanding the market business models required to achieve these goals (Baringa).

Understanding the benefits of the above to domestic consumers, DSOs, the ESO and the environment (ICON).

Dissemination of learnings

Details of key Discovery Phase learnings will be uploaded to the Smarter Networks Portal and feature on the UKPN innovation website with specific project learnings being disseminated at the IUK Show & Tell events and other SIF dissemination events. Findings will also be reported back to stakeholders through the stakeholder engagement process.

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

Maintaining competitive markets

The Discovery Phase will not be supporting any single market participant in developing a proprietary approach or technology. All technologies will be treated fairly and analysed independent of bias, safeguarded via the neutral position of Baringa.

To promote competitive markets, outline propositions and business models identified through this project will be made available to all market participants. Whilst the project will engage with a selection of providers, all data gathered and insights developed will be made available to all through knowledge dissemination.

If successful, this project will stimulate new propositions for domestic flexibility that will increase competition, reduce the prices for such services, and reduce customer bills.

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 Framework.

The partners recognise that knowledge transfer is one of the key aims of the SIF, and that the benefits of this project will be maximised by the ability of other licensees to be able to learn from the Project so as to create improved outcomes or reduce costs for consumers. The partners do not anticipate that the Discovery Phase (or any potential subsequent phases) will result in the creation of IPR that cannot be freely disseminated, and have no expectation of creating income streams or royalties from IPR outside of participation in a competitive marketplace for services that may be informed or stimulated via the outcomes of the project.

Value for money

The total costs for the Discovery are:

Total Project Costs: £171,890

Total Partner Contribution: £25,953 (15%)

Total SIF Funding requested: £145,937

This is based on the following breakdown:

UK Power Networks – £23,445

Total costs: £26,050

Contribution: £2,605 (10%)

SIF funding request: £23,445

Baringa Partners – £98,940

Total costs: £116,400

Contribution: £17,460 (15%)

SIF funding request: £98,940

ICON – £23,552

Total costs: £29,440

Contribution: £5,888 (20%)

SIF funding request: £23,552

ICON (20%), Baringa (15%) and UKPN (10%) are contributing through investment in kind of days' effort. This demonstrates value for money by contributing more than the minimum 10% contribution requirement.

The team has been assembled with prior deep experience in flexibility modelling and domestic demand-side response propositions and have the relationships and expertise to deliver this work efficiently. We will leverage Baringa Partners' flexibility

business model valuation and forecasting capabilities and models, as well as ICON's expertise and tools for modelling energy systems to conduct a GB-wide cost-benefit assessment.

Baringa are a specialist energy consultancy with deep commercial and market expertise. We are aware that consulting rates will appear high compared to other rates. However, we believe they represent value for money because:

- Baringa's costs are based on their UKPN Framework Contractor rates, which has been determined through an ODEU-compliant procurement process run by UKPN, have been challenged competitively, and represent fair market value for the services required.
- Baringa are investing 15% of their costs. They are prepared to do this because the work is meaningful, exciting for their people, and deepens their relationship with UKPN and UKRI in the longer term.
- Baringa bring specific IP for use on the project, for instance in the form of energy market modelling software that they will use to model customer/housing archetypes, and informal access to a wide pool of experts and experience.

There are no sub-contractor costs, nor funding from other innovation funds. Partners will leverage their own facilities (e.g. offices and IT). Baringa and ICON will leverage background IP to assist in their roles.

The route to commercialisation will be in providing insight and tools to market participants to assist in understanding optimal ways to drive benefit with domestic batteries for all parties, and in developing propositions and business models. The route to BAU for the DNO will involve creation of support data and tools for participants, enabling DSO flexibility procurement from home batteries, and more accurate forecasting of domestic LCT impacts on the network to reduce network investment.

Supporting documents

File Upload

SizeWise - Show and Tell - Final.pdf - 634.9 KB
SizeWise - End of Phase - Final.pdf - 1.6 MB
SIF Round 3 Project Registration 2024-07-08 10_33 - 62.3 KB
SIF Round 3 Project Registration 2024-05-13 10_24 - 62.2 KB

Documents uploaded where applicable?

