SIF Discovery Round 2 Project Registration

Date of Submission

Jul 2023

Project Reference Number

10058665

Project Registration

Project Title

Dynamic Networks

Project Reference Number

10058665

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

Apr 2023

Project Duration

3 Months

Nominated Project Contact(s)

Ross Bibby - ross.bibby@sse.com

Project Budget

£154,748.00

Funding Mechanism

SIF Discovery - Round 2

SIF Funding

£139,273.00

Strategy Theme

Flexibility and market evolution

Challenge Area

Improving energy system resilience and robustness

Lead Sector

Electricity Distribution

Other Related Sectors

Electricity Distribution

Funding Licensees

SSEN-D - Scottish and Southern Electricity Networks Distribution

Lead Funding Licensee

SSEN - Southern Electric Power Distribution Plc

Collaborating Networks

Scottish and Southern Electricity Networks Distribution

Technology Areas

Commercial, Demand Response, Digital Network, Network Monitoring, Resilience

Equality, Diversity And InclusionSurvey

Yes

Project Summary

SIF Innovation Challenge 3: Improving energy system resilience and robustness invites applications that look at strengthening whole system resilience and robustness to achieve Net Zero securely.

Unprecedented growth in LCT connections such as Photovoltaic solar panels (PVs), Heat Pumps (HP) and Electric Vehicles (EVs), is triggering network constraints that may continue to increase as the uptake of LCTs gathers speed. Not being able to connect this demand quickly could delay the transition to Net Zero.

Theme: Accelerating the uptake of LCTs at residential level, both in new large housing or in large scale retrofits where network constraints would otherwise prevent connection

Scope: This project will develop technical, regulatory and commercial models to enable implementation of connections solutions for dynamically managed demand schemes, that can connect increasing LCT demands in constrained areas within network limits, without compromising customer needs.
The project will define technical requirements and specification for real time load management systems and explore the role of flexibility management platforms available today to control end point devices, such as EV chargers , HP and Solar PV.
The project will focus on developing a scalable, integrated approach by combining residential flexibility with automated control to manage constraints locally. The project will also explore potential for new products and services such as LV resilience and peer-to-peer trading behind network constraints.
Experience and Capability of Project Partners:
SSEN-D: as project Lead, SSEN-D bring extensive network knowledge and experience in network planning, connections and power flow analysis that will help to define the rules for site identification and implementation of the solution.
E.ON: acting as a technology supplier, will bring their Dynamix product, one of the potential technical solutions that can enable dynamic connections. They also bring experience in gathering consumer insights and developing and delivering energy efficiency solutions.

Baringa: bring an extensive track record of working on regulated energy market projects, experience of conducting economic analysis and calculating Social Return on Investment (SROI). They have extensive experience in innovation trials and Business as Usual (BAU) deployment of new connections products and solutions.
UKPN: while not a project partner, UKPN will provide objective oversight of the project and challenge assumptions, along with the experience of addressing similar challenges to ensure this project has relevance for all DNOs.
Who this will benefit: Housing developers, local governments and housing associations will benefit from quicker speed of connection, customers will benefit from reduced energy bills.

Project Description

As a provider of critical national infrastructure, Scottish and Southern Electricity Networks – Distribution (SSEN-D) play a critical role in the delivery of Britain's 10-point plan and Net Zero strategy that will accelerate the electrification of heat and transport.
Local authorities across Great Britain have declared climate emergencies and some, such as Greater London Authority (GLA), have set ambitious targets to achieve Net Zero by 2030.
As decarbonisation progresses, we face a challenge, across our network, in facilitating the required rate of Low Carbon Technology (LCT) connections in both new and existing homes. This is currently the case in West London where development of new housing or large-scale heat pump retrofits face delays out to 2035, whilst awaiting resolution of transmission level constraints. Networks must find solutions that will accelerate the domestic connections in constrained area to avoid delays for customers wanting to connect or upgrade their supply and avoid slowdown of NetZero transition.
SSEN-D, with project partners E.ON and Baringa, will develop and test a way of managing peak demand of residential developments, in real time (i.e., without predefined schedules), creating more headroom on the network in order to connect more properties in constrained areas. A dynamic connections product is a technical solution that will manage individual LCT devices to ensure the peak demand stays within the network capacity limits. It can provide a secure and reliable means for all new demand to connect more quickly, without the end users being inconvenienced.

In the Discovery phase we will explore how dynamic connections products can be implemented quickly within new and existing residential developments, in areas with capacity constraints.

The Discovery project will:
Explore scalable business and commercial models and the required regulatory landscape to enable dynamic connections products to be offered without the need for network reinforcement, and additional opportunities to provide value added services such as resilience.
Create a framework that can be adopted by other technology providers by developing the technical architecture, specifications, and

requirements for dynamic connections products to help DNOs improve integration of new demand in areas with demand constraints.
Undertake a whole system Cost Benefit Analysis outlining the costs and benefits of the proposal (economic, societal, stakeholder and environmental).
Develop robust assessment criteria and tools to identify sites suitable for such connections products and assess the impact of these changes on the network planning and connections process and new agreements.

Nominated Contact Email Address(es)

fnp.pmo@sse.com

Project Description And Benefits

Applicants Location (not scored)

SSEN - Southern Electric Power Distribution Plc

No. 1 Forbury Place, 43 Forbury Road, Reading, RG1 3JH

Project Short Description (not scored)

Dynamic Networks: Enabling faster LCT connections in constrained areas of the network, benefiting customers and accelerating Net Zero.

Video description

https://vimeo.com/769791925/802251cc97

Innovation justification

Problem:
In some areas of our Southern Electric Power Distribution (SEPD) network the rising demand for customer connections is exceeding the rate at which the capacity of the network can be increased, resulting in significant delays to connection for customers, both new developments and retrofitting LCTs to existing buildings, while waiting for long lead time network upgrades to be delivered.

Why it is Innovative
The Project explores the commercial/market models and regulatory frameworks required to support the adoption of new dynamic demand management schemes that can enable the connection of residential developments more quickly in constrained areas of the network. Such connections products would be a market first for residential customers in GB and would be instrumental in accelerating decarbonisation of households.

Knowledge Gaps:
Flexible connections have been used extensively in RIIO-ED1 for large connections, primarily to manage generation constraints, but the approach has not yet been explored for demand constraints.
While the technology has been proven in managing generation constraints, its installation at scale and across a variety of end point demand devices at residential level has not been tested. This Project will also define the roles and responsibilities of the participants to allow widespread adoption of this approach. The Project also aims to understand the longer-term optimisation of the assets to avoid stranding or to facilitate participation in different markets.
Work is also required to ensure that the regulatory framework does not act as a barrier to the deployment of this solution. In particular, this Project will explore the application of current roles for firm and non-firm connection definitions.

Value of the solution
The value of being able to connect low carbon homes, in advance of network reinforcement, will be measured against the carbon output that would otherwise be incurred, as well as the societal benefits from new housing and LCT usage. The Project will also explore the use of this solution as a tool for resilience, avoiding costs of network outages. This can also accelerate participation in flexibility markets for homeowners, creating additional financial benefits.

Why is this not Business-As-Usual?
The integration of these real time demand management solutions for domestic users within the GB marketplace has never been done at scale and an enduring business model has never been developed. There is lack of clarity on the value chain, business and commercial models and role that each participant would play.

Benefits Part 1

Environmental - carbon reduction – indirect CO2 savings per annum against a business-as-usual counterfactual
Financial - cost savings per annum on energy bills for consumers
New to market – products, processes, and services

Revenues - creation of new revenue streams

Benefits Part 2

Dynamic connections solutions will help accelerate domestic LCT connections, allowing DNOs to meet their licence obligations to facilitate Net Zero and will deliver wider socio-economic benefits such as
Increased job opportunities by improving the demand for installation services and facilitating new business;
Reduced demand for health services in SSEN's areas by improving air quality delivered through decarbonisation of heat and transport.

From SIF point of view, the project can deliver the following benefits.

Financial - Cost savings per annum on energy bills for consumers
As heat pumps are c. 30% cheaper to run compared to gas boilers, enabling installation of heat pumps at scale would help lower energy bills for customers. Deferring network reinforcement will lower associated DUoS charges over longer term.
KPIs to measure benefits:
Number of HP connections facilitated by the Dynamic Networks solution.
Average heating cost/KWh/ customer with heat pump compared to a boiler within a building archetype
Projected DUoS reduction for domestic customers.

Environmental - carbon reduction – indirect CO2 savings per annum against a business-as-usual counterfactual
Improving the speed of LCT connections will enable more customers to decarbonize their transport and heating needs earlier, leading to indirect CO2 savings.

KPIs to measure benefits:
Number of heat pumps and EVs (number of households) in SSEN-D's area compared to DFES assumptions

Revenues - creation of new revenue streams
Dynamic connections agreements will be a lower cost alternative to firm connections at domestic level and will provide connectees with access to new revenues through rewards during curtailment events.
KPIs to measure benefits
Total amount of curtailment rewards given to customers in a period
Number of customers benefiting from curtailment rewards

New to market - products, processes, and services
In addition to the primary benefits listed above, the project will deliver several secondary benefits. This may include connections advisory services from DNO to promote dynamic connections, new resilience and peer-to-peer trading products, which will enhance revenue opportunities for connectees
KPIs to measure benefits:
Number of DNO services and incentives available to residential customers
Number of residential customers participating in LV flexibility services

Indicative quantitative benefits
Dynamic connections can save c. 14% of planned LV reinforcement spend when deployed at scale, assuming results are similar to those at HV level and above using Flexible connections products. SSEN saved c.£60m in deferred reinforcement on an agreed baseline reinforcement expenditure of £437m in RIIO-ED1, can be achieved at LV level.

Project Plans And Milestones

Project Plan and Milestones

There are 7 work packages for the Discovery phase.

WP1: Project Management Managing the project plan, timeline and delivery of all work packages, and end stage report.

WP2: Technical Defining functional and technical specifications for the solution and determining required technical and commercial data flows, leading to a plan for the technological development of the solution.

WP3: CBA Delivering a high-level Cost Benefit Analysis comparing local grid management and grid infrastructure upgrades.

WP4: Customer and Stakeholder Engagement Identifying stakeholders, including other technology providers, to engage with in the Alpha phase and producing an Engagement Strategy.

WP5: Trial Site Analysis Developing trial site requirements to allow identification of appropriate location and recommending an appropriate trial site based on a high-level grid analysis.

WP6: Regulatory and Commercial Review Construction of commercial models needed to enable adoption of dynamic network solutions and reviewing current regulatory landscape to identify barriers to be addressed for adoption at scale. WP6 will make recommendations for high level solutions to be fully designed in Alpha.

WP7: Residential Demand Assessment WP7 will review current models for calculating demand figures for LCTs, and understand what changes or updates need to be made in order to create accurate models that can better inform network connection decisions. This will also clarify how the proposed load management solution will benefit network connections.

Risk Management

A number of project specific risks have been identified, and these will be managed by robust challenge of assumptions and clear mitigation strategies. Key risks are outlined below:

As this solution has never been tested at an LV level, there is a risk around ability to identify a viable commercial model that would benefit all participants.

Another risk to The Project is identifying necessary changes to regulation and policies – should these be impossible to navigate, it may bring the project to an end.

The market size for Dynamic Networks may be too small for the solution to be viable which could mean the application is not feasible.

Full risk register is available within the PM Book.

Constraints

We believe that there may be some barriers to residential flexibility that will require derogations in order to put the solution into practice. These will be explored in the Discovery phase.

Regulatory Barriers (not scored)

The Project has identified the issues below as potential regulatory barriers to the deployment of the solution.

Current scope of "Firm" and "Non-firm" access connections

Network access rights define the nature of users' access to the network and the capacity they can use and how and when they can use it, and if and for how long their access can be interrupted. As per the current regulations, a residential customer with a "standard connection" at distribution level, has a high level of firmness that can only be curtailed for planned maintenance activities. As the distribution network becomes more constrained, flexible, non-firm access arrangements such as flexible connections could be used by DNOs to plan and develop the network. However, under the current regulatory framework non-firm access options are not available to

small users such as households.

Dynamic connections – A standard or a flexible connections solution?

The real time load management solutions will curtail selected equipment such as solar PV, EV or HP at a domestic property in 'real-time' when the power flows reach the constraint limits set at the LV substation level. Hence, the proposed dynamic connections products do not entirely conform to the rules of a 'standard' or 'Firm' access connection solution defined by Ofgem.

Real-time curtailment, not forecasted

Currently, flexible connection contracts or non-firm access arrangements require network operators to provide a forecast view of frequency and duration of curtailment to the customer. The real-time feature of our proposed connections product means it will only act when needed, managing demand and generation within the constraint boundary. Due to this real time nature, network operators might not be able to provide a schedule of curtailment as is required with flexible connections contracts.

Our proposal during Discovery and Alpha phase

During the Discovery and Alpha phase, we will engage with the regulatory and connections teams in SSEN-D and UKPN as well as stakeholders in Ofgem to clarify what the barriers are and what derogations, if any, are required for the Beta phase. We will draw learnings to inform the discussions with stakeholders, build a case for derogations and shape the market arrangements for the trial.

Commercials

Route To Market

A standard specification for end-to-end residential load control will be developed alongside revised LCT After Diversity Maximum Demand (ADMD) figures in order to create a new BAU standard for the DNO connections process with the SSEN connections teams. A grid analysis methodology will also be developed to identify network constraint areas suitable for deployment of real time load management technologies. The outcome of this work will be disseminated freely.
Effectively identifying suitable areas will generate open market tenders and allow suppliers to provide their own load management solutions, including their individual IP, to resolve constraint issues. The chosen supplier will work together with the DNO and the party requesting the connection to ensure the solution is successfully implemented.
This proposal will seek to address any barriers that exist in the regulatory environment for residential flexibility and will clearly define the necessary foundations and revenue streams for load management approaches, further facilitating the creation of competitive markets.

Effective management of loads in constrained areas will benefit the end customer through faster connection times and allowing quicker decarbonisation of heat and transport. Accelerated network connections also brings secondary benefits in terms of job creation in the construction and LCT installation industries.
A key part of the proposal will involve completing cost benefit analyses (CBA) to ensure our network innovations are developed at market competitive prices to encourage large scale deployment long after SIF funding has ended. In addition, this project intends to integrate residential load management approaches into the common evaluation methodology (CEM) tool and create new CBA standards to encourage the uptake of load management from other DNOs.
Our primary users will be DNOs and large scale LCT deployers such as housing developers and local authorities. New developments will be the early adopters of these technologies due to installation of LCTs in new homes. However, the largest market for the Project's innovations is the retrofit market, as this too will need to become carbon neutral between now and 2050.
Once in place the new solutions will give customers the opportunity to participate in new flexibility markets increasing engagement in the longer term and ensuring the solution remains viable.

Intellectual property rights (not scored)

To ensure clarity is provided to the Project partners, UKRI and Ofgem regarding the intellectual property (IP) landscape, the Project is using an IP register to track the Background IP provided to the Project, the Foreground IP the Project generates, and the use and access rights to all this IP.

The main contract governing the Project (the Collaboration Agreement) will include detailed, mutually agreed terms governing IP that are in line with the SIF Governance Document. For the Discovery Phase, all the IPR arrangements will follow the default recommendations of Chapter 9 SIF Governance Document.

Costs and value for money

The total project cost is £154,748
The compulsory 10% contribution for the Discovery phase will be funded by SSEN-D.
Requested SIF funding - £139,273.56

The balance of costs will be funded through the SIF application
There are no subcontractor costs associated with this project

The project delivers value for money by developing a pathway to allow accelerated connection of LCTs both in new housing developments and in LCT retrofit in existing housing stock, primarily belonging to Local Authorities and Housing Associations. This will bring benefits in reduced carbon emissions and achievement of Net Zero targets, customers will see reduced energy and fuel bills due to improved access to LCT devices. There will be job creation benefits both in construction and LCT installation services and the Project will also explore opportunities to defer network investment.
The CBA analysis that will be undertaken in the Discovery Phase will quantify the benefits of the Dynamic Networks solution.

Document Upload

Documents Uploaded Where Applicable

Yes

Documents:

10058665 - Dynamic Networks_ProjectDirection.pdf

Dynamic Networks End of Phase Presentation Final.pdf

Dynamic Networks Show and Tell Presentation - Final.pdf

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SIF Discovery Round 2 Project Registration 2023-07-14 1_51 (1)

SIF Discovery Round 2 Project Registration 2023-07-14 1_51 (2)

This project has been approved by a senior member of staff

☑ Yes