SIF Discovery Round 2 Project Registration

Date of Submission

Apr 2023

Project Reference Number

10055259

Project Registration

Project Title

Net Zero Terrace

Project Reference Number

10055259

Project Licensee(s)

Electricity North West

Project Start

Apr 2023

Project Duration

3 Months

Nominated Project Contact(s)

InnovationTeam@enwl.co.uk

Project Budget

£151,966.00

Funding Mechanism

SIF Discovery - Round 2

SIF Funding

£129,519.00

Strategy Theme

Net zero and the energy system transition

Challenge Area

Supporting a just energy transition

Lead Sector

Electricity Distribution

Other Related Sectors

Funding Licensees

Lead Funding Licensee

ENWL - Electricity North West Limited

Collaborating Networks

Electricity North West, Northern Powergrid

Technology Areas

Community Schemes, Heat Pumps, Photovoltaics

Equality, Diversity And InclusionSurvey

Yes

Project Summary

The project sits under Innovation Challenge 1, Project Scope 2, and will focus on supporting the decarbonisation of heat for those consumer groups with reduced access to opportunities for decarbonisation by demonstrating the benefits of an integrated SLES. SIF is the most appropriate funding mechanism because there is a strong but indirect interest from networks in solving this problem; however, there are greater benefits to the consumer than the networks.

The community-led 'Net Zero Terrace' project will be the first to explore utilising a DNO network to decarbonise terraced communities through an integrated, optimised community virtual power plant, taking a smart integrated systems approach to low carbon heat. The benefits of this include enabling communities to decarbonise whilst reducing costs by avoiding the expensive counterfactual of direct electric heating and deferring network reinforcement. The shared heating system will comprise shared ambient loops, home thermal storage, home energy management and community storage, with the potential to provide flexible services to the DNO. The SLES will require a local energy market to operate in the form of a ledger platform (digital platform, aggregates generation and allows Power Purchase Agreement (PPA) transactions) to manage PPA contracts between the shared assets and individual homeowners.

Our project partners in the Discovery phase:

· Electricity North West (ENWL) – responsible for providing network data, financial information and understanding DNO network integration.

· Northern Powergrid (NPg) – another DNO, responsible for ensuring the model is replicable across GB.

· Buro Happold – responsible for providing expertise in decarbonisation of the built environment, including specialised knowledge on smart energy and low carbon heat systems. · RV Energy – local non-profit organisation working on Net Zero community services, responsible for engagement with households and wider community.

· Rossendale Borough Council – responsible for support and coordinating community engagement.

The project will also be supported by the BEIS-funded North West Net Zero Hub, which will assist in networking across the region and enabling dissemination and sharing of learning, including with other regional hubs.

Potential users of this innovation include:

· Consumers in terraced streets.

· Supply chain, including suppliers of LCTs and fabric retrofit – can adopt to develop new market opportunities at scale.

· Local authorities – can incorporate into their Local Area Energy Action Plans.

· Housing associations – can use to decarbonise their housing stock.

· DNOs – can benefit from improved understanding of how to integrate into the network, the network benefits and how it can help to deliver flexible services.

Project Description

Decarbonising urban areas is a complex problem, especially considering the electrification of heat and transport and its impact on the electricity network. The current strategy is around macro (heat networks centred around large loads and peripheral areas) and micro (individual homes) solutions.

Many communities, especially terraced streets, will not be appropriate for either solution. The micro solution of Air Source Heat Pumps (ASHPs) is not feasible due to space constraints, noise implications, efficiency losses, maintenance issues and risk of damage in a confined area such as a small back yard. Likewise, the macro solution of 4th generation heat networks proves challenging due to space constraints in locating energy centres and the scale of delivery needed to be commercially viable.

'Net Zero Terrace' is an innovative solution to these issues. It overcomes multiple barriers to the rapid deployment of low carbon, affordable heat at community scale. It will produce a replicable technical and financial model for decarbonisation of terraced housing that can be scaled and is appropriate for those that might otherwise be left behind.

Net Zero Terrace is a Smart Local Energy System (SLES) which will comprise ambient loop ground source heat pumps (GSHPs), community provided storage and solar PV and local peer-to-peer Power Purchase Agreements (PPAs) controlled by optimisation software. The project will provide a replicable model that integrates with the electricity network, reduces bills and defers the need for reinforcement. Its innovation lies within the integration and optimisation of community energy models for electricity and heat utilising the

Distribution Network Operators (DNO) network for fair distribution of generation and provision of flexibility.

This SLES will be up to four times more efficient than the counterfactual of electric boilers, and thereby considerably reduces both network capacity requirements and consumer bills.

As a case study the project focusses on a real community within Rossendale, Lancashire. Community engagement is already underway, facilitated by RV Energy, a local community energy organisation.

Activities in the Discovery phase include creating a modelled solution utilising real property data, techno-economic assessment and DNOs grid operating model studies, to enable quantification and appraisal of the benefits to both network consumers and the DNO.

It's value objectives include:

- Overcoming barriers to entry for consumers who could not otherwise afford to decarbonise
- Protecting consumers from fuel poverty through reduced bills
- Accelerating decarbonisation through enabling participation and uptake
- Being a replicable model that is scalable and deployable GB-wide

Nominated Contact Email Address(es)

innovation@enwl.co.uk

Project Description And Benefits

Applicants Location (not scored)

Electricity North West Ltd – Borron Street, Stockport, SK1 2JD

Buro Happold – Camden Mill, 230 Lower Bristol Road, Bath, BA2 3DQ

Rossendale Valley Energy – Alliance, 18-20 Market Street, Bacup, Lancashire

Rossendale Borough Council – Future's Park, Bacup, OL13 0BB

Northern Power Grid – Lloyds Court, 78 Grey Street, Newcastle upon Tyne, NE1 6AF

Project Short Description (not scored)

This project will demonstrate how to decarbonise an entire terraced street using a Smart Local Energy System that is integrated with the network, optimised, affordable to consumers and easily replicable through the UK.

Video description

https://youtu.be/J3bhpZ7VotM

Innovation justification

There are nearly 10 million terraced homes in GB. Many cannot easily transition to low carbon heating due to space and noise constraints, which risks leaving these communities behind, locked into higher energy bills and at increased risk of moving into fuel poverty.

Net Zero Terrace is innovative in its use of an optimised SLES, which integrates community heat, community generation and fair distribution of generation via the DNO network for a street of terraced houses. Previous uses of integrated technology have been limited to landlord-owned apartment blocks and private networks. This project is innovative because it is working across mixed ownership buildings for the first time and making use of the DNO network. This project is commercially risky because the finance model and consumer value proposition are novel and require demonstration.

This project will build on a previous high-level feasibility study, funded by the Community Renewal Fund project and led by RV Energy, supported by Rossendale Borough Council and delivered by Buro Happold. The feasibility explored all potential options to decarbonise a trial area in Bacup, Rossendale, and determined the best approach would be the SLES approach described here. However, it did not determine the technical or commercial requirements for deployment or prove the solution in the field.

The risks we are seeking to address centre around the level of integration needed between different stakeholders to develop and implement a system which relies on community investment, DNO integration and delivering consumer value.

The counterfactual solution to this problem, due to the constraints on space and noise pollution prohibiting installation of alternatives, is that consumers have no option but to default to direct electric heating (e.g. electric boilers), which could increase their consumption, and the corresponding DNO network capacity requirements, by more than four times.

Net Zero Terrace is replicable and scalable, and presents an economic and sustainable solution against this counterfactual. The technology used in this solution is retrofittable, providing opportunity to create demand and supply.

Please see the appendix for a project overview including a diagram for how the SLES might operate.

SIF is the most appropriate funding mechanism for Net Zero Terrace. There is an existing strong but indirect interest from networks in solving this problem; however, there are greater benefits to the consumer than the networks. Therefore, NIA is not a suitable funding mechanism and there are no other government subsidies to support this innovation.

Benefits Part 1

Environmental - carbon reduction – direct CO2 savings per annum against a business-as-usual counterfactual
Environmental - carbon reduction – indirect CO2 savings per annum against a business-as-usual counterfactual
Financial - cost savings per annum on energy bills for consumers
Financial - future reductions in the cost of operating the network
New to market – products, processes, and services
Revenues - improved access to revenues for users of network services

Benefits Part 2

Net Zero Terrace will deliver the following net benefits to consumers:

1. A significant reduction in bills compared to the counterfactual of direct electric heating, as direct electric heating is more costly to operate. The reduction in energy consumption predicted could save consumers up to 70% on their bills. Additionally, if forced to use electric boilers residents are likely to respond by turning their heating down to reduce bills, which can significantly impact comfort, health and building fabric condition.

2. In addition to reduced consumption, consumers may also receive payments for providing flexibility, and utilising community-funded generation will result in lower tariffs, leading to a further estimated bill reduction of 10%.

3. Reduced socialised costs of infrastructure expenditure will be realised through a reduction in peak energy consumption. These benefits will be quantified against the counterfactual for each locality where the solution is deployed and will include ENWL's costs for any network upgrades required.

4. Accelerating the decarbonisation of homes as low carbon heating becomes affordable and available to them. For every year decarbonisation is accelerated, the average household will save around 2.5tCO2e in carbon emissions, a figure that would continue to drop to almost a full reduction by 2040.

These benefits will be delivered through enabling an accelerated transition to low carbon heating, using more efficient heating sources than can otherwise be obtained by individual households. Shared community heating provides flexibility and reduced peak energy consumption, deferring network reinforcement requirements, which can otherwise be a barrier. Integration with community energy as an SLES further stabilises prices and reduces bills.

To enable the tracking of these benefits the following metrics will be used:

1. Peak and aggregated heat demand profiling from the SLES.

2. Metered energy costs against calculated bill costs derived from current actual bills and usage.

3. Local energy demand profiled against local energy generation to compare actual generation and actual consumption on a house-by-house basis.

4. Cost of implementation (capital and operational) compared to techno-economic assumptions to determine whether the actual business model performance aligns with the forecasted model.

5. Regular surveys of customer satisfaction via the Fairer Warmth App, conducted by RV Energy.

We will also be measuring to ensure the risk of negative impacts is fully evaluated and managed. For example, related to the project risk register, the potential for higher bills than anticipated or lack of consumer response and buy-in to the operating model.

Project Plans And Milestones

Project Plan and Milestones

The project plan contains nine work packages (WPs) – Gantt chart attached, project plan and risk register in Project Management Workbook. WPs, owners, funding allocation and success criteria are outlined below:

WP1 – Project management

Project management activities and progress monitoring.

Success criteria: key tasks/ milestones defined, regular meetings to identify actions and maintain progress.

WP2 – Regulatory review

Identify potential regulatory barriers and derogations required for progressing to Alpha and Beta stages.

Success criteria: report on regulatory barriers.

WP3 – DNO/DSO interface requirements

Identify operational interfaces to DNO system including physical connections and flexibility market mechanisms. Success criteria: report on identified operational interfaces.

WP4 – Community energy strategy

Develop strategy for consumer engagement, determining commercial routes to funding for community-owned assets, support of supplier engagement (WP7).

Success criteria: consumer engagement strategy produced.

WP5 – Spatial planning

Develop spatial plan assigning potential clusters for deployment/ engagement, considering utility assets, routings, allocation of future PV and heat networks, environmental screening.

Success criteria: spatial plan produced.

WP6 – System design

Explore technical design options, operating and business models, including two design reviews.

Success criteria: report on reference architecture, outline system design, high-level functional requirements.

WP7 – Supply chain engagement

Supply chain engagement to test and evaluate system and subsystem offerings in market, integrate into design.

Success criteria: report on supply chain engagement.

WP8 – Local authority engagement plan

Produce local authority engagement plan alongside RV Energy, defining local authority's role, processes for engagement and providing assets for integration, and procurement options.

Success criteria: local authority engagement plan produced.

WP9 – Benchmarking

Appraise and feedback on compatibility with other DNOs to ensure solution is scalable and deployable GB-wide.

Success criteria: Attendance at project meetings, review of draft outputs.

All regulatory, commercial and technical risks are identified within the risk register/ Question 8.

Main risks below:

· Economic – cost models cannot achieve price parity to gas/ acceptable operating costs, energy price instability affects service model/ rollout options.

· Social – lack of interest amongst target population.

· Financial – value for money case reduced, affecting business model.

· Commercial – supply chain restriction prohibits volume deployment.

The probability and impact of all identified risks have been evaluated on our risk register. We will continually review risks to ensure they are managed effectively and will create mitigating actions to implement should any risk be realised.

Regulatory Barriers (not scored)

There are a number of potential barriers to fully embedding the solution in business as usual. We will research these further during the discovery phase.

Installation of a shared ground source heat pump involves creating bore holes and an underground hot water pipe network to deliver ambient temperature heat to individual homes. This is not a new concept, but the application of it in the manner proposed here, is. Therefore, Net Zero Terrace will need to investigate whether existing regulations, including permits for bore hole drilling, wayleaves for highway disturbance, access to private property and the associated licences and permitted rights for individual contractors, are fit for purpose.

Heat as a service is currently an unregulated part of the utility sector which theoretically should reduce the barriers to entry for new service providers. However, the project will need to consider the longer-term policy direction that BEIS is taking in potentially applying regulation to heat service providers.

Installation of a community owned roof-mounted PV has implications for mortgage holders, housing association properties and those that are privately rented, which will need to be considered. For example, do current mortgage regulations accommodate situations where roof-mounted PV is owned by a third party? Does it impact the contract between a housing association and tenant or private landowner and a tenant?

Longer-term policy direction for the supply of electricity to local customers may affect the future embedding of the Net Zero Terrace solution. For example, there may be an impact if the Local Electricity Bill campaign is successful in enshrining into law the right for local communities to supply local customers. This could result in changes to the market conditions impacting the local energy market solution proposed by this project. Currently, the Net Zero Terrace solution will work within the existing licencing regime for the supply of electricity and use PPA managed through a local energy market software package.

Net Zero Terrace will gather evidence to influence policy and regulations by developing a

a methodology including significant stakeholder engagement to:

· capture and document all actual and perceived regulatory and policy barriers;

· capture evidence on how barriers could / do impact and how they can be overcome;

· communication of outcomes to the relevant stakeholders.

Derogations or exemptions from any policy will not be required to deliver the project.

Commercials

Route To Market

With a viable and profitable business model, the Net Zero Terrace street service model will stimulate and create demand at community scale across UK terraced streets. The UK supply chain will mobilise to meet this scaled demand; for lower cost heating, upgrades of building fabric, and delivery of SLES. Increasing resource/ skills/ jobs and creating economies of scale will bring competitive pricing advantage.

Successes and outcomes, including a tool kit describing the model and system architecture, will be disseminated and shared, ensuring the development of a competitive market. The supply chain will be consulted in the Discovery phase, with representatives embedded into the Alpha and Beta stages, to ensure suitable BAU adoption.

The implementation of the solution will require a collaboration between different parties working towards delivering the service offering. This will include at its core, Local Authorities, community organisations, DNOs and selected technology providers.

The system will be designed to be procured by local authorities, community groups and/ or new integrators offering energy services. The system will be managed and operated based on different ownership and operations of the subsystems. A community energy organisation may own and operate the solar PV system, selling energy to consumers. A separate Energy Service Company may own and operate the community heat system, whereby they will apply a long term standing charge to those connected to recover the initial CAPEX. The DNO may provide flexibility payments to either organisation, directly to consumers or via a separate aggregator, which procures and meters and distributes the value.

The value proposition to consumers enabling communities living on terraced streets to transition to Net Zero in an affordable way, which significantly reduces their bills and circumvents financial and societal barriers to entry. Customer bills can be significantly reduced, as per Q6, and requiring no upfront capital from householders makes the solution homogenous and inclusive, ensuring no one is left behind. Added value through healthy homes, air quality improvements, reduced bills and local energy spend, meaning a local economy multiplier effect.

The funding strategy is predicated on enabling, demonstrating and proving the viability of an investable new systems approach that will allow market entry by existing supply chains to provide these solutions. The project will develop both technical and commercial options, which will be tested and trialled with the supply chain with the aim of making the model commercially self-sustaining, with the ability to replicate and therefore scale at speed.

Intellectual property rights (not scored)

The project will comply with the default IPR arrangements in accordance with Chapter 9 of the SIF Governance Document.

For the Discovery phase all selected partners, whilst they have significant ability and the relevant expertise to deliver, are bringing minimal background IP to the project as they are not involved directly with the supply chain. This presents a real opportunity for agnostic development and dissemination to the project.

It is envisaged that through a process of consultation as part of the Discovery phase, selected partners in the Alpha and Beta phases will be bringing product and systems background IP to the project for their respective ‘subsystem’ commercial offerings. This will again be managed in line with the SIF Governance. The resulting systems IPR derived from the project that determines the integrated solutions and derived benefits will be considered foreground IPR in accordance with the SIF Governance. This will include the dissemination of a tool kit that can be used by the industry.

Costs and value for money

The total Discovery Phase cost is £151,966.00.

The total SIF funding request is £129,519.

Value for money

For the investment, there will be a significant leverage on the funding. The Net Zero Terrace model will be scalable and deployable GB-wide wherever there is a large number of communities with similar constraints to those described for Rossendale.

Even at Beta stage, the model will include an element of private capital investment into assets. The SIF funding being focussed on the

integration requirements to enable the system to operate effectively as a whole system.

Based on the outcomes of the previous study, which determined the SLES model is the best opportunity for decarbonising terraced communities like Bacup in Rossendale, the potential for consumer and network reinforcement savings would be considerable. The potential network CAPEX will be calculated in more detail during the Discovery Phase, but the Net Zero Terrace model will reduce the overall peak by 70% on networks as compared to the counterfactual. Consumer costs will be reduced by a similar margin. This would save approximately £2000 per household on bills as compared to the counterfactual assuming a price of 30p/kWh. Aggregated, this will save consumers many millions of pounds in energy costs whilst enabling the acceleration of electrification through mitigating barriers associated with grid reinforcement. Early indicators suggest this could save the average household approximately 10 years in transition, equating to an average of 2.5tCO2 per household initially, dropping to almost a full reduction by 2040. These benefits are in addition to the other benefits of enabling a model for deployment by the supply chain at scale, including the establishment of viable community energy solutions. This will create jobs as well as other social benefits, such as community benefit funds derived from revenues made.

Document Upload

Documents Uploaded Where Applicable

Yes

Documents:

SIF Discovery Round 2 Project Registration 2023-04-11 2_03

SIF Discovery Round 2 Project Registration 2023-04-11 2_03 (1)

SIF Discovery Round 2 Project Registration 2023-04-14 11_07

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This project has been approved by a senior member of staff

☑ Yes