SIF Discovery Round 2 Project Registration

Date of Submission

Apr 2023

Project Reference Number

10055401

Project Registration

Project Title

RetroMeter

Project Reference Number

10055401

Project Licensee(s)

Electricity North West

Project Start

Apr 2023

Project Duration

3 Months

Nominated Project Contact(s)

InnovationTeam@enwl.co.uk

Project Budget

£164,877.00

Funding Mechanism

SIF Discovery - Round 2

SIF Funding

£148,081.00

Strategy Theme

Net zero and the energy system transition

Challenge Area

Accelerating decarbonisation of major energy demands.

Lead Sector

Electricity Distribution

Other Related Sectors

Funding Licensees

Lead Funding Licensee

ENWL - Electricity North West Limited

Collaborating Networks

Electricity North West

Technology Areas

Carbon Emission Reduction Technologies, Demand Response, Measurement, Modelling

Equality, Diversity And InclusionSurvey

Yes

Project Summary

RetroMeter addresses SIF Round 2 Challenge 4: “Accelerating Decarbonisation of Major Energy Demands: Improving energy efficiency at all levels in the system”. It will implement P4P financing models based on metered savings calculations, which use smart meter energy consumption data and independent parameters such as external temperature data to construct reliable counterfactuals for energy consumption in buildings.

The innovative validation of achieved energy savings will encourage homeowners, landlords and local authorities to deploy retrofit energy efficiency measures to reduce energy consumption and provide potential additional flexible services, allowing DNOs to defer costly network reinforcement.

The Discovery Phase will be led by ENWL, and principally delivered by ESC, EPL, Carbon Co-op, supported by Manchester City Council.

In Discovery Phase, EPL will document the finance model options to be developed in the Alpha Phase, drawing on their experience from drafting the Green Finance Institute’s white paper for metered savings in the UK. ESC will draw on their expertise in smart meter data access/ governance and M&V baselining methods development gained from a previous metered savings research project (with EPL) during 2021/22, to make recommendations for suitable methods and datasets for development in Alpha Phase. Carbon Co-op will ensure that any financing models are deliverable by providing their extensive expertise in integrating retrofit delivery with energy technologies, through their dedicated retrofit team, and experience developing metered savings methods through their OpenEnEffS project. Each delivery partner will also draw on existing links to organisations piloting these finance models and methods internationally, including Recurve, Inc., NYSERDA, EnergyRM, and SENSEI.

The Discovery Phase project will be delivered through 3 key activities:

1. Develop a list of available and proposed UK energy consumption datasets, with access plans for each. (ESC lead)

2. Assess output parameters and current state of M&V methods and propose two or three methods for development in Alpha Phase. (ESC lead)

3. Identify barriers to P4P energy efficiency models; develop a least-cost quantitative model to value the benefits to householders, network users and DNOs; and propose and refine three delivery model options for development in Alpha Phase (ENW lead).

Beyond Discovery Phase, RetroMeter aims to build on existing metered savings and Energy Services Company (ESCo) design expertise from the Project Partners. It will implement the first metered savings-financed retrofit programme in the UK, emulating programmes already in existence in the US and solving for the first-tier problems of UK residential retrofit and grid optimisation.

Project Description

With electricity demand from homes set to double by 2050, DNOs are faced with a significant capacity problem, leaving networks either to reinforce the network in constrained areas or procure flexible services such as end-user energy efficiency.

Energy efficiency is considerably more attractive for consumers with home retrofit measures providing health and comfort benefits in addition to reductions in volatile energy bills. Historically, however, high capex has hampered consumer investment in residential retrofit, leaving them reliant on limited subsidy programmes or supplier obligations seen as a regulatory requirement rather than a business incentive. Established ‘pay-for-performance’ (P4P) schemes in the US offer a compelling alternative solution. In using advanced Measurement and Verification (M&V) techniques to accurately baseline energy usage, aggregators sell pooled savings from retrofitted homes to long-term finance providers in return for upfront investment in the cost of retrofit. This spreads the consumer’s costs, enabling them to experience the multiple benefits of energy efficiency upfront; meanwhile the finance provider generates returns through savings. This approach – Metered Energy Savings (MES) – could unlock massive investment in UK retrofit, and has been subject to considerable sector attention including from the Green Finance Institute (GFI) and BEIS. According to the GFI: “A home-grown approach to MES is critical for this valuable tool to gain traction in the UK. While seeing the concept demonstrated in other markets is helpful, and software and programme designs have matured as a result, a MES protocol in the UK must explicitly meet the demands of the UK market and engage with industry if it is to build awareness and acceptance.”

RetroMeter proposes the first MES demonstrator project in the UK, piloting baselining methods and verifying savings in a live retrofit scheme in Manchester. Sponsored by Electricity North West Limited (ENWL), the Project Partners will draw on their pioneering MES experience to:

a) develop methods and data access protocols (Energy Systems Catapult - ESC);

b) refine business models and financing offers (EnergyPro Limited - EPL);

c) explore public sector roles and support (Manchester City Council - MCC); and

d) implement methods, developed in Discovery and Alpha Phases, in a live area-based retrofit scheme in Manchester during Beta Phase (Carbon Co-op).

The overall aims are:

- enabling DNOs to quantify retrofit benefits against conventional options,
- facilitating mass retrofit as a solution to network constraints;
- increasing the attraction of residential retrofit as a financial product, enabling flows of capital into these programmes.

Third Party Collaborators

Energy Systems Catapult

Carbon Co-op

epGroup

Manchester City Council

Nominated Contact Email Address(es)

innovation@enwl.co.uk

Project Description And Benefits

Applicants Location (not scored)

Electricity North West Limited, Borron Street, Portwood, Stockport, Cheshire, SK1 2JD

The Society for the reduction of Carbon Limited, Bridge 5 Mill, 22a Beswick St, Ancoats, M4 7HR

EnergyPro Ltd, 7 Bell Yard, London, WC2A 2JR

Energy Systems Catapult Ltd, Cannon House 7th Floor, Birmingham, West Midlands, B4 6BS

Manchester City Council, Manchester Town Hall, Albert Square, Manchester, M2 5DB

Project Short Description (not scored)

RetroMeter will provide and demonstrate a consistent methodology to accurately measure the energy and cost savings of retrofits, unlocking pay-for-performance financing, increasing uptake and leading to reduced costs for consumers and additional flexible services for the DNO.

Video description

https://youtu.be/l91Xq5yfB9w

Innovation justification

Successive residential retrofit programmes in GB, such as the Green Deal or ECO, have struggled to incentivise mass uptake to address both the climate emergency and soaring energy bills. A principal barrier to these programmes has been the validation of achieved energy savings, as they rely on an outdated savings calculation methodology known as deeming. Deemed savings approaches ascribe a per-product savings figure before installation, which has been shown to systematically overestimate savings – handing windfalls to generators and preventing the efficient operation of a functioning retrofit market.

MES methods use comparatively low-cost statistical and machine learning principles to dynamically baseline energy consumption and reliably calculate post-retrofit savings. These methods hold great potential to unlock new sources of retrofit financing in the UK. Initially, measuring and valuing retrofit savings will help DNOs to make informed decisions regarding investment in either flexible services from energy efficiency or network reinforcement. Beyond this use case, these methods could unlock significant amounts of private financing for retrofit via energy performance contracting/ metered energy services agreements. This project will be the first of its kind to trial MES methods in a live area-based retrofit in the UK, answering calls from industry (GFI, 2021) and BEIS (call for evidence, 2019), in addition to a call for novel financing methods in the UK Heat and Buildings Strategy (2021).

Two major UK projects have investigated MES for retrofit financing: GFI (2021) and ESC/EPL (2022). GFI called for further work to develop an industry-accepted MES protocol to support confidence to invest in energy efficiency; ESC/EPL recognised some methods as fit for purpose with data aggregated across several household retrofits. RetroMeter seeks to a) inform a future MES protocol; and b) trial methods, including those identified in the ESC/EPL report, in a live area-based retrofit to demonstrate that such methods can be used to support investment in the manner described above.

Carbon emissions from residential buildings comprised 19.9% of the UK total in 2021; meanwhile domestic energy bill expenditure could reach 8.1% of GDP in 2022. This proposal – to pilot a system of cost-effective investment in residential energy efficiency – could ultimately save up to 25% of residential emissions, and a similar amount on bills (Rosenow, 2021).

SIF ideally suits this project, with its multi-year, multi-phase approach; opportunities for consortium partnerships; and significant capital grant opportunities. No other UK funding opportunities are available to support work of this scale.

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 for users of network services
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 - creation of new revenue streams
Revenues - improved access to revenues for users of network services

Benefits Part 2

Using RetroMeter would widen access for all consumers to the multiple benefits of energy efficiency improvements in the short term, including energy bill reductions, whilst spreading the considerable costs. One recent study found cost-effective energy efficiency procurement could save consumers £390pa on average, which is particularly pertinent now, with the squeeze on disposable income and energy price rises. There is also potential for consumers to participate in flexible services at individual building/ appliance levels – expanding Demand Side Response participation and enabling every householder to sell Energy Efficiency flexible services.

Reduced energy consumption afforded by the increased uptake of energy efficiency retrofit will reduce overall peak demand, leading to deferment of costly network reinforcement further reducing consumer bills. Additionally, the option of procuring flexible services will offer a cost-effective solution for network operation.

While RetroMeter focuses on the residential sector, given its urgent requirement for novel financing solutions for retrofit, metered savings approaches are equally applicable to commercial/ industrial network users. Benefits from demonstrating such approaches will translate to, and support, investment in energy efficiency in all built environment network users.

This expansion of metered savings approaches will enable replication of existing business models at larger scales. This will allow end users, who would otherwise be excluded, to participate in demand reduction, driving additional carbon and cost savings.

The reduced energy consumption will deliver a direct carbon saving, as overall energy generated will be reduced. Additionally, enabling consumers to better manage their energy will accelerate the uptake of low carbon technologies and behaviour change, and will highlight events that lead to wasted energy (e.g. changes to temperature setpoint).

Indirect carbon savings are achieved through deferment of network reinforcement and the associated embedded emissions.

RetroMeter will create new revenue streams. For example, metered energy data and analysis outputs, such as savings benchmarks, can be sold to other energy industry actors. The aggregated grid-service impacts and carbon savings could be validated and sold through flexibility and emissions trading markets. Additionally, the final methodology could be “white labelled” and sold to independent actors in the retrofit sector to help measure the performance and savings outcomes of their projects.

RetroMeter will give innovators and funders a proven methodology to demonstrate energy-saving performance, which would accelerate innovation in product offerings and therefore accelerate domestic decarbonisation in GB.

Metrics to quantify these benefits will predominantly be avoided reinforcement costs which are calculated via conventional ENWL CBA tools.

Project Plans And Milestones

Project Plan and Milestones

Work Package (WP) 1: Data Access and Governance

WP1 establishes the parameters to be monitored in later phases and prepares data access plans accordingly.

Milestones:

i) dataset scope established (Success Criteria (SC): data landscape established);

ii) available datasets identified and access plan prepared (SC: 1,500-word summary report); and

iii) additional data requirements confirmed (following completion of WP2) and access plan prepared (SC: 1,500-word summary report).

Risk: no suitable datasets exist/ access requirements prevent use during Alpha.

Mitigation: early engagement with data providers.

WP2: Methods Development

WP2 defines the methods landscape and associated data requirements (feeding into WP1) and selects three pre-retrofit baselining methods from a range of contemporary approaches used in research and practice.

Milestones:

i) confirmation of output parameters of interest to energy savings and finances (SC: should specify at least one of emissions and comfort);

ii) confirmation of savings accuracy evaluation metrics (SC: live P4P programme precedent required); and

iii) report on suitability of different methods (SC: data requirements, computational complexity and reliability of three proposed methods confirmed).

Risks:

i) selected methods present implementation difficulties in later phases;

ii) no contemporary M&V methods can baseline energy consumption with sufficient accuracy to satisfy the risk appetite of finance providers.

Mitigations:

i) selection of multiple methods;

ii) Alpha-phase testing of method suitability; WP3 to research finance provider risk appetite.

WP3: Valuation and Business Model Design

WP3 examines the proposal's strategic business case and defines options for the roles of various investment/delivery system actors.

Milestones:

i) techno-economic analysis optimising tradeoffs between consumer and DNO energy efficiency needs (SC: three potential value scenarios released); and

ii) delivery model report released (SC: three corresponding delivery models released, defining each actor's roles and constraints

(including risk appetite)).

Risks:

i) lack of relevant data for network constraints and benefits/ costs of retrofit;

ii) difficulties arranging workshops/ interviews for delivery model design.

Mitigations:

i) early engagement with ENWL team; literature review, provision of Carbon Co-op retrofit data;

ii) schedule interviews prior to Discovery commencing.

WP4: Project Management

WP4 co-ordinates weekly meetings, project progress updates, and risk management.

Milestones:

i) project kickoff (SC: confirmation to Ofgem/InnovateUK); and

ii) release of final Discovery Phase report (SC: report summarising outputs from WPs 1-3).

Risk: staff absence

Mitigation: Partners have processes to ensure key skills/ expertise remain available to support throughout.

Regulatory Barriers (not scored)

In the short-term, the principal immediate regulatory consideration is that GDPR restrictions around access to household-level energy usage data (e.g. smart meter data) make developing a metered energy savings solution significantly more complex. In the United States, where metered savings-based investment products have enjoyed greatest success, data privacy regulations are less stringent than those brought about by EU/UK GDPR. RetroMeter's proposal to implement such solutions in GB therefore faces regulatory hurdles not in place elsewhere. One key objective, as described in WP1, is to design access strategies for sensitive smart meter data that comply with comprehensive UK data protection regulations. This is not expected to hinder the development of the Alpha and Beta phases, since the Project Partners have previously engaged in methods development and data access techniques compliant with UK regulation. One example of this is the ESCs use of its secure Living Lab smart meter database for analysis in its previous funded metered savings project.

In the long term, one potential barrier is the lack of an accepted metered savings protocol as maintained by the independent ASHRAE and the IPMVP in the United States. This could have knock-on effects for the likelihood of insurers to underwrite the relevant energy performance contracts (or similar) and for finance providers to invest in energy efficiency. While this could be maintained by government (BEIS, DLUHC or Ofgem), BEIS has previously stated that it expects industry to develop a metered savings protocol independently. The project consortium will therefore seek to promote the outputs of this project with appropriate industry actors (e.g. GFI, BRE, CIBSE, UK Finance, Association of British Insurers) via a dedicated stakeholder advisory group to design a functioning protocol to govern metered savings-based investment products so that the commercialisation goals of this project can be realised. The Project Partners are already well-networked with such groups, having previously contributed to GFI's metered savings coalition and engaged BEIS, Ofgem, CIBSE and BRE through existing projects. The outputs of this protocol development would then be fed back to government to allow for appropriate policy responses. It is anticipated that such a protocol would be considerably advanced by methodology development in Alpha Phase and demonstration in Beta Phase.

RetroMeter does not require any derogations or exemptions from regulatory requirements.

Commercials

Route To Market

The issue of network reinforcement vs. efficiency/ flex investment raised in the Project Description is already creating problems for networks; ENWL predicts that during RIIO-ED2 the estimated load growth of 5TWh would result in many more substations becoming overloaded and requiring intervention.

Consumer interest in novel energy efficiency financing is already strong. One recent GFI report found nearly 90% of homeowners regarded energy efficiency as 'important' or 'very important'; however, only 20% could invest in measures themselves. By verifying energy efficiency savings, this innovation would enable householders to secure long-term retrofit financing and experience the multiple benefits of energy efficiency more quickly. Financial institutions have already expressed interest in this innovation, with many contributing to the GFI's Metered Energy Savings Working Group during 2020-21.

RetroMeter therefore seeks to align emerging DNO investment priorities with existing consumer demand for energy efficiency. It also opens the possibility of secondary financing for energy efficiency. The market-based model is tailored towards developing innovative financial products for energy efficiency and is therefore expected to contribute towards the development of competitive markets.

ENWL, as project lead, will be responsible for promoting the innovation accordingly as the SIF project progresses. ENWL will engage with other DNOs throughout the SIF stages to promote this technology, beginning with UKPN, which has already expressed interest in collaborating in Alpha Phase.

As an existing one-stop shop retrofit provider, with extensive links to GM householders and metered savings expertise through its project OpenEnEffS, Carbon Co-op will be responsible for implementing the innovation in the first instance. Carbon Co-op will promote this approach with other energy services co-operatives throughout the UK to ensure it can be scaled nationally, and intends to use an open-source methods approach to support scalability. At the finance end, meanwhile, EPL will use its existing links with GFI and other groups to promote the outputs of this work in the form of a financing protocol for retrofit investment.

Following Beta Phase, the primary customer segment will be retrofit evaluators and DNOs seeking to verify the impact of fabric efficiency upgrades.

The innovation is anticipated to become self-sufficient following Beta Phase: the methodology itself is highly replicable, with minimal capex costs (if open-source), and – depending on savings magnitude – the demonstrator pilot is expected to produce a ready-for-market financial product for independent finance providers to invest in retrofit.

Intellectual property rights (not scored)

Each partner within the consortium will comply with the default IPR arrangements in accordance with Chapter 9 of the SIF Governance Document.

For the Discovery phase all selected Project Partners, whilst they have significant ability and the relevant expertise to deliver, are bringing minimal background IPR to the project.

ESC has background IPR in the form of knowledge around metered energy savings, as well as data and methodologies used for assessing different metered energy savings models. ESC supports the shared intention to produce an open-source methodology, and will approach any decisions on licensing of new IPR with this intention in mind.

EPL has some relevant background IPR in the form of know-how regarding energy efficiency, measurement and verification, 'metered energy savings' and the design of P4P energy efficiency schemes. EPL notes the consortium's shared intent to produce open-source, public domain resources as outputs of this project, and will approach any decisions on licensing of new IPR with this intention in mind.

Carbon Co-op is an open collaboration and innovation organisation, which publishes and licenses its work in order to maximise reuse and replicability, via the use of open-source licensing for software development and public release of its research process and findings. Carbon Co-op's preference is for the outputs of the project to remain open-source, though recognises this may be contingent on the terms of any Funding Agreement with the Project Funders and the outputs of the Discovery Phase project.

MCC has no relevant background IPR.

Costs and value for money

The total Discovery Phase cost is £164,877.

The total SIF funding request: £148,081.

WP1 (Data Access & Governance) will provide access to high-quality energy consumption data that is critical in the development of a clear list of available and proposed UK datasets, with access plans for each. This accounts for around 14% of the total project costs.

WP2 (Method Development) will be required to access appropriate methods for development in Alpha Phase. This accounts for around 27% of the total project costs.

ENWL will lead WP3 (Valuation and Business Model Design), which will develop a proposed delivery model for Alpha phase and wider rollout of a metered savings-based energy efficiency programme, incorporating estimates of the value of such a programme to ENWL and network users. This accounts for around 40.5% of the total project costs and will include key deliverables from Carbon Co-op, EPL, and MCC.

WP4 (Project Management) is critical to ensure effective management and co-ordination of the project itself (all WPs) to drive maximum benefit and efficiencies, prevent value leakage and have in place strong Project Partner relationship management. This accounts for around 18.5% of the total project costs.

Document Upload

Documents Uploaded Where Applicable

Yes

Documents:

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WP1 - Data Access and Governance.pdf

WP2 - Methods Development.pdf

WP3 D1 Literature Review on EE Valuation.pdf

WP3 D2_Householder P4P demand assessment report.pdf

WP3 D3 Regulations & D4 Constraint Zones.pdf

WP3 D5-D8 Delivery Model Options.pdf

WP4 M3 Discovery Phase Report.pdf (1)

Retrometer – Show & Tell Presentation

This project has been approved by a senior member of staff

☑ Yes