WP5 D2: RetroMeter Advisory Board and Stakeholder Report

RetroMeter Alpha (SIF)

Date: March 2024

Author: Carbon Co-op and ep group

Acronyms

ABS:	Area-based Scheme
BSI:	British Standards Institute
BTS:	Build Test Solutions
DCC:	Data Communications Company
DESNZ:	Department for Energy Security and Net Zero
DNO:	Distribution Network Operator
EDOL:	Energy Demand Observatory and Laboratory
ESG:	Environmental, Social, Governance
GFI:	Green Finance Institute
HLP:	Heat Loss Parameter
HTC:	Heat Transfer Coefficient
MES:	Metered Energy Savings
NHR:	National Retrofit Hub
NGESO:	National Grid Electricity System Operator
PAS:	Publicly Available Specification
RdSAP:	Reduced data Standard Assessment Procedure
RSTG:	Retrofit Standards Task Group
SERL:	Smart Energy Research Lab
SHDF:	Social Housing Decarbonisation Fund
SIF:	Strategic Innovation Fund
SMeter:	Smart meter enabled thermal efficiency ratings
SMS:	Smart Meter System
UKRI:	UK Research and Innovation

1. Introduction

Carbon Co-op and ep group have prepared this report, which focusses on the advisory board and sectoral engagement of the RetroMeter Alpha phase. Under work package 5, the project is aiming to broaden stakeholder engagement and participation. To do this, the advisory board which was first held in the Discovery phase, was reconvened with the objective of receiving and incorporating expert input and highlighting challenges to the project. Project partners also co-ordinated sectoral engagement with a range of stakeholders outside of the advisory board meetings. See appendix A for the stakeholder register, which was used as a source to draw the advisory group members and stakeholder engagements from, as well as a contact list for the dissemination outputs of the project.

2. Project specific conditions

Under the project's specific conditions, it is a requirement to show how the project has incorporated Great Britain focused energy efficiency research into the project to ensure the project's proposed solution will be applicable to the national context. To do this, under project condition 4 the project is required to include how energy efficiency research through the Smart Meter Enabled Thermal Efficiency Ratings (SMETER) programme and University College London's Smart Energy Research Lab (SERL) are being incorporated into the project. Furthermore, under project condition 5 the project is required to engage with the British Standards Institute (BSI) as a key stakeholder in the Alpha Phase and provide a summary of the engagement, including consideration for how the project may seek to incorporate its findings and proposed solution into a Publicly Available Specification (PAS) standard.

Specific engagements were undertaken by the project team: -

- ESC met with the lead author of SMETER several times, in addition to relying heavily on the SMETER papers and data. This improved understanding and use of the SMETER, which was essential for the physics-based methodology. (see section 3.2).
- The project partners met with Project Lead investigator of SERL (see section 3.14).
- ep group met with the Lead Standards manager and Sector Lead in Built Environment at BSI, who also works with Department for Energy Security and Net Zero (DESNZ) on PAS development (see section 3.6). This was to ensure PAS are integrated in the further development of RetroMeter and Metered Energy Savings (MES) methods. The key outcomes and takeaways from this session are as follows:
    - RetroMeter has been allocated a timeslot, and planned attendance, represented by ep group, at the upcoming Retrofit Standards Task

Group (RSTG) meeting at the end of April, where RetroMeter and MES methods can be promoted, critiqued, and ideas about the further development or integration of the methods within BSI / PAS approaches could be raised and discussed further.

- The input of the RSTG working group, along with BSI's influence more generally, would support the ongoing outcome of pursuing the development of an industry-accepted MES standard through the following sources: *an industry coalition, productised private service, and DESNZ- or Ofgem-led working group.* The importance of this standard is discussed further within the Work Package 3 Milestone 3 report.

3. Advisory Board

3.1 Advisory Board membership

Three advisory board meetings were held over the course of the project, which involved discussions with a variety of experts in the industry. See below the membership of the advisory board and their attendance across the meetings.

Role/ Organisation	1st Advisory group	2nd Advisory group	3rd Advisory group
Head of ED2 Net Zero: Strategic Investment, Ofgem	✓	✓	
Technical Director, Parity Projects		✓	
Senior Strategy Consultant, Longevity Partners	✓	✓	
Head of Insights and Impact, Innovate UK (Strategic Innovation Fund)			✓
Senior Innovation Lead: Construction and net zero, Innovate UK	✓		
Head of Partnerships, Green Finance Institute	✓	✓	✓
Senior ESG Strategist, DWS	✓	✓	✓
Professor of Energy and Environment, Bartlett School of Environment, Energy & Resources, University of Oxford	✓	✓	
Greenhouse Gas Emissions Scientific Officer, Department for Energy Security and Net Zero			✓
Director of The Bartlett School of Environment, Energy and Resource UCL		✓	

3.2 Advisory Board meetings

3.2.1 Advisory Board meeting 1: 11th December 2023

The first advisory group meeting introduced the RetroMeter project and the relevant project team members presented on each work package.

Electricity North West highlighted the importance of the projects for energy networks in the UK and shared how the project seeks to answer the following questions: -

1. Where we are utilising home energy efficiency measures to provide a demand reduction in return for payment, how do you baseline and then measure the savings? There is not yet a UK standard of baseline that monitors that.
2. Where DNOs are forecasting demand growth associated with electrified heat- how should DNOs account for efficient savings as part of retrofit?
3. How do installers of electrical heating equipment know what equipment to install and declare on their application forms for connections to the network?
4. How to give credible advice to stakeholders on benefits of retrofit?

ESC introduced their methodology work, which focuses on homes with gas heating and uses smart meter data and external temperature.
They introduced the first part of their work on testing the OpenEEMeter methodology in the UK context. The OpenEEmeter model has hourly and daily models, and can be aggregated to the monthly level, with ESC focusing on the daily model.

ESC also introduced the physics-based methodology. This model accounts for comfort take back and is similar to SMETER. It has been designed in a way so that it does not require pre-retrofit internal temperature, which would have presented challenges in collecting that data.

ESC sought feedback on the following questions:

- Comparison based methodology relies on a continued stream of smart meter data on non-retrofit homes to do the matching on. How might this be sourced on an ongoing basis? Ability to define groups of homes (i.e. archetypes)- possibility to publish savings on an ongoing basis.
- Focus on gas metered homes- could there be ways of being broader?
- How to deal with homes which have changes in behaviours/ occupancy that render our approach less accurate?

ep group highlighted the rationale for the project with regards to increasing investment in energy efficiency. They introduced the two-pronged approach to developing business models; a societal/ regional scale and motivating different delivery actors to engage, while defining what a successful retrofit delivery model looks like and sought feedback on:

- Different opinions on characteristics of a successful retrofit?
- Any value streams not considered?
- How best can we lobby for support for MES with policymakers?
- Other challenges with delivery and verifying the value of whole house retrofits?

Carbon Co-op introduced their work packages on householders' engagement, data collection and beta planning, and sectoral engagement and dissemination. The alpha phase focusses on designing how to engage with householders and collect data, and this was discussed through the two potential pilot projects: area-based schemes (ABS) and Manchester City Council Social Housing Decarbonisation Fund (SHDF). With regards to data, the development of a new smart meter onboarding and consent process, and gathering of temperature sensor data from within the home, were discussed. They sought feedback on:

- What additional data other than what is outlined should we be gathering?
- What should we consider a valid scale for a beta pilot, given the difference in delivery models being explored- one very large and one very small
- Are there any interesting precedents around householder messaging/ communication on MES that we should look at?

Additionally, the advisory group were asked more general engagement questions such as:

- Thoughts on specific themes and topics
- Stakeholder groups, networks or individual organisations we could engage with.
- Policy barriers or policy enablers?

Discussion and next steps: -

There was a discussion about the comparison-based methodology and how this relies on a continued stream of smart meter data on non-retrofit homes as well as the project's focus on gas metered homes. The advisory group advised that time of use tariffs are only relevant post retrofit if a heat pump is used post retrofit. In relation to smart meter data and access to this, it was highlighted that 60% of gas-powered homes have a smart meter where energy suppliers have primary access, but households own their smart meter data in the UK. This presents barriers to data access, which is different to the US.

In relation to the business model, there was a discussion about the sizeable stack of health improvements that retrofit could create and that institutional health actors should therefore be involved, which ep group are looking into further, as it is recognised that benefits to households and society go beyond energy savings and finance. There are benefits associated with the greater good, community or area improvement, and health.

For the householder engagement led by Carbon Co-op it was suggested that Living Lab members could allow access to their smart meter data, and that they could be asked to join more proactively.

With regards to stakeholder engagement, suggestions were made to broaden the advisory group by reaching out to finance groups. It was also suggested that further engagement with those who have existing relationships with homeowners would also be useful. Carbon Co-op and ep group took these ideas forward.

The first advisory group meeting allowed the project team to introduce the project and gain insight in relation to the current challenges. Following on from the meeting, ep group took up the action point to follow up discussions regarding the business model financing with the Green Finance Institute and engage with banks and investors. ESC undertook to also consider how to involve Living Lab Members, however they found at a later stage in the project that there were issues with data quality with Living Lab data.

3.2.2 Advisory Board meeting 2: 29th January 2024

ESC built upon the previous discussion on OpenEEMeter. It was explained that the methodology can be used for baselining gas in situations where there are energy efficiency retrofits in homes which are gas heated pre-retrofit. They indicated that the daily model was not performing as well as they would have hoped, and that by aggregating to a monthly level, the results are better but still not good.

As part of the work on physics methodology, ESC discussed trying the SMITE Heat Transfer Coefficient (HTC) model and the challenges they found as it is hard to detect heating demand in the data in some homes.

ep group shared the next steps to continue exploring the value proposition and business model canvas for the Aggregator / Delivery Body and proposed a quality assured, project life cycle for retrofit scheme design. ep group have focussed on regions and places where it would be valuable to understand how retrofits could support decarbonisation of the grid more widely from a national perspective. They also discussed how to enable different retrofit providers to use different approaches as community level approaches will vary. ep group discussed with the

advisory group about the development of a proposal for a 'data warehouse' and who might be involved in this and how the ownership of data might work.

Ep group sought feedback on the following:

- Are there any roles/ responsibilities you think we missed?
- How best can we lobby for support for MES methodologies with UK policy makers?
- What barriers have you identified in delivering and verifying the value of whole-house retrofits?

Carbon Co-op discussed the mapping of engagement approaches with householders, and where piloting/ testing is possible given the timescale available. The team is building a better understanding of two different engagement models - Area Based Scheme (ABS) and Social Housing Decarbonisation Fund (SHDF) and the processes for households to consent to sharing of their smart meter data were outlined.

Carbon Co-op sought feedback on the following:

- Examples of data sharing process flows or mechanisms suitable for small scale organisations - perhaps housing provider to conduct all engagement, organisation like Carbon Co-op come in at a later stage
- Householder messaging/communication on metered energy savings - how to pitch - sweet spot between building understanding of householders about what data is being used for without overwhelming them.

Discussion and next steps: -

On the physics methodology, there was discussion that any amount of pre-retrofit metering/ monitoring may be helpful in redefining/ validating baseline models on an individual home basis.

With regards to the business model, there was discussion about the need to focus on customer value proposition, and to put consumers at the centre of the business model.

Advisory group members argued that MES won't be successful for all other stakeholders unless household engagement is right. The members emphasised the importance of household engagement, and the importance of householder participation and consent in relation to data, as without householders participating and consenting it won't work.

The importance of identifying parallel markets to learn from was emphasised.

The importance of engagement with the British Standards Institute (BSI) was discussed, otherwise it may lead to a wild west of different models. Following on from this, ep group undertook organising an engagement with BSI.

Advisory group members suggested to ep group to look at how ESG (environmental, social, governance) data management platforms work for a reference data warehouse business model- who owns the data, who owns the notional portfolios that might be subject to modelling/retrofit.

Following on from this advisory group meeting, the Professor of Energy and Environment at the University of Oxford undertook to join the project team for an individual meeting. This engagement is detailed in the sector meetings and activities in section 2.

3.2.3 Advisory Board meeting 3: 4th March 2024

- Electricity North West introduced the final advisory group and highlighted that the alpha phase of the project has nearly finished. They stated that RetroMeter has found that there are methodologies for MES which could be used by electricity DNOs or external parties participating in DNO services, however direct benefits to the DNO are hard to quantify using current Ofgem cost benefit analysis tools. There are significant benefits beyond the DNO use case and they will investigate whether DNOs can use some of the outputs. The current Ofgem price control methodology states that DNOs need to see problems appearing on the network before fixing them, so this presents a challenge to the business case for RetroMeter. This raised questions on the next steps and way forward for SIF beta phase, but there may be opportunity to explore other funding options.

ESC discussed the comparison and physics methodologies. The comparison methodology is an effective way of accounting for external factors, and is significantly better than OpenEEMeter in isolation. The challenge is ongoing access to comparator groups, and their smart meter data. The physics methodology is less focussed on core energy savings and more focussed on comfort rather than cost savings. ESC sought feedback on:

- Maintaining comparison groups during evaluation periods over multiple years will be challenging due to occupancy changes, privacy protection and commercial friction- are there any other unforeseen challenges that we might have missed?
- Applying RetroMeter to heat pump conversions needs assumptions about boiler efficiency, Heat Loss Parameter (HLP), and the heating schedule- is it reasonable to make assumptions about these or is the uncertainty typically much too high?

ep group discussed the role of the data warehouse and had started to define the data warehouse and key factors. They have looked at how data privacy concerns overlap with commercialisation. They said the end goal is to have a set of procedures for a retrofit provider to integrate a metered energy savings approach. ep Group sought feedback on:

- What thoughts do you have on our focus on the Aggregator? Are there additional services or perspectives we should integrate?
- Are there any key stakeholders or stakeholder channels you recommend we integrate as part of our proposed upscaling approach and recommendations?
- Are there any specific elements of the adoption of MES-enabled retrofit designs that we have missed or should refocus on throughout Milestone 3

Carbon Co-op discussed progress on smart meter sign up, challenges with data sharing agreements and benefits of liaising with data related partners (Hildebrand, Switchee, Daikin etc.). On householder engagement, within the ABS there is a good level of buy-in from households but this is very small scale. Whereas, with the social housing model, there are benefits at a medium scale but there are challenges interfacing with SHDF. There are challenges engaging with households on metered energy savings given that the methodologies are less accurate at the individual property level.

Carbon Co-op sought feedback on:

- Examples of data sharing process flows of mechanisms more suitable for small scale engagement organisations.
- Are there any interesting precedents around householder messaging/ communication on metered energy savings that we should look at?
- Are there any specific themes or topics we should address in our dissemination activities (webinars, blog posts, briefing notes)?
- Are there stakeholder groups, networks or individual organisations we should be engaging with?

Discussion and next steps: -

ESC discussed with the advisory group how people would use the methodology when there is a heat pump involved, and explained that this depends if it is a requirement to measure the savings due to fabric and heat pump separately, or if it is acceptable to measure the savings bundled together.

There were then further discussions on accessing data on comparison groups on an ongoing basis – options discussed were: -

1. Embed MES with energy suppliers who already have smart meter data access, incorporating MES into the ECO scheme
2. Work through SERL to obtain comparator group data
3. Use pre-aggregated electricity network data published by networks, however electricity DNOs do not have access to gas data, on which the methodology testing work has focused.

There were discussions about the level of demand for financing retrofit, therefore ep group are going to investigate different blending of private and outcome finance for small and larger schemes and consider the variety of stakeholders which could be fund or investor, but also a bank, holding mortgages and also loans to SMEs.

There was a discussion about engagement with the Green Homes Finance Accelerator program and with smart thermostat companies, followed by a suggestion that smart thermostat companies may have own business models that may or may not align with MES business models. The project team undertook to review these suggestions and how they apply to their individual work packages. Following on from the final advisory group meeting, ep group will continue to work on the refinement of data warehouse model in line with suggestions.

There was a suggestion from an advisory group member that the briefing notes could be tailored for different audiences including DNOs and energy suppliers, and Carbon Co-op undertook to gather contacts of DNOs and energy suppliers to share dissemination work with, particularly briefing notes which would be customised separately for DNOs and energy suppliers. This suggestion informed how the briefing notes for the dissemination work package have been organised, with six briefing notes for six different audiences (Policymakers, investors, retrofit providers, householders, electricity network operators and energy suppliers).

4. Sectoral meetings and activities

During the Alpha phase, the RetroMeter team conducted 14 external stakeholder engagements, as detailed below.

4.1 Energy Innovation Summit

Date: 31st October- 1st November 2023

Electricity North West attended the Energy Innovation Summit and played the RetroMeter 60 second video on loop at their stall. They also had many conversations with various people attending the summit.

4.2 Loughborough University, Lead Author of SMETER Study

Date: 8th November 2023

ESC met with the lead author of Smart Meter Enabled Thermal Efficiency Ratings (SMETER)[1]. The purpose of the meeting was to discuss the work on SMETER and share learnings. The SMETER study used end-terrace, semi-detached and detached housing because flat and mid-terraces are difficult to model. Therefore, SMETER buildings could not be too diverse (or nationally representative) to not disadvantage participants.

There is follow up research ongoing based on the SMETER project with rollout nationwide, space heating prediction (Heat Transfer Coefficient better than Reduced data Standard Assessment Procedure (SAP) across 70 houses. DESNZ are keen to work with ESC on this.

Engagement continued throughout the project via email exchanges and a couple of short calls to explore specific details of the methodology and data.

These engagements:

- Improved understanding and use of the SMETER data, which was essential for the physics-based methodology.
- The initial core physics-based methodology was based on a SMETER paper, which was reproduced with support from these discussions.
- Helped steer methodology development towards fruitful avenues based on others' learnings.

4.3 Build Test Solutions

Date: 13th November 2023

ESC engaged with Build Test Solutions[2] (BTS) and discussed the work BTS do. They discussed: -

- Mean temperature of rooms taken
- Easier across groups of houses
- Smart meter - with estimated internal temperature

This informed the development of the physics-based model, helping steer the physics-based methodology development towards fruitful avenues based on others' learnings.

[1] SMETER is an innovation competition funded study for the development and testing of new methods of measuring the thermal performance of homes using smart meter and other data.

[2] Build Test Solutions develop and manufacture unique products and smart technologies designed for energy assessors, building surveyors, the construction industry, utility suppliers and other built environment experts. https://www.buildtestsolutions.com/about

4.4 Centre for Net Zero

Date: 18th January 2024

A member of the RetroMeter Advisory panel and ep group met with the Director of External Affairs and a Policy Manager at the Centre of Net Zero. Centre for Net Zero shared the release of a White Paper on benchmarking for flexibility.[3] The paper outlines a potential set of common principles for quantifying demand flexibility, considering different methods and when these might be appropriate, and calls for further collaboration to coalesce around a more standardised approach to baselining in future. They have also published analysis on the performance of a range of baselines used in Great Britain, with a specific focus on remunerating individual householders for the flexibility provided during events, such as NGESO's Demand Flexibility Service.[4]

Centre for Net Zero could see RetroMeter approach as a possibility fitting in with their trials work. At an appropriate time, they may invite RetroMeter to pitch to be part of a trial. They also discussed that the EU is working on a Network Code for flexibility and something is needed in GB. They are also looking at a smart building rating. They were invited to be part of the advisory group, to which they declined but wished to be kept informed about the RetroMeter project.

4.5 Retrofit Standards Task Group

Date: 18th January 2024

pp group met with a representative from the Retrofit Standards Task Group (RSTG) who was previously CEO of National Energy Foundation and is currently involved in various aspects of the retrofit market, including on standards committees.

RetroMeter was introduced and advice sought on appropriate ways to engage with BSI. Introductions were then made to the Chair of the BS 401 committee and the Sector Lead of the Built Environment at BSI. Additionally, introductions were made

[3] Quantifying demand flexibility: Toward a standardised approach to baselining (January 2024) https://www.centrefornetzero.org/wp-content/uploads/2024/01/Quantifying-Demand-Flexibility-paper-Jan-2024.pdf

[4] Quantifying demand flexibility at household level: Analysis for baselining methodologies, Centre for Net Zero (January, 2024) https://www.centrefornetzero.org/wp-content/uploads/2024/01/CNZ-analysis-baselining-methodologies-Jan-2024.pdf

to the National Retrofit Hub. ep group then made arrangements for meetings with these organisations.

4.6 Built Environment, BSI

Date: 26th February 2024

ep group met with the Lead Standards Manager at BSI who also manages the RSTG and the Sector Lead in Built Environment at BSI, who is also involved Each Home Counts and works with DESNZ on PAS (Publicly Available Specification) development.

After an introduction about RetroMeter, it was expressed that DESNZ are talking a lot about Pay for Performance. There is strong interest if there is a system that could be used. BSI also have a strong relationship to UKRI, who requested that ep group speak with BSI.

Standards development can come from many sources but usually either a coalition, or a company with a product, or DESNZ, and Ofgem would also be influential. It was agreed that the RSTG would be very interested in hearing about RetroMeter and would likely have ideas for the further development of metered energy savings.

The key takeaway/outcome of this session was RetroMeter's planned attendance, represented by ep group, at the upcoming RSTG meeting at the end of April, where RetroMeter and metered energy savings methods can be promoted, critiqued and ideas about the further development or integration of the methods within BSI / PAS approaches could be raised and discussed further. This, along with BSI's influence, would support the ongoing outcome of pursuing standard development through the following sources: *an industry coalition, productised private service, and DESNZ- or Ofgem-led working group.*

4.7 Parliament Office of Science and Technology

Date: 18th January 2024

ESC engaged with the Parliament Office of Science and Technology. This led to RetroMeter being referenced in the UK Parliament POST: Green skills in education and employment[5]. The RetroMeter project was mentioned in reference to post-installation performance data to ensure safety and raise demand for well-trained installers.

[5] UK Parliament POST, Green skills in education and employment https://researchbriefings.files.parliament.uk/documents/POST-PN-0711/POST-PN-0711.pdf

4.8 Net Zero Terrace

Date: 26th January 2024

Project team members met with the Net Zero Terrace SIF project technical team to discuss and share learnings. This involved an introduction to the two distinct SIF projects.

4.9 Green Finance Institute

Date: 1st February 2024

ep group met with the Head of Partnerships at the Green Finance Institute. The MES methodology was introduced and the concepts behind the business model being developed for Work Package 3, Milestone 2. They highlighted the benefits of MES-enabled retrofits to the NHS trust, homeowner, network operators, public sector and private investors.

MES could impact the affordability assessment stage for loans through mortgage lenders, making it a standard measure to give lenders more confidence. This could also apply to the home improvement loan and other green loans. There is an opportunity to tap into the green lending market if MES can prove that carbon emissions have been reduced through energy efficiency retrofits.

4.10 Professor of Energy and Environment, Bartlett School Environment, Energy and Resources, University of Oxford.

Date: 2nd February 2024

Project team members met with a Professor of Energy and Environment from the University of Oxford to have a focussed discussion on methodologies and data access. EDOL aims to develop tools to collect and share energy demand data at scale.

ESC discussed three levels of error in model:

1. Error due to bias, because we are not controlling for external factors such as price
2. Error because not fitting to external temperature or patterns of time usage which exist
3. Error due to noise

It was discussed as to what is the size of the last one (noise) and whether that is constant across homes or varies. The Energy Demand Observatory and Laboratory (EDOL) approach is considering that if, for example, 80% of homes were easy to predict, the focus should be on these homes, but we don't know how many homes

are easy to predict. A key question is therefore, can we know which homes are easy or hard to predict. There was discussion around how do we find out what the indicators of easy or hard-to-predict are and what the focus should be on. It was discussed that a smaller group of households could have more detailed and additional data points collected, to establish that link for indicators of difficulty-to-predict, but once the link was established, those additional data points would then not be needed on a routine basis for all MES assessments. However, even the smaller group of households would need to be quite large to draw conclusions. EDOL has "observatory" households with limited data collection, and "laboratory" households with more detailed data collection.

Issues around willingness of households to share data in different circumstances were discussed, including whether the individual household can gain insights from MES and whether methodologies are valid at the individual household level.
Issues around commercial use of data vs public-good use of data was discussed, and what the boundaries are.
Some of the issues within the EDOL project around data collection were also discussed, including the appropriate number of temperature sensors to have in a home.

4.11 Watt Heat Team

Date: 5th February 2024 (ESC)
Date: 19th February 2024 (Carbon Co-op)

ESC met with Watt Heat team and Carbon Co-op later held a meeting with the Watt Heat Project following a suggestion by Ofgem.

The Watt Heat project is looking at modelling the impacts of thermal storage for domestic use, including hot water tanks and dedicated thermal batteries, including impacts on electricity networks and broader impacts on the customer and on society. They are struggling with finding ways of piloting and testing in real world scenarios, including finding funding for real life installations.

Thermal batteries include: -

- Terep Zero Emissions Boiler (ZEB). They can take up less space than water tanks per unit of heat stored.
- Sunamp (this is used by Carbon Co-op members).

Also mentioned:

- Smart meter systems (SMS)
- ESC Living Lab Digital Integration Platform
- Metering and monitoring service package (MMSP)

ESC: -

- Network contribution to the value stack- Watt Heat has done some related calculations so worth comparing notes.
- Working with an SHDF scheme as a route to a large trial. They haven't really thought much about this as an option so we should share our experiences.
- Metering and collating/storing data - they are scoping this out so again we should compare notes and share learnings.

Carbon Co-op: -

- Watt Heat asked about funding for pilots and interventions- Carbon Co-op explained that in the case of owner occupiers, some contribute themselves, some grant funding, local authority loans, but managing/ coordinating all the funding is a challenge. SHDF 50% funding only. Possibility of electricity DNOs contributing to funds- complicated as they might have interest to pay for permanent demand reduction, there is no real mechanism to pay for it. Electricity North West have mechanism to pay for short term flexibility but that is very different. RetroMeter is doing long term baselining for long period (like a year), which is very different to short-term baselining needed for flexibility payments.
- Discussions about choosing pilots and incentives for households to participate- Carbon Co-op- suggest need more back up options. SHDF is large, ABS is small.

4.12 Data Communications Company

Date: 9th February 2024

Ep group met with Head of Strategic Innovation and Strategy, Markets & Innovation at Data Communications Company (DCC).

DCC had been advised to speak with a few of the SIF projects, including RetroMeter. Ep group gave them a briefing of the project and progress to date.

DCC has three policy foci:

- Fuel poverty reduction
- Energy efficiency- e.g. local area plans
- Flexibility

They all fit well with RetroMeter. DCC advised ep group with a couple of DCC initiatives which are relevant to RetroMeter.

1. Taking temperature and humidity sensor readings and back hauling the data over the smart meter network to ensure such sensing can be scaled. This

ensures widespread access, greater reliability and cyber security. Project led by energy supplier (s).

2. DCC does not have visibility of the consumption data itself but is in discussion with Ofgem and DESNZ to have some strategic derogations so that they can make the data available, obviously with appropriate data protection in place. The purpose of this will be to provide insights into outstanding pockets of fuel poverty and help guide action.

DCC keen to liaise closely with RetroMeter, particularly on the issue of scaling up and the data warehouse.

4.13 National Retrofit Hub

Date: 18th March 2024

Ep Group met the co-directors of National Retrofit Hub (NRH). NRH agreed RetroMeter fitted very well with the hub's activities and it should be of interest to NRH stakeholders, where they are currently engaged with 1,300 people in different Working Groups.

NRH expressed interest in getting news about the project out to a wider group through the NRH. NHR has working groups on particular subjects. NRH suggested starting with the Logbooks working group who are concerned with data. Also, working group 5 Delivery Methods and Models and working group 4 Finance. Ep Group was invited to speak at the WG1 meeting.

4.14 Professor of Energy & Environment, SERL, UCL

Date: 26th March 2024

Attendance: Project team members from Carbon Co-op, ESC, ep Group and Electricity North West

Agenda:

- Access to SERL for ongoing comparison group work.
- Prohibition on commercial activity - could this be overcome with some sort of not-for-profit public interest entity.
- Potential for academic partnership (knowledge transfer).
- From their work on evaluating large scale public retrofit schemes (e.g. LAD) were there any key findings/learning around leveraging better data access, that we could compliment and use to continue to advocate for coordinated

data collection by key stakeholders involved in funding and delivering schemes?
- Update on physics / HTC methodology.

Summary:

- There is various work ongoing with SERL that may contribute to the requirement for comparison group data and SERL said they would be happy to look at potential collaborations.
    - SERL is planning to provide counterfactual data for anybody who wants to use it, and trying to automate that process.
    - ESC outlined a process whereby candidate property profile could be submitted to SERL, SERL would run an agreed algorithm to find matching properties, and SERL would return the matching properties aggregated together (not individual household data).
    - There were questions as to the frequency of update of this potential comparison group data. SERL said they are updating government monthly, which is much more frequently than they used to, so this update frequency would be achievable.
    - There was discussion around requirements for data to be used for public good vs commercial activity, and SERL said this would unlikely to be a barrier in this case.
    - Carbon Co-op asked what the practical next steps might be and the response was probably a much more detailed discussion about what would be needed and how they could help. This would need input from other colleagues at UCL who know more of the detail and how much time it would involve.
- Carbon Co-op asked a question about the evaluation exercise they had been involved with for government funding schemes like Green Homes Grant. SERL said there was lots of interesting learning, including around how they recruited homeowners to take part in the evaluation and share data. SERL shared a paper, Evaluation of the Green Homes Grant Voucher Scheme[6].
- ESC mentioned the Heat Transfer Coefficient physics methodology - SERL said it would be best for ESC to compare notes with UCL colleagues who have also been doing similar analysis with internal temperature data.
- There was a general discussion around SMETER methods, advocating for change in the current system. SERL says they have a role to play in the transition and improving EPCs, but is mindful of limitations and broader applicability in short-medium term especially (ie. You can't run a SMETER calculation on many homes currently). So, there could be parallels drawn

[6] Evaluation of the Green Homes Grant Voucher Scheme: Outcome and economic evaluation- Technical Annex https://assets.publishing.service.gov.uk/media/65427a8dd36c91000d935be6/ghgv-phase-3-final-outcome-evaluation-technical-annex.pdf

here in how we should be messaging MES methodologies and current limitations.
- Data quality- gas being notably worse. SERL said he thought they do publish data on how many homes in their database are affected by poorer quality data, how they characterise it and thresholds for exclusion. He will send paper/ links to this info. The biggest problem is the tariff data they get which is particularly unreliable.

4.15 OpenEEMeter engagement

Date: 14th March 2024

Attendance: Project team members (ESC, Carbon Co-op, ESC, Electricity North West) and data science managers and the CEO of Recurve.

Summary: -

- There was discussion on implications of using Celsius vs Fahrenheit.
- There was discussion on how to do matching in a comparison methodology, using GridMeter approach. GridMeter matching based on counterfactual error in baseline period and clustering was discussed. This involves choosing comparison groups based on the type of error you are trying to isolate.
- There was discussion on how this work is being applied/used through portfolios and business models.
- Data quality, effects of missing values were discussed.
- The relationship between sensitivity of models and depth of saving was discussed.
- There was discussion on targeting properties based on how well they might fit.
- A colleague linked to OpenEEMeter was interested in further discussion on physics methodology with ESC.

5. Conclusion

The project engaged widely with external stakeholders through the advisory group meetings and 15 focused engagements. The advisory group contributed many excellent pointers and inputs into the project. The focused engagements both fed into the quality of the project work and helped to raise awareness of the work.

6. Appendices

Appendix A: Stakeholder Register

Stakeholder name	**Type of organisation**	**Role/ purpose of organisation**	**Link with RetroMeter**	**Website**
Ofgem	Utilities	Regulates utilities, including the electricity sector.	A methodology done by Ofgem, alongside BRE, to provide a score to energy efficiency measures based on the bill savings they would achieve.	https://www.ofgem.gov.uk/
UK Research and Innovation (UKRI)	Innovation	Brings together seven Research Councils, Innovate UK and Research England.	Relevant government department	https://www.ukri.org/
Innovate UK (Part of UKRI)	Innovation	Supports business-led innovation	Relevant government department	https://www.ukri.org/councils/innovate-uk/
NESTA	Innovation	UK innovation agency for social, working on a variety of projects for a sustainable future	Innovator active in-home energy efficiency	https://www.nesta.org.uk/
Crawley Borough Council	Local Gov	Local Government Council implementing Social Housing	Expressed interest	https://crawley.gov.uk/
Greater Manchester Combined Authority (GMCA)	Local Gov	Coordinates between the 10 different local authority councils in the Greater	Relevant local authority body	https://www.greatermanchester-ca.gov.uk/

		Manchester Area, and the mayor		
Greater Manchester Green City Initiative	Local Gov	Environmental initiative of GMCA	Relevant local authority project	https://gmgreencity.com/
Greater Manchester Retrofit Taskforce	Local Gov	Established in July 2021 to help tackle Greater Manchester's urgent retrofitting challenge	Relevant local authority project	https://www.greatermanchester-ca.gov.uk/what-we-do/environment/homes-workplaces-and-public-buildings/retrofitgm/
Manchester City Council	Local Gov	Local authority for Manchester	Relevant local authority body. Administers the SHDF, the HUG and can also support retrofit through the Housing Revenue Account	https://www.manchester.gov.uk/
Great Yarmouth Council / Norfolk Climate Change Partnership	Local Gov	Develop a sustainable energy plan to decarbonise energy supply for Norfolk and improve distribution of energy to citizens	Local government advisors on Net Zero	https://www.norfolkclimatechange.co.uk/our-purpose/
Manchester City Council Housing Services	Local GovHousing	Manages over 12,500 City Council homes across Manchester, department of MCC	Relevant local authority programme	https://www.mcchousingservices.co.uk/
Greater Manchester Local Energy Market (GMLEM)	Energy	Consortium of 12 partners who have appointed ESC to support the development of Local Area Energy Plans across Greater Manchester	Relevant project in Manchester	https://gmgreencity.com/greater-manchester-local-energy-market/

Department for Energy Security and Net Zero (DESNZ)	Energy	Responsible for security of energy supply, energy markets, energy efficiency and supporting net zero.	Relevant government department.	https://www.gov.uk/government/organisations/department-for-energy-security-and-net-zero
UCL Smart Energy Research Lab (SERL)	Energy	Understanding research with smart meter data.	Provide access to smart meter data for research purposes.	https://www.ucl.ac.uk/bartlett/energy/research/smart-energy-research-lab
Centre for Research into Energy Demand Solutions (CREDS)	Energy	Does research to demonstrate how reductions in energy use are essential for the transition to a fair, zero-carbon society	Likely to be interested in project outputs	https://www.creds.ac.uk/
BEAMA	Energy	Uk trade association for manufacturers and providers of energy infrastructure technologies and systems	Expressed interest	https://www.beama.org.uk/
Energy UK	Energy	Trade association for the energy industry	Expressed interest	https://www.energy-uk.org.uk/
Energy Unlocked	Energy	Consultancy working with cities, governments, businesses on energy and net zero	Expressed interest	https://www.energyunlocked.org/
Regulatory Assistance Project	Energy	Advancing policy innovation and thought leadership with the energy community	Expressed interest	https://www.raponline.org/
Community Energy England	Energy	Helps community energy organisations create and implement new projects by advocating for a	Potential disseminator of metered energy savings	https://communityenergyengland.org/

		policy landscape that will support community energy practitioners to learn, share business models and help each other overcome obstacles		
Energy Saving Trust	Energy	Empowers householders to make better energy choices, works with government on energy programmes, supports businesses with energy efficiency	Non-profit active in-home energy efficiency	https://energysavingtrust.org.uk/
End Fuel Poverty Coalition	Energy	Broad coalition of anti-poverty, health, housing and environmental campaigners, charities, local authorities, trade unions and consumer organisations	Potential user of metered energy savings	https://www.endfuelpoverty.org.uk/
Power Circle	Energy	Social enterprise dedicated to supporting social housing providers, private house owners, communities and the private sector to access affordable, low carbon energy by helping them establish smart, local energy systems.	Monetising CO2 savings through social housing retrofits. Had follow up questions with ep Group about collaboration following interest group discussion following the Discovery Phase	https://powercircle.org.uk/
Energetik	Energy	Established by Enfield Council to provide better value energy that's reliable and	Expressed interest	https://energetik.london/

		environmentally friendly by working with a range of organisations to design, build and maintain community energy heat networks/ district heat networks.		
National Energy Agency	Energy	Work to overcome the effects and causes of fuel poverty in four ways- provide advice and support; campaign and advocate for the needs of the fuel-poor households, carry out research to raise awareness and find solutions; and provide accredited training	Relevant for impacts of measuring energy	https://www.nea.org.uk/
University College London (UCL) Energy Institute	Energy	Delivers world-leading learning, research and policy support on the challenges of climate change and energy security	Advising on physical model design/ involved in SMETER Study	https://www.ucl.ac.uk/bartlett/energy/
Centre for Sustainable Energy	Energy	Charity supporting people and organisations across the UK to tackle the climate emergency and end the suffering caused by cold homes	Expressed interest	https://www.cse.org.uk/
Centre for Net Zero	Energy	Research non-profit linked to Octopus Energy, on future energy system using Octopus customer data points	Expressed interest	https://www.centreofornetzero.org/

National Grid ESO	Electricity	Make sure electricity supply meets demand every second of every day- Electricity system operator (TSO) for Great Britain.	Relevant electricity stakeholder	https://www.nationalgrideso.com/
Electricity North West	Electricity	Electricity distributed system operator (DSO/DNO)	Electricity DNO covering Manchester. Retrofit reduces network reinforcement costs.	https://www.enwl.co.uk/
Northern Powergrid	Utilities	Electricity supplier to 3.9 million homes and businesses in the North East, Yorkshire and northern Lincolnshire.	Relevant electricity stakeholder	https://www.northernpowergrid.com/
Scottish and Southern Energy	Utilities	DNO is responsible for delivering power to over 3.9 million homes and businesses across central southern England and the north of Scotland.	Relevant electricity stakeholder	https://www.ssen.co.uk/
Scottish Power Energy Network	Utilities	Distribution and Transmission Network Operator supplying electricity throughout Central and Southern Scotland, North Wales, Merseyside, Cheshire and North Shropshire	Relevant electricity stakeholder	https://www.spenergynetworks.co.uk/
UK Power Networks	Utilities	Maintain electricity networks across London, the South East and East of England	Relevant electricity stakeholder	https://www.ukpowernetworks.co.uk/

Electricity Networks Association	Electricity	Represent the UK and Ireland's energy network operators (9 DNOs including ENW)	Relevant electricity stakeholder	https://www.energynetworks.org/about/
Electricity Suppliers/ retailers	Electricity	Buy or generate electricity and sell to consumers	Under the ECO scheme, a Home Heating Cost Reduction Obligation (HHCRO) is placed on medium and large energy suppliers	
British Gas	Electricity	Largest UK energy and homes services company. Supply gas and electricity, boilers and boiler cover as well as other home services.	Energy supplier, relevant for impacts of measuring energy	https://www.britishgas.co.uk/
EDF Energy	Electricity	EDF if an energy provider, supplying electricity and gas to homes and businesses in the UK	Energy supplier, relevant for impacts of measuring energy	https://www.edfenergy.com/
Ovo Energy	Electricity	Major energy supplier based in Bristol	Energy supplier, relevant for impacts of measuring energy	https://www.ovoenergy.com/
NPower	Electricity	British supplier of gas and electricity to businesses	Energy supplier, relevant for impacts of measuring energy	https://npowerbusinesssolutions.com/
Scottish Power	Electricity	Distribution network operator for Central and Southern Scotland, Merseyside, North Wales and parts of Cheshire and Shropshire.	Energy supplier, relevant for impacts of measuring energy	https://www.scottishpower.co.uk/

Octopus Energy	Electricity	British renewable energy group specialising in sustainable energy	Energy supplier, relevant for impacts of measuring energy	https://octopus.energy/
Utility Warehouse	Electricity	Multi-service provider that uses multi-level marketing to obtain customers through independent	Energy supplier, relevant for impacts of measuring energy	https://uw.co.uk/
SSE	Electricity	Leading generator of renewable electricity and one of the largest electricity network companies in the UK	Energy supplier, relevant for impacts of measuring energy	https://www.sse.com/
Smart Meter Enabled Thermal Efficiency Ratings (SMETER)	Metered Energy Savings	Funds development, test and demonstration of technologies that measure the thermal performance of homes, using smart meter and other data	Has funded similar work	https://www.gov.uk/guidance/smart-meter-enabled-thermal-efficiency-ratings-smeter-innovation-programme
CalTrack	Metered Energy Savings	Specifies a set of empirically tested methods to standardise the way normalised meter-based changes in energy consumption are measured and reported	RetroMeter methodologies will build on CalTrack methodologies	www.caltrack.org/
Sensei Project	Metered Energy Savings	SENSEI designs and tests innovative transaction models that enable energy efficiency upgrades in buildings. Aimed to build Pay-for-performance (P4P) schemes.	Business model for retrofit	https://senseih2020.eu/

Northern Housing Consortium (NHC)	Housing	Membership organisation representing over 400 local authorities, ALMOs and associations that provide social housing for tenants across the North of England. NHC has run a series of support projects focused on retrofit	Potential user of metered energy savings	https://www.northern-consortium.org.uk/
Local housing associations	Housing	Retrofit Clients	Potential user of metered energy savings	https://www.manchester.gov.uk/info/84/rehousing_and_finding_a_home/4887/council_homes/2
Housing Associations Charitable Trust (HACT)	Housing	Charity of the social housing sector	Developed Retrofit Credits to leverage additional funding (essentially carbon offsets) into retrofit. Have previously expressed interest in moving away from deemed savings to more accurate measures of savings	https://hact.org.uk/retrofit-credits/
Manchester Housing Providers Partnership	Housing	Links registered housing providers in Manchester and the City Council in partnership to facilitate local delivery on key strategic themes	Could use metered energy savings	https://www.mhpp.info/home
British Standards Institute (BSI)	Standards	Regulates standards	Methodology developed by RetroMeter could become a	https://www.bsigroup.com/

			standard	
BSI Retrofit Standards Task Group	Standards	Develops standards for retrofit	Links to evaluation in existing standards. E.g. PAS2035, BS 40101 Methodology developed by retroMeter could become a standard	https://www.bsigroup.com/globalassets/localfiles/en-in/training/bsi_retrofit_infographic.pdf
Department for Science, Innovation and Technology (DSIT)	Science and Technology	Responsible for science, innovation and technology	Relevant government department	https://www.gov.uk/government/organisations/department-for-science-innovation-and-technology
Engineering and Physical Sciences Research Council (EPSRC) (Part of UKRI)	Science and Technology	Supports research in engineering and physical sciences	Relevant government department	https://www.ukri.org/councils/epsrc/
Parity Projects	Retrofit	Uses data science, software and analysis to help clients deliver energy efficiency efficiently. Develop cost-effective retrofit programmes.	Developing algorithm focused on homes that match metered energy savings with modelled savings. Possibility for potential collaboration.	https://parityprojects.com/about/
Kestrix	Retrofit	Uses thermography and AI to map how heat leaks in buildings, informing retrofit planning, pricing and verification	Expressed interest	https://www.kestrix.io/
Your Home Better	Retrofit	An independent, low-cost service	Potential user of metered energy	https://yourhomebetter.co.uk/

(RetrofitWorks)		commissioned by the GMCA that can help you improve the energy efficiency of your home	savings	
Furb Now	Retrofit	Retrofit provider	Potential user of metered energy savings	https://furbnow.com/
Melius Homes	Retrofit	Contractor specialising in energy efficient building solutions that partnered with Nottingham City Homes to deliver the energiesprong approach to retrofitting homes in the Sneinton neighbourhood in 2018	Potential user of metered energy savings	https://www.meliushomes.co.uk/
PNZ Group	Retrofit	Carbon credit scheme for domestic retrofits and renewables	Verification of retrofit for carbon credits	https://thepnzgroup.com/
Retrogreen	Retrofit	Retrofit provider	Expressed interest	https://retrogreen.co.uk/
People Powered Retrofit (PPR)	Retrofit	One stop shop for retrofit	Potential user of metered energy savings	https://retrofit.coop/
EnergieSprong	Retrofit	Supports markets for energy transition, development of energy positive materials, inspired business development needed to drive forward the right regulations and financing schemes	Received follow up questions about collaboration following interest group session during the Discovery phase	https://energiesprong.org/about/
Elmhurst Energy	Retrofit	The UK's largest independent	Expressed interest	https://www.elmh

		provider of energy assessment, retrofit and property professional training, software and accreditation		urstenergy.co.uk/
Net Zero Go	Retrofit	ESC project supporting local authorities with their Net Zero plans	ESC platform for local authorities	https://www.netzerogo.org.uk/s/
Heat Geek (Previously Skoon Energy)	Retrofit	Engaging engineers over the country for heating engineers	Exploring pay for performance model for heat pump installation	https://about.heatgeek.com/about
National Retrofit Hub	Retrofit	Working with the retrofit industry to enable the delivery of housing retrofit across the UK. Establishment funded by sponsorship from Innovate UK, the UK's national innovation agency together with contributions from many organisations across the sector. Currently hosted by the Sustainable Development Foundation with plans to become registered in its own right in 2023/2024.	Relevant to retrofit approaches- NRH working group engagement	https://nationalretrofithub.org.uk/
Net Zero Terrace Project	Retrofit	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	Could use RetroMeter methodology	https://www.enwl.co.uk/future-energy/innovation/strategic-innovation-fund/net-zero-terrace/

		easily replicable across GB. Electricity North West began delivering project in April 2023 alongside partners Buro Happold, RV Energy, Rossendale Borough Council and Northern Powergrid.		
University of Oxford	Building/ engineering	Work on Energy Network and Flexibility and energy transition	Contact has sat on the OpenEnEffs Advisory Board and is interested in development of RetroMeter and its outputs.	https://www.ox.ac.uk/news-and-events/find-an-expert/dr-phil-grunewald
UK Green Building Council (UKGBC)	Building/ engineering	UKGBC is the membership-led built-environment industry network with 700+ members. UKGBC is at the forefront of positively influencing policy, identifying the pathways to propel the sector forward sustainably and driving the solutions to transform our buildings, communities, cities and infrastructure so that people and nature thrive.	Building Upon framework- helps LAs measure the broad benefits of building renovation in a simple and consistent manner; They want to arrange a meeting to discuss potential collaboration.	https://ukgbc.org/
Leeds Beckett- School of Built Environment, Engineering and Computing	Building/ engineering	School at Leeds Beckett University with committed colleagues and students working on planning, designing and constructing a	Want a presentation at Leeds Sustainability Institute over Teams to understand project better	https://www.leedsbeckett.ac.uk/school-of-built-environment-engineering-and-computing/

		better built environment		
University of Salford Energy House 2.0 project	Building/ engineering	Provides environment for testing energy efficiency in houses	Facilitate testing of buildings in controlled weather conditions	https://energyhouse2.salford.ac.uk/
Arup	Building/ engineering	A consultancy practice that provides engineering, design and planning and sustainability consultancy	Committed to developing a sustainable built environment	https://www.arup.com/
BRE Group	Building/ engineering	Built environment assessment	Owner of BREEAM, science-based suite of validation and certification systems for a sustainable built environment. BREEAM's third-party certified standards have helped improve asset performance at every stage, from design through construction, to use and refurbishment	https://bregroup.com/
Equans	Building/ engineering	An international service provider focusing on energy, digital and industrial solutions	They have experience in retrofit projects across the country and in 2021 signed a 3-year contract with MCC to provide repair and maintenance services to over 13,000 council-owned homes in the city.	https://www.equans.co.uk/

Turner Townsend	Building/ engineering	A building and infrastructure consultancy practice that act as advisors providing public programme, cost, procurement and contract and risk management	They have helped to support programmes such as SHDF	https://www.turnerandtownsend.com/
Common Projects	Building/ engineering	Property development	Expressed interest	https://common-projects.co.uk/
CoreLogic	Building/ engineering	Property surveying and data	Expressed interest	https://www.corelogic.com/
Kamma	Building/ engineering	Property profiling in terms of safety and environmental performance, for Lettings Agents, Mortgage Lenders, Local Authorities, Conveyancers, Surveyors, Landlords, receivers	Expressed interest	https://www.kammadata.com/
Kier Group	Building/ engineering	Construction company	Expressed interest	https://www.kier.co.uk/
Wates Group	Building/ engineering	Construction company that completed a housing retrofit for Northampton Partnership homes and several housing retrofit projects in Stevenage and London Borough of Enfield.	Potential user of metered energy savings	https://www.wates.co.uk/
Wilmott Dixon	Building/ engineering	Construction company specialising in sustainable building and refurbishment	Has completed multiple retrofit projects including work with Hill City Council for 3,000 homes	https://www.willmottdixon.co.uk/
Trustmark	Building/ engineering	UK Government-Endorsed Quality	Expressed interest	https://www.trustmark.org.uk/

		Scheme for home improvements carried out in and around the home		
Chartered Institution of Building Services Engineers (CIBSE)	Building/ engineering	Professional association of building engineers	Has long been active on the topic of climate change mitigation and adaptation, and linking it to building performance. CIBSE and LETI published the Climate Emergency Retrofit Guide: Shows how we can retrofit out homes to make them fit for the future and support the UK's Net Zero targets. Define energy use targets for existing homes and provide practical guidance on how to achieve them	https://www.cibse.org/
Low Energy Transformation Initiative (LETI)	Building/ engineering	LETI is a network of over 1,000 built environment professionals, working together to put the UK on the path to a zero-carbon future. The voluntary group is made up of developers, engineers, housing associations, architects, planners, academics, sustainability	CIBSE and LETI published the Climate Emergency Retrofit Guide: Shows how we can retrofit out homes to make them fit for the future and support the UK's Net Zero targets. Define energy use targets for existing homes and provide practical	https://www.leti.uk/

		professionals, contractors and facilities managers	guidance on how to achieve them	
Build Test Solutions (BTS)	Building/ engineering	Technology to make in-situ building performance measurement cost-effective and accessible to the mainstream building construction, renovation and home improvement sectors.	Expressed interest	https://www.buildtestsolutions.com/
IRT	Building/ engineering	Energy efficiency surveys- helps clients identify simple leaks, evaluate a commercial property portfolio for refurbishment, or assess a housing portfolio for energy performance for a social landlord	Expressed interest	https://irtsurveys.co.uk/
Loughborough University	Building/ engineering	University leading SMETER project.	Leading SMETER study	https://www.lboro.ac.uk/news-events/news/2022/march/smarter-ways-to-make-your-home-more-efficient/
DWS	Finance	Real estate investor	Contact at DWS has been promoting metered energy efficiency savings in the UK and EU since 2016/17.	https://dws.com
New Economic Foundation	Finance	Economics think tank with a mission to transform the economy so it works for people and the planet.	Run the Great Homes Upgrade campaign	https://neweconomics.org/

Building Societies Association	Finance	Represent all 42 UK building societies, together with some of the larger credit unions	Expressed interest	https://www.bsa.org.uk/
3Ci Cities Commission for Climate Investment	Finance	Partnership between Connected Places Catapult, Core Cities UK, London Councils and other local authorities across the UK aimed at supporting local authorities secure the necessary long-term finance for achieving net zero.	Potential of metered energy savings as basis for finance schemes	https://www.3ci.org.uk/
Ecology Building Society	Finance	Provides renovation mortgages for single dwelling renovations to improve their energy efficiency	Potential user of metered energy savings as basis for investment	https://www.ecology.co.uk/
Skipton	Finance	Building society	Expressed interest	https://www.skipton.co.uk/
Carbon laces	Finance	Automated Smart Energy Verifications Tool & has anonymised dataset for domestic energy usage	Ep Group had follow-up questions about collaboration following interest groups during the Discovery Phase.	https://carbonlaces.com/
Handelsbanken	Finance	Bank	Expressed interest	https://www.handelsbanken.co.uk/
Green Finance Institute (GFI)	Finance	Catalysing investment in net zero and nature positive outcomes.	Potential user of metered energy savings as basis for finance schemes.	https://www.greenfinanceinstitute.com/
Abundance Investment	Finance	Investment platform that allows people to invest in green	Potential user of metered energy savings as basis for investment	https://www.abundanceinvestment.com/

		projects, including energy efficiency and retrofit schemes		
LendInvest	Finance	LendInvest's Green Bond Framework is designed to accelerate the allocation of capital to eligible retrofit projects in the UK to decarbonise the UK's housing stock in the form of green loans to borrowers	Potential user of metered energy savings as basis for investment	https://www.abundanceinvestment.com/
Lloyds Banking Group	Finance	Offers green financing loans or investment that supports environmentally-friendly activity, including improving energy efficiency in homes.	Potential user of metered energy savings as a basis for investment	https://www.lloydsbankinggroup.com/
Tallarna	Finance	Finance for energy performance in buildings	Expressed interest	https://tallarna.com/
Triodos Bank	Finance	'Ethical banking' offering financing for sustainable projects, including retrofitting and energy efficiency	Potential user of metered energy savings as basis for investment	https://www.triodos.co.uk/
M&G Investments	Finance	Offers green bonds and other sustainable investment options	Potential user of metered energy savings as basis for investment	https://www.mandg.com/
Manchester Credit Union	Finance	Offering loans to homeowners in Manchester through Your Home Better to install solar panels and battery storage	Potential user of metered energy savings as basis for investment	https://manchestercreditunion.co.uk/
Bankers	Finance	A not-for-profit	Potential user of	https://www.bwb.

Without Boundaries		innovating in finance, powered by former investment bankers to assist high impact projects that benefit the environment and social good	metered energy savings as basis for investment advice	earth/
Lendology	Finance	Home improvement loans for homeowners, funded by local councils	Expressed interest	https://www.lendology.org.uk/
Bankers for Net Zero (B4NZ)	Finance	Bankers for Net Zero (B4NZ) convenes the UK country chapter of the Net Zero Banking Alliance (NZBA), which is one of the four main pillars of the Glasgow Financial Alliance for Net Zero (GFANZ). Focus is strategic policy alignment – by creating clarity on which areas of the net zero transition require policies which can optimise the contribution banks can make to net zero.	Expressed interest	https://www.bankersfornetzero.co.uk/
Longevity Partners	Net Zero	Global and independent multidisciplinary sustainability consultancy.	Carbon Co-op contact who previously worked on OpenEnEffs and conducted research on CalTrack and metered energy savings.	https://longevity-partners.com/
MCS	Net Zero	Oversees the MCS	Relevant	https://mcsfound

Foundation		standards scheme which certifies the quality of renewable energy across UK homes and convenes partners from sectors to drive innovation.	foundation in sector	ation.org.uk/about/
E3G	Net Zero	Independent think of world leading strategists on the political economy of climate change, dedicated to achieving a safe climate for all.	Expressed interest	https://www.e3g.org/
Climate Change Committee (CCC)	Net Zero	Independent non-departmental public body, formed under the Climate Change Act to advise the UK and devolved governments and parliaments on tackling and preparing for climate change.	Government advisors on Net Zero	www.theccc.org.uk
Carbon Trust	Net Zero	On decarbonisation: Advise public and private sector, provide verification and assurance services, design and implement business models and projects.	Runs the Green Home Finance Accelerator (GHFA) of the UK Government's Net Zero innovation for piloting a range of finance propositions which encourage domestic energy efficiency, low carbon heating and micro-generation retrofit in the owner-occupied and private rented sectors	https://www.carbontrust.com/

Perseus project	Net Zero	Developing a pragmatic whole-of-market solution to create rapidly scalable, low-effort, low-friction sustainability reporting. This aims to help unlock access to capital by automating Greenhouse Gas reporting for every Small and Medium Enterprise in the country.	Unlocking access to finance using accurate, assurable data.	https://www.bankersfornetzero.co.uk/perseus/
Icebreaker One (IB1)	Net Zero	Non-profit that works on data sharing and sustainability. Mission is to make data work harder to deliver net zero.	Break down barriers to access data needed for reaching net zero.	https://icebreakerone.org/
The Institute for European Energy and Climate Policy (IEECP)	ICT	Not-for-profit independent research organisation on the energy transition and a sustainable future. Working on science-based climate mitigation, energy efficiency and renewable energy policy. Generates and disseminates scientific knowledge through a range of projects.		https://ieecp.org/
University of Oxford-Computer Science	ICT	Using smart meters to infer the thermal efficiency of residential homes	Advising on physical model design.	https://ora.ox.ac.uk/objects/uuid:a53d24d7-7842-47a9-8c9e-f1c4f8d297c8
OpenEEMeter	ICT	Developing	Software	https://lfenergy.or

Working group		OpenEEMeter software (reference implementation of CalTrack)	developed under RetroMeter will be submitted to the broader OpenEEMeter software	g/projects/openeemeter/
Recurve	ICT	Originally developed OpenEEMeter (reference implementation of CalTrack) and contributed it to LF Energy	Originally developed OpenEEMeter (reference implementation of CalTrack) and contributed it to LF Energy	https://www.recurve.com/
Data Communications Company	ICT	Manages telecommunications technology infrastructure that underpins the smart meter roll-out	Awarded the Smart Meter Communication Licence 0 provide smart meter data	https://www.smartdcc.co.uk/
Hildebrand	ICT	Third party smart meter provider	Providing data to RetroMeter, but also contribute to Demand Forecasting Encapsulating Domestic Efficiency Retrofits (DEFENDER) project	https://www.hildebrand.co.uk/
LF Energy (Linux Foundation Energy)	ICT	Provides a community to build shared digital investments to transforms the energy sector	Home of OpenEEMeter software, which RetroMeter software will contribute to	https://lfenergy.org/