HEAT PUMP READY | Department for Energy Security & Net Zero

Part of the Net Zero Innovation Portfolio

Advanced Modelling for Heat as a Service

CARBON TRUST

Project Lead: City Science Corporation

Funding:
£498,692

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The problem: How can heat pumps be financed to reduce capital expense?

Upfront capital costs of heat pumps are expensive, and existing financial products have not been able to meaningfully address this barrier. Heat-as-a-Service (HaaS) has been gaining popularity as a new financial model to facilitate the deployment of low carbon heating solutions, like heat pumps; however, previous trials have identified that the inability to accurately predict energy requirements of a specific property is a significant barrier to commercial success.

The solution

City Science's Advanced Modelling for Heat-as-a-Service (Haas) project will transform our current understanding of heat in the domestic setting and provide a scalable approach to heat pump financing and deployment throughout the UK. This will be achieved via the testing of a cutting-edge Heat-as-a-Service modelling solution, which will provide decarbonisation pathways and financing models to facilitate large scale heat pump deployment in domestic buildings, coordinated with retrofit.

> "The funding provided under the NZIP Heat Pump Ready Programme has allowed us to significantly accelerate our research and development into cutting-edge technologies and delivery models. This has allowed us to collaboratively tackle key barriers to large scale heat pump deployment, and positively contribute to the UK's decarbonisation objectives."

Laurence Oakes-Ash
CEO, City Science

How can heat pumps be financed to reduce capital expense?

What are we going to do?

This project will build on outputs from the Government-funded SMETER programme to further develop the proof-of-concept algorithms for demonstration and qualification in a real-world environment.

A modular Heat-as-a-Service (HaaS) simulation library will be developed and, depending on the property, our HaaS software will generate the financial model to be used and the tariff connected with it. The prototype will be deployed in a live trial in up to 20 properties then tested and evaluated for accuracy, customer acceptance, cost and carbon savings.

Why is this an improvement on current solutions?

Heat pumps are high cost items but can save money over their lifetime due to their high efficiencies. Providers willing to cover the upfront cost require assurance that the installation will perform as expected in the property. Currently, it is difficult to access accurate and detailed data about a property's thermal performance to support accurate HaaS modelling. Crucially, the incentives to achieve energy efficient and affordable heating place this onus on the end user.

The Heat-as-a-Service model shifts the motivation for delivery of an efficient heating system from the customer to a provider, who may have more skills to generate efficient performance and more ability to attain savings. This project will develop robust and accurate HaaS algorithms which will enable the provider to select the most efficient solution and enable optimisation of heat pump operation post installation.

What would success look like?

Through the facilitation of a complete and accurate financing package, this project hopes to enable increased financing for combined heat pump and energy efficiency retrofit solutions, thus accelerating heat pump deployment at the lowest cost to the consumer.

How will this project help towards the target of installing 600,000 heat pumps per year by 2028?

By enhancing confidence in expected savings of heat pump and retrofit solutions, the financial risks of Heat-as-a-Service (HaaS) are reduced. Our project will therefore increase finance availability within the energy efficiency sector and identify opportunities where HaaS can support decarbonisation of heat, without public subsidy.

Our solution will also enable modelling of policy scenarios, allowing us to identify optimal cost policies to accelerate the decarbonisation of heat even further.

The Optimised solutions development stream of the Heat Pump Ready programme supports the development of innovative tools, technologies and processes to overcome specific barriers to heat pump deployment in the UK. This stream supports solutions aiming to reduce the life time cost and increase the performance of domestic heat pumps, minimise home disruption whilst providing high quality installations, develop and trial financial models to support heat pump deployment, improve the heat pump consumer journey and provide a smart and flexible home energy system.

Heat Pump Ready is funded by the Department for Energy Security and Net Zero through the NZIP programme. The Collaboration & Learning stream is managed by the Carbon Trust with support from Ipsos and Technopolis.

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Advanced Modelling for Heat as a Service

Project Progress (Autumn 2023)

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Key Findings

- Customers who were contacted regarding the monitoring of their smart meter data stated that reducing energy bills and concerns around climate change were their top considerations. Energy consumption and making their home smarter were amongst the lowest.
- The software can now achieve very close correlation between real and predicted data energy use, giving confidence to the Heat as a Service offering.
- Home monitoring hardware installs can be complex so care needs to be taken during set up to ensure reliable data.
- Cadence 360 has proved to be very powerful and can be a huge asset for portfolio managers.

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What progress have we made so far?

The project is currently deep into the beta code refinement, after the alpha phase was successfully launched in March 2023. User journeys and preferences have been mapped and have been important in the development and refinement of the software. Exeter City Council has been actively involved during the project, with over 5,000 of their properties now integrated into the software.

The Cadence 360 software is now operational and has demonstrated its ability to be a powerful tool for portfolio managers through its features that can spatially identify properties on a rage of characteristics, both energy and social.

What barriers have we identified and how has this changed our approach to delivering our project?

There have been issues around the reliability of in-home monitoring, so lessons have been learned around optimal install practices and what to be aware of. There have also been challenges around the user API; when there is so much data available it can be difficult to understand what is key for the end user and ensure they only see what is relevant. There have also been the usual technical challenges when working on complex algorithms and energy data but the team has achieved very close correlations between actual and predicted usage giving confidence to portfolio managers in the software and more generally in the Heat as a Service (HaaS) offering.

What are our next steps?

A lot of progress has been made to date and towards the end of the project the focus will move towards development of the HaaS style contracts, making sure these are appropriate for large portfolio managers. There will also be further work on the beta phase testing/refinement and integration of the financial models into the portfolio model. These are currently integrated but work over the next few months will be to better integrate these and ensure there is an effective final product at project completion.