Primary Aim

To reduce carbon emissions from energy use within buildings by understanding, incentivising and influencing changes in the habitual behaviours of the buildings’ occupants.

This project brings together expertise from a range of disciplines including: low carbon design; architecture and civil engineering; electronic and electrical engineering; computer science; environmental psychology; and habitual behaviour.

In achieving this aim we will meet five key objectives:

1. Dynamic Building Energy Model

Our approach will model domestic buildings’ thermal properties using data obtained from low cost sensor networks installed within each building.

This will lead to the development of a novel intelligent system that builds and maintains a dynamic building energy model, including an auto-generated thermal model.

2. Building Occupant Model

We will develop an unprecedented understanding of the role of habit in occupants’ energy demand and attitudes to carbon saving. We will draw on a wide range of automated sensing and human data analysis.

This will give occupants insight into their own energy consuming behaviours, in particular those which are performed automatically.

3. In-Building Interactive Tool

A unique whole building energy model will be developed by bringing together the building energy and occupant models. This will underpin the design, development and evaluation of an in-building interactive tool to help the occupants identify and break poor energy habits and form better ones.

The tool will provide customised, actionable prompts rather than numerical energy estimates, which are poorly understood by occupants.

4. Novel Energy Tariff Structure

The whole energy model will determine:

• Which behavioural changes will have the greatest potential for carbon savings.
• The financial and behavioural costs of change.
• The likelihood of the change actually happening.

These social-economic incentive mechanisms will inform the development of a non-intrusive, individualised tariff system to promote energy saving through targeted behavioural change rewards.

5. Implications for Assessing the Risk of Fuel Poverty

By developing an in-depth understanding of building energy properties and the role of behaviour in energy use, the project will provide in-depth insight into the causes of fuel poverty.

Our approach will result in accurate estimates of the energy required in order to deliver adequate fuel services to each individual property. This will aid the assessment of ‘at-risk’ occupants and will support better targeting of services and resources to these occupants.