

EnergyFlex: using simulation to make our homes more energy-efficient

What happened?

Researchers on the Turing's ASG programme built a tool that can help reduce household energy use for heating and save carbon emissions by making detailed data on energy performance available to local government and housing providers. Using public data from the [English Housing Survey](#), [National Energy Efficiency Data-Framework](#) and energy performance certificates, [EnergyFlex](#) generates 'synthetic data' for homes in a given area to create a representative housing population. Applying an energy model to this population allows the user to simulate energy usage and performance at the level of individual homes.

What are the real-world impacts?

- A simulation tool for analysing energy inefficiencies in housing and identifying solutions, such as incentives for updating heating systems or discounts for insulation.
- The synthetic approach allows housing data to be used at a finer scale than is possible for real public data because it does not compromise residents' privacy.
- Using a cloud-based platform provided by the [Data & Analytics Facility for National Infrastructure](#), users can run EnergyFlex without in-depth knowledge of the software.
- EnergyFlex simulations for a case study on Birmingham demonstrate the tool's potential for supporting locally targeted policy. Researchers found that low-income homes in blocks of flats built between 1930-2010 were often inefficiently heated by electric heating systems and therefore made good candidates for heat pump retrofits.
- With the UK government's Department for Business, Energy & Industrial Strategy (BEIS), researchers are exploring using the tool for analysing fuel poverty statistics.
- Researchers created a mapping tool to aid housing association [Places for People](#) in decision-making related to energy performance of its houses in Leeds.

Why was the Turing's [ASG programme](#) uniquely placed to do this?

- EnergyFlex is built on a microsimulation modelling approach developed through ASG funding and uses this approach, the [Synthetic population estimation and scenario projection](#) (SPENSER) model, to produce its synthetic housing population.
- Collaboration with Turing researchers developing the [Synthetic Population Catalyst](#), a tool that makes it easier to work with synthetic data, helped to inform EnergyFlex as well as a project [modelling the effects of extreme heat under climate change](#).
- The Turing's [AI UK 2022 event](#) provided a forum for open discussion about energy and housing, with representatives from EnergyFlex, Parity Projects, and [Cambridge Centre for Housing and Planning Research](#) taking part in an [interactive session](#).

What's next?

- The team is engaging with [Parity Projects](#), which uses data analytics to help local authorities and landlords design retrofit programmes for improving energy efficiency.
- Identifying public and private sector users to apply EnergyFlex in decision-making.
- Documenting and sharing the project's outcomes in the academic literature.

“The data... provide a more comprehensive picture of the area and the challenges faced... in relation to the condition of properties. We are keen to continue to engage with EnergyFlex to enhance our knowledge and to help inform our decision making.”

Claire Bailey, Head of Innovation, Places for People