Energy Demand Observatory and Laboratory

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We use energy in our homes for heating, washing, cleaning, cooking, lighting, and powering our appliances, for entertaining, socialising and interacting with each other. **Using energy in our homes is essential for our health, wellbeing, and comfort**.

However, domestic energy use is also responsible for almost **20% of UK carbon emissions**. Energy use in homes is also the biggest driver of demand during the peak winter period, which means it determines the amount, type, and cost of power generation capacity we need to have available to meet this peak.

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Engineering and Physical Sciences Research Council

Partners

University College London:
Smart Energy Research Group

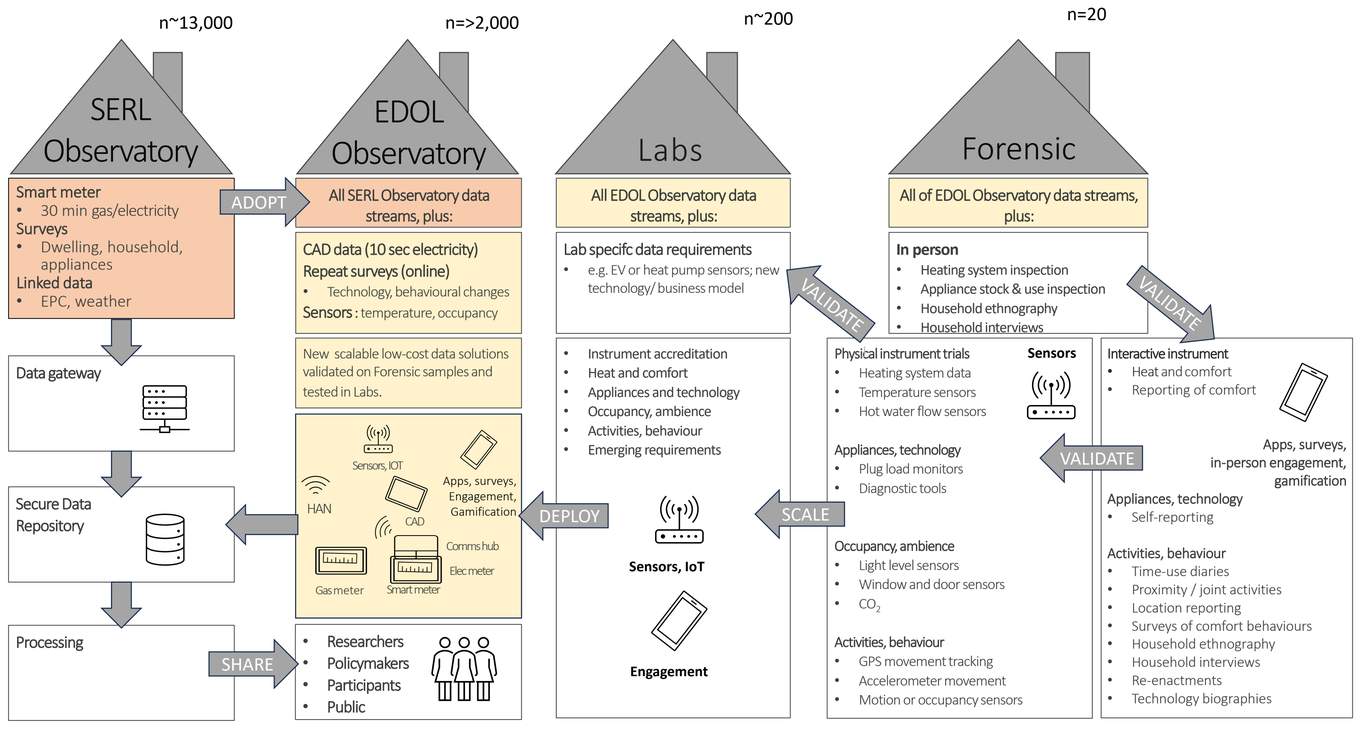
The University of Oxford:
Department of Engineering Science,
Environmental Change Institute

Duration: 5 years (2023 - 2028)
More about the project and team: visit edol.uk

Objectives

- **sociotechnical** research for a scientific understanding of energy use
- **responsive** research to a fast-moving technological and policy landscape
- **data-driven approaches** to energy data collection, analysis and access
- **data availability** for scientists, industry and policymakers
- **innovation** for new, cost-effective smart data solutions at scale

Implementation



Four challenges

Reducing energy waste

Quantifying wasted energy, assessing potential to reduce waste & identify technological & behavioural solutions

- Improve design & co-design of control systems, technologies, services, information and advice
- Policy and intervention strategies to ensure wellbeing while reducing energy demand
- Algorithms for predicting occupancy

Managing energy disruptions

Assessing the effects of disruptions on household energy use, bills, and CO2 emissions

- Disruptions are significant changes in circumstances
  - Internal: Job change, moving home, life events
  - External: Pandemics, extreme weather, policy changes
- Affects decision-making for individuals, government, etc.

Flexible demand for flexible systems

Quantifying the effects of emerging technologies, behaviours, and interventions, on daily load profiles

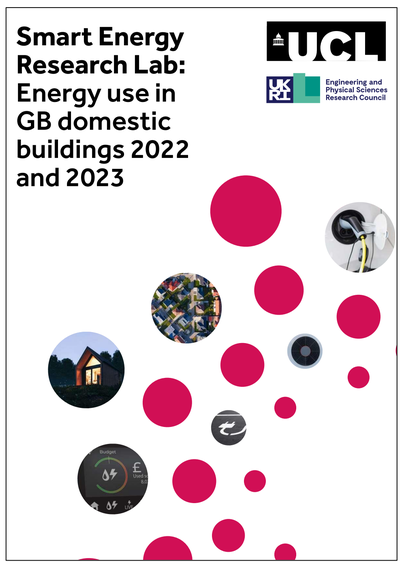
- **Supply systems** are likely to change in the future with potential consequences for domestic energy use
- **New (smarter?) electrical loads, e.g. EVs, heat pump, PV and batteries:** more (peak!) demand, more flexible resources, more agency? (AI, DSOs, Prosumers)
- How to **measure** and **attribute** the success of interventions

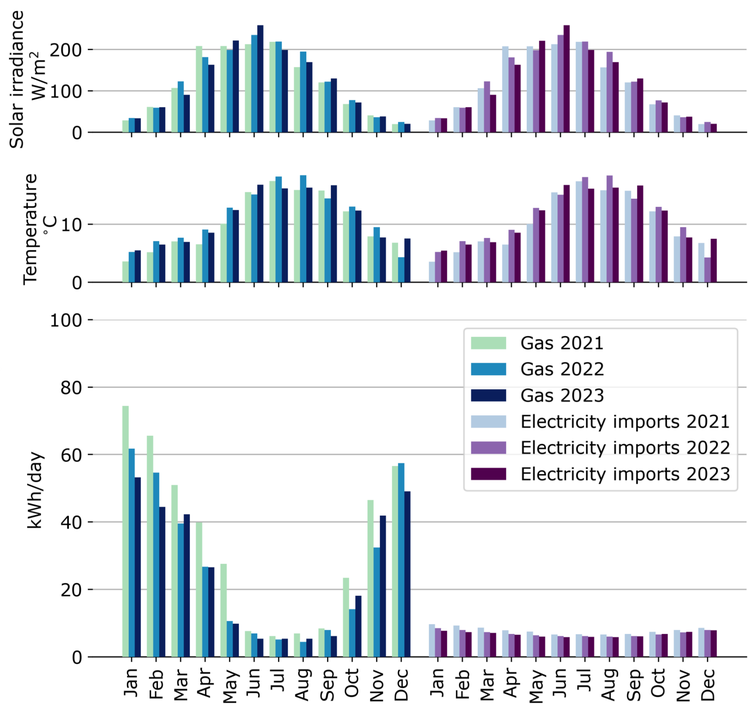
Energy demand modelling

Understanding the strengths & weaknesses of building energy models, contributing insights to the net-zero transition

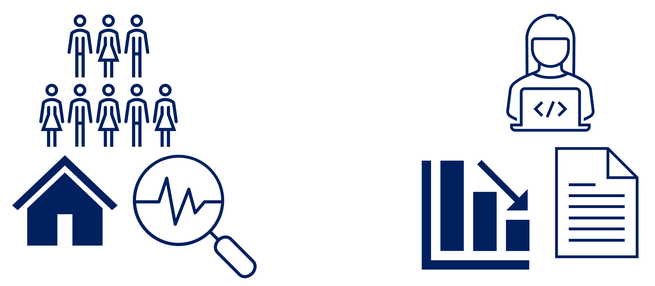
- A **comprehensive longitudinal dataset** is needed to **test and train models**, develop algorithms for specific energy uses and to account for occupant behaviour.
- Models need continuous grounding in high quality disaggregated energy data to account for **changes in behaviour, climate, energy costs, and technologies**.

Outputs to date





Current foci



Establishing the EDOL Observatory: data resources for other researchers

Development of:
- Sensor and survey data collection
- Heat pump lab
- Flexibility lab
- Cost of living lab