

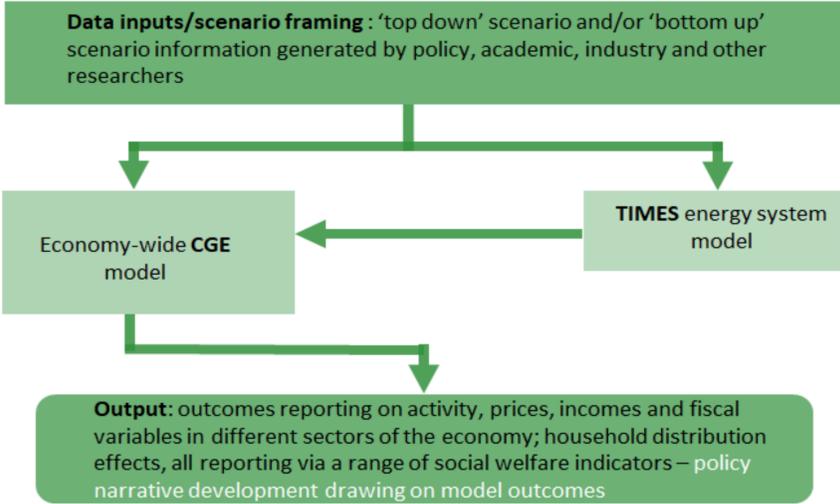
1. Introduction

To tackle climate change to meet net zero, the electrification of residential heat is proposed to be a key action. Significant changes to the energy system - including the upgrade of the energy networks and increasing renewable energy generation capacity - will be needed alongside the installation of new heating systems in people's homes. This project aims to:

- Analyze key impacts on the energy system and the associated costs of incorporating varying levels of electrification and energy efficiency.
- Investigate the economy-wide impacts across regions/sectors/household income groups, with a particular focus on low-income households and fuel poverty.
- Assess how different heat pump purchase options, production costs and supply chain shares affect the economy in the presence of persisting energy price shocks.
- Liaise with key policy stakeholders on how emerging understanding of key societal and political economy consequences may impact public and private sector decisions.

2. Soft-linked modelling approach

The methodology applies an innovative blend of energy system (TIMES) and economic (CGE) modelling to the heat decarbonization challenge.

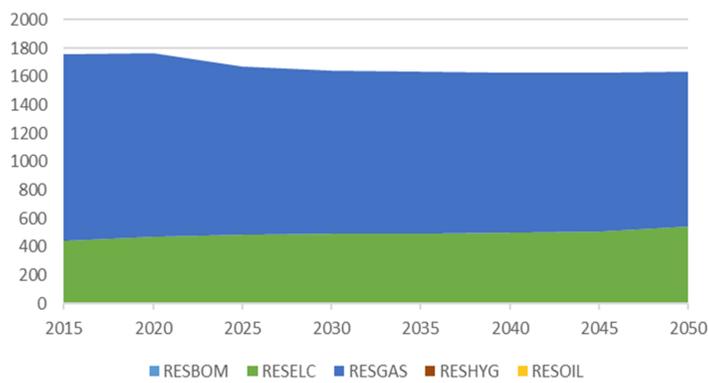


3. Scenario layering

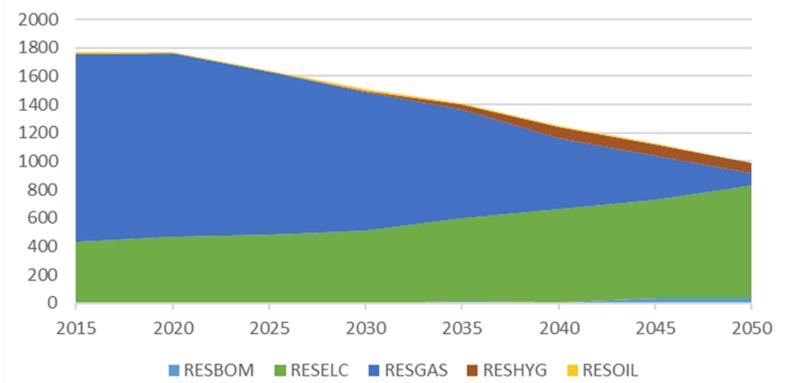
- **Price Shock Case:** Only energy (electricity & gas) price shock until 2030
- **Central Case:** Energy price shock + Grid network upgrade + Electricity efficiency gain + Heat pump purchase/installation by outright payment/government grants, with share of 25% equipment, 50% fittings, 100% labour being UK sourced
- **Cost Reduction Case:** Central Case with heat pump **cost reduced** by 30% in equipment, fittings, and 50% in labour effective from 2028
- **UK Source Case:** Central Case with **higher share** of 75% equipment, 75% fittings, 100% labour being UK sourced

4. Energy system impacts

Residential Energy Use: Base



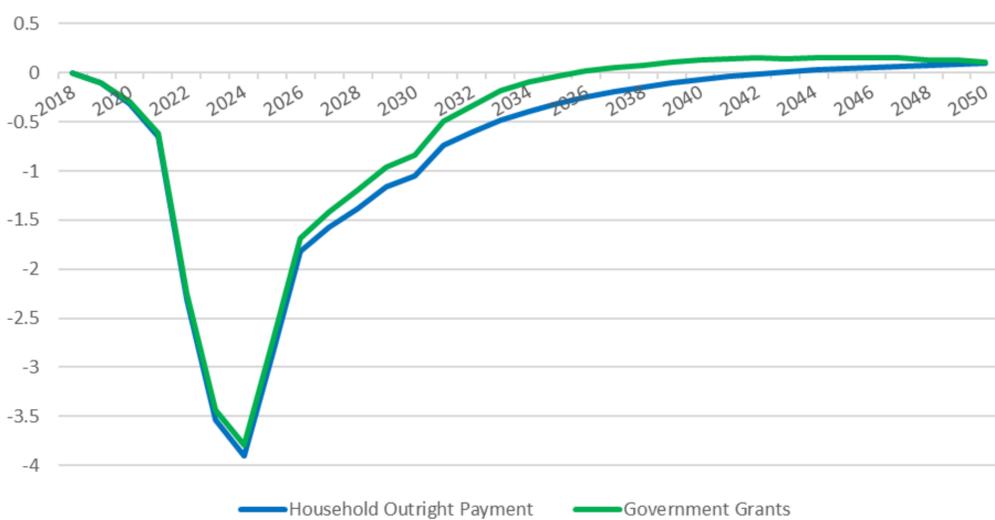
Residential Energy Use: Change



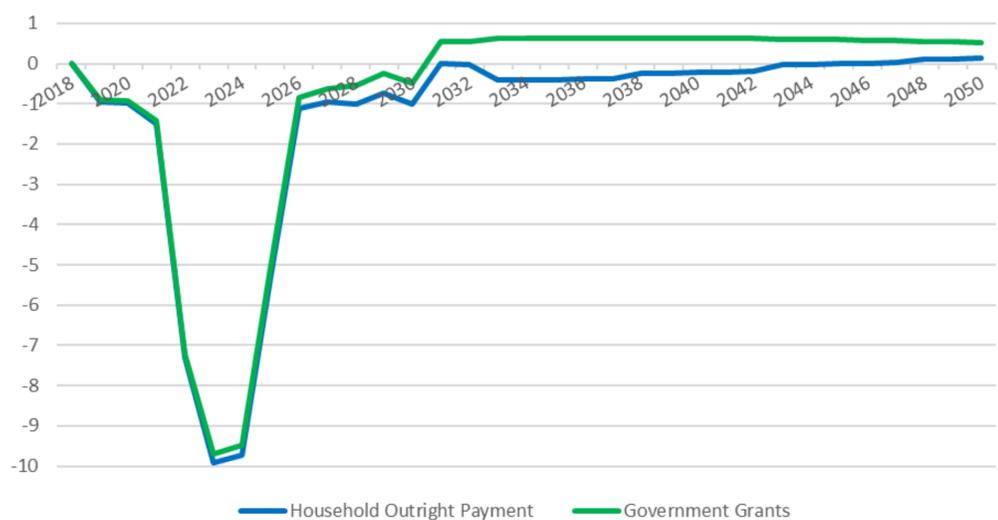
Almost 50% of residential heat using low carbon systems by 2035 and almost all by 2050

5. Wider economy impacts

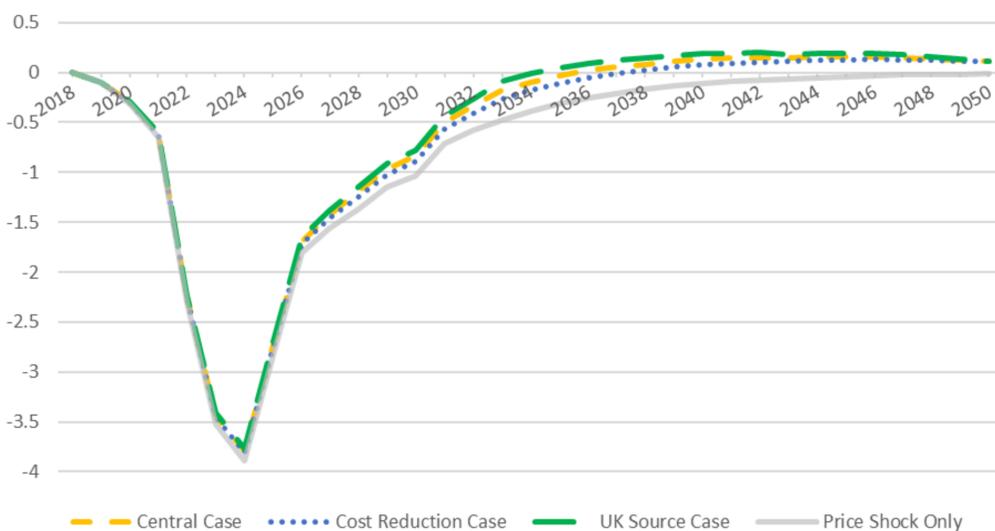
GDP % Change of Central Case



Consumption % Change of Central Case



GDP % Change of Heat Pump Purchase by Grants



- With dominating energy price shock, all scenarios show approx. 10% inflation
- Heat pump purchase by grants deliver the best economy-wide outcomes
- Unlike outright payment/loans for heat pump purchase, using grants does not negatively affect non-heat pump household consumption which is the main factor determining the economy-wide impacts here
- All cases mitigate the adverse wide-economy effects of energy price shock
- More UK manufacture leads to higher demand and spending to UK sector's output
- Covered by grants, heat pump cost reduction does not affect consumption but leads to less spending to UK sector's output
- Lowest income households mostly affected in proportionate terms