

## Fully-funded 4-year PhD Project at Loughborough University – The Electric Home and its Role in a Net Zero Carbon Economy

<b>Project Title</b>	The Electric Home and its Role in a Net Zero Carbon Economy
<b>Supervisor(s)</b>	Dr Steven Firth, Dr Arash Beizae
<b>Project Description</b>	<p>The UK has committed to a net zero carbon target by 2050. This will require a radical transformation of the energy systems and energy consumption in the UK built environment and transport sectors. Moving from fossil fuels towards electricity is considered a necessary step, making use of technologies such as heat pumps for heating buildings and electric cars for powering personal transport.</p> <p>This PhD examines the concept of ‘the Electric Home’ and the intended and unintended consequences of the drive to electricity use to reduce carbon emissions. The Electric Home provides all energy services for its occupants using electricity. Space and water heating are provided by a heat pump or direct electric heating. Transport needs are met by electric cars which are charged overnight at the dwelling. The electricity is supplied by on-site renewable generation such as solar photovoltaics and by the national grid from green, low carbon sources such as offshore wind.</p> <p>Using the latest modelling techniques and government statistics, this research will address the following questions:</p> <ol style="list-style-type: none"> <li>1. How does the energy consumption of a typical UK household changes for an Electric Home? Clearly the electricity consumption will increase significantly, but how much might be expected? How does the timing of energy demand throughout a typical day and month change? What</li> </ol>

are the effects of delivering energy for personal transport at the home rather than at the petrol forecourt? How will the consumption change for different household compositions and different dwelling types? Will the Electric Home mean that occupants change their behaviour when powering their homes and driving their cars?

2. What are the unintended consequences of a mass uptake of the Electric Home? The increase in electricity consumption for powering homes and cars will require the national electricity infrastructure provide an uninterrupted supply, but will it be able to cope? What will be the additional strains on the electricity grid at the local and national level, and at different times of the year? Will a significant investment in electric storage be required? For the household, what will be the impact on energy bills and how will different household be affected? Will the Electric Home exacerbate fuel poverty? The use of thermal stores for heat pumps and electric charging points for vehicles require major, possibly unwanted modifications to the house, will these be acceptable to homeowners and at what additional cost?

3. What is the realistic deployment of the Electric Home as part of a net zero carbon future? The costs and infrastructure changes required mean that the Electric Home will not suit all situations and is likely to be part of a series of solutions for delivering low carbon home heating and personal transport. This research will use multidisciplinary models of home and car energy use in a national housing stock model to predict the realistic uptake of the Electric Home under different scenarios as a part of delivering on the UK's 2050 net zero target.