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Maximising equity outcomes of Net Zero energy transitions

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Abstract:
The climate emergency is recognised by more and more countries. The world has a viable pathway to building a global energy sector with net-zero emissions in 2050, but it is narrow and requires an unprecedented transformation of how energy is produced, transported and used globally. As well as the Net Zero challenge, the UK is suffering an energy price crisis that has brought greater public and policy focus on energy security and affordability. This research explores how the deployment of different energy demand solutions could be designed and deployed in ways that could result in maximised equity in diverse communities with access to varying supply vectors and design/deployment of demand reduction options. A case study builds a three-layer whole-system approach to tackle fuel poverty and decarbonisation in a distributed heating system. The three-layer model optimises heating system decarbonisation plans and simulate socio-economic system impacts under millions of scenarios to provide quantitative decision support. It is found that heating system decarbonisation heavily relies on future grid carbon intensity and energy prices and it appeals to a more comprehensive policy design for multiple stakeholders. Lessons of this study would shed light on other regions in tackling fuel poverty, delivering transformative insights to support delivery of energy demand reduction and Net Zero transition pathways that are economically, socially, politically and technically feasible.

Keywords: Equity, Net Zero, Energy security, Heating decarbonisation

Lirong Liu is a Senior Lecturer in the Centre for Environment and Sustainability (Surrey) with recognized expertise in innovatively integrating methodologies at different scales to address scientific issues with consideration of conflicting environmental, economic, and social objectives. LL has produced over 100 refereed journal papers with an H-index of 30 from Google Scholar. She is the UK PI in the project 'Wellbeing, inclusion, sustainability and the economy' (€3m, Horizon Europe), leading the sustainable wellbeing economy research. She is a Co-I of the Energy Demand Research Centre (£18.75m, UKRI) working on the Equity theme and Co-I of the 'Soilless cultivation for rapid bioenergy feedstock production' project (£4m, BEIS) on socio-economic impacts assessment. She is involved in the UK Energy Research Centre (UKERC) and Network+ Decarbonisation of Heating and Cooling (H+C Network) by leading flexible funds as PI. Her research also received support from surrey internal funding and Royal Society.