



The case of 100% electrification of domestic heat in Great Britain

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Abstract

Unlike power sector decarbonisation, there has been little progress made on heat, which is currently the biggest energy consumer in the UK, accounting for 45% of total energy consumption in 2019, and almost 40% of UK GHG emissions. Given the UK's legally binding commitment to "Net-Zero" by 2050, decarbonising heat is becoming urgent and currently one of the main pathways involves its electrification. Here, we present a spatially-explicit optimisation model that investigates the implications of electrifying heat on the operation of the power sector. Using hourly historical gas demand data, we conclude that the domestic peak heat demand is almost 50% lower than widely-cited values. A 100% electrification pathway can be achieved with only a 1.3-fold increase in generation capacity compared to a power-only decarbonisation scenario, but only, by leveraging the role of thermal energy storage technologies without which a further 40% increase would be needed.

Keywords heat electrification, energy systems optimisation, carbon capture and storage, heat pumps, unit commitment, investment planning

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