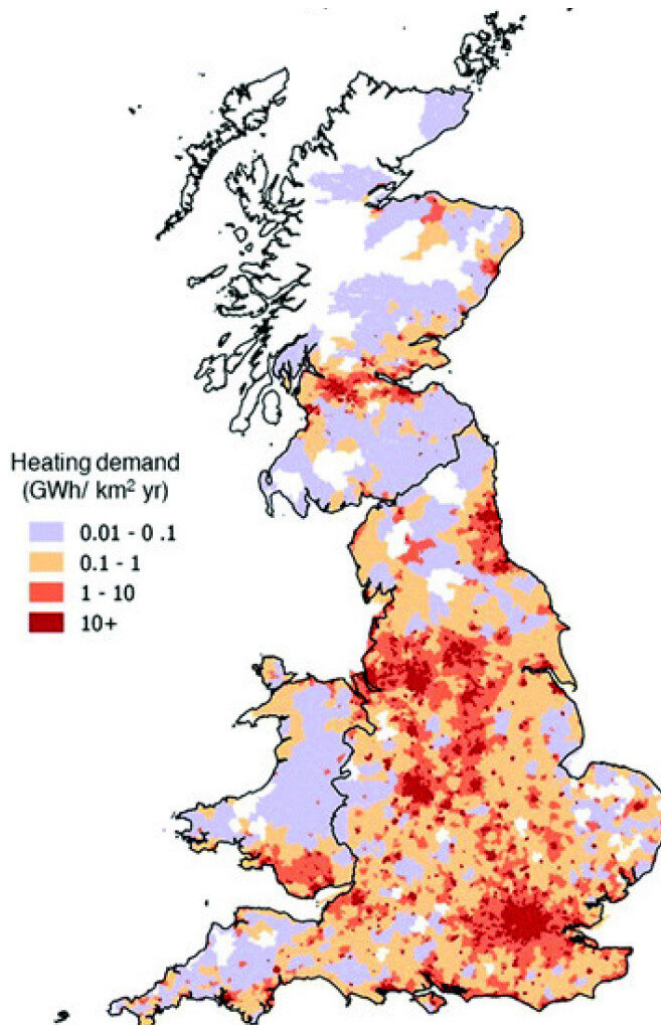


Hydrogen-based heating could help UK reach net-zero carbon by 2050

7 October 2020, by Caroline Brogan



Intensity of heating demand across Great Britain. Credit: Imperial College London

Using hydrogen instead of natural gas for heating could help the UK to achieve net carbon-neutrality by 2050, according to new Imperial research.

Currently, non-renewable [natural gas](#) from [fossil fuels](#) is used to supply half of Europe's heat demand, with national shares as high as 80 percent in the Netherlands and the UK. However,

the UK has committed to developing an economy with net-zero greenhouse gas emissions, and one of the ways to achieve this might involve switching natural gas for [hydrogen](#).

Hydrogen has long been hailed as a clean alternative to natural gas. It produces only water when consumed, and it can be distributed through existing infrastructure such as pipelines with minimal adjustments. Yet there is little understanding of the various requirements of this transition, including its cost.

A new Imperial College London study has now, for the first time, laid out a comprehensive assessment of how the UK could convert its national heating network from using natural gas to hydrogen. The paper, published in *Energy & Environmental Science*, provides a detailed roadmap in setting out the "what," the "where," and the "when" of transitioning.

The research found that transitioning from natural gas to hydrogen for heating could help the UK to reach 2050 targets, but that setting up and running hydrogen-based heating may cost as much as three times that of natural gas.

A key conclusion of this work is that whilst the transition to a hydrogen-based heating system is technically feasible today on the basis of commercially available technologies, there remains an important role for the government to act as market maker to enable this transition.

The researchers say that rolling out a national hydrogen infrastructure can be fast-tracked using a form of hydrogen that cheaper but non-renewable alongside [carbon capture](#) and storage while we develop cost-effective renewable-hydrogen options. This form of hydrogen is derived from methane and biomass, which produce some greenhouse gasses, but is cheaper than renewable hydrogen, which requires splitting water using [renewable energy](#)

[sources](#) like wind or solar power.

Alternatively, renewable hydrogen could be combined with existing electric heating capabilities to meet this same goal.

To conduct the study, the researchers used new open-source mathematical modeling tools and investigations using UK regional data to describe the potential rollout of hydrogen infrastructure.

Lead author Nixon Sunny from Imperial's Department of Chemical Engineering said: "Our findings show that transitioning to hydrogen will be rather costly, but we suggest options like government subsidies and policy innovation to help achieve this. We believe offsetting these initial costs will be worth it if it means we can reach carbon neutrality by 2050."

Study co-author Professor Nilay Shah, also of the Department of Chemical Engineering, said: "There is a lack of clarity on the most affordable means of supplying heat in a carbon-neutral world, especially given the lag times associated with building new low-carbon technologies and supporting infrastructure.

"We hope these insights will help governments and companies in gas-reliant nations, including the UK, to make more informed decisions on decarbonising their heating sector."

Study co-author Professor Niall Mac Dowell of Imperial's Center for Environmental Policy said: "Decarbonising the heating sector is a particularly important milestone on the UK's pathway to net zero by 2050. However it is particularly challenging because the usual technical and commercial challenges are further complicated by concerns around cost, which could increase energy poverty. It is therefore vital that the public and private sectors work closely together to enable a rapid, reliable, and equitable transition."

The researchers are now investigating how hydrogen and electric heating could be combined to meet the 2050 goals.

"What is needed to deliver carbon-neutral [heat](#)

using hydrogen and CCS?" by Nixon Sunny, Niall Mac Dowell and Nilay Shah, published 22 September 2020 in *Energy & Environmental Science*.

More information: Nixon Sunny et al. What is needed to deliver carbon-neutral heat using hydrogen and CCS?, *Energy & Environmental Science* (2020). [DOI: 10.1039/D0EE02016H](https://doi.org/10.1039/D0EE02016H)

Provided by Imperial College London

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