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An old central heating boiler (L) and a hydrogen boiler inside the Hydrogen Experience Centre in Apeldoorn, Netherlands, the hydrogen house of certification body Kiwa and Dutch gas, heat and power distributor Alliander Photo: AFP/Getty

Revealed | What 18 independent studies all concluded about the use of hydrogen for heating

Investigations repeatedly find that H₂ will prove to be too expensive and inefficient compared to other clean alternatives such as heat pumps

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By [Leigh Collins](#)

A total of 18 independent studies produced since 2019 — including by the IPCC, IEA and McKinsey — have ruled out hydrogen playing a major role in the heating of buildings, according to a list compiled by renowned energy expert Jan Rosenow.



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Several gas distributors, particularly in Europe, have been lobbying hard in recent years as they seek government backing to eventually swap the natural gas at the core of their business — used mainly to heat homes and businesses — with clean hydrogen.

But study after study has shown that such a scenario would be highly unlikely due to the costs and inefficiencies involved.





'Hydrogen for heating is not financially feasible — gas distributors need to realise their business model is dead'

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For instance, the UN's International Panel on Climate Change (IPCC) concluded in its recent 2,913-page [Mitigation of Climate Change report](#) that close to 0% of buildings would be heated by hydrogen in 2050.

Management consultant McKinsey came to the same conclusion in its 2022 study, [The net-zero transition: What it would cost, what it could bring](#), while the International Energy Agency (IEA) found in its [Net Zero by 2050](#) report last year that its least-cost pathway would include less than 2% hydrogen use in decarbonising buildings.

Rosenow — who is the European programme director at the [Regulatory Assistance Project](#) (RAP), an energy-focused independent multinational non-governmental organisation — tells *Recharge*: “For more than two years I have collected and analysed all independent studies I could find on hydrogen for heating. Virtually none of them identifies heating with hydrogen as a good option for various reasons.

“This includes the costs, which are higher than other clean heating options such as heat pumps and district heating. It also includes environmental impacts because to deliver one unit of heat with [green] hydrogen requires about five to six times more renewable electricity compared to a heat pumps. This means five to six times more generating capacity, more resources and more land.”

He dismisses the idea that heat pumps — which are highly energy efficient and can also provide air conditioning — will not work in poorly insulated homes or in freezing conditions.

“Heat pumps are a proven technology widely deployed in cold climates and all types of buildings. It is a myth that heat pumps do not work in old buildings or in cold climates,” he says.



Gas distributor group Ready4H2 says majority of members would not be ready for hydrogen until 2040

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Blue hydrogen, derived from natural gas with carbon capture and storage, has also been proposed to heat homes, but this would actually require more methane per unit of heat than simply burning the gas in the first place — [hardly an ideal proposition during a global gas price crisis](#).

In addition to the expense and inefficiencies of using hydrogen to heat homes, there are also significant issues around the practicalities of converting appliances and networks to run on 100% H₂.

For instance, a group of 90 European gas distributors campaigning for 100% hydrogen in their networks, called Ready4H₂, has inadvertently demonstrated the exact opposite of its name — that gas grids will not be ready for pure H₂ any time soon.

According to the group's report, *Ready4H₂: Europe's local hydrogen networks*, published last December, only 24% of its members said they would be “fully ready” for 100% hydrogen by 2035, and only 67% said they would be by 2040.

In other words, a third of the most pro-hydrogen gas distributors in Europe say they will not be fully ready for pure H₂ networks in 20 years' time, and three quarters won't be ready in 15 years' time.

Rosenow defines “independent” as “not carried out by or on behalf of a specific industry (gas, oil, electricity, heat pumps, boiler manufacturers, etc)”. So this excludes studies by lobbyists such as the Hydrogen Council and Hydrogen4EU, which are dominated by fossil-fuel companies.

The other independent reports in Rosenow's list were written by academic institutions, including London's Imperial College, the Potsdam Institute for Climate Impact Research, the UK's Manchester University; research organisations such as Germany's Wuppertal Institute and Öko-Institut, and the UK's Centre for Research into Energy Demand Solutions; non-profit organisations such as the International Council on Clean Transportation and the Energy

Transitions Commission; and analysts such as Element Energy, Agora Energiewende and Michael Liebreich.

For Rosenow's full list of studies, click [here](#).

In addition to his work at RAP, Rosenow also serves on the executive committee of the IEA's demand-side management programme, and ha also advised the European Commission, European Parliament, and government departments in several countries, including the US.

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