Is Hydrogen A Climate Silver Bullet, Or Fossil Fuel Industry Spin?

By David Vetter
Forbes: September 1, 2021

New research claims the gas industry is using the promise of so-called "blue'' hydrogen to delay a shift away from fossil fuels. Getty Images

When it comes to cutting carbon emissions, where does hydrogen belong? The gas, which releases no greenhouse gases when burned for energy, has been touted as a promising route by which countries can achieve their climate goals. But a new report claims that oil and gas companies are using the promise of "low-carbon" hydrogen as a tactic to delay the transition away from fossil fuels.

According to U.S. environmental non-profit Earthjustice, claims from fossil fuel firms that so-called "blue" hydrogen – derived from fossil gas using high-temperature steam, with the carbon emissions captured by special equipment – can offer a quick and effective way to decarbonize the world's energy systems do not stand up to scrutiny.

But the viability of large-scale, cost-effective removal of carbon dioxide from the process has not been proven, the report contends, and pressure from the oil and gas lobby to support hydrogen production could cause governments to de-emphasize the cheapest and most effective route to decarbonizing the energy sector: electrification.

"Hydrogen isn't the silver bullet it's marketed to be," said Sasan Saadat, a senior researcher for Earthjustice and a co-author of the report. "Worse, the deluge of hydrogen hype from fossil fuel companies threatens to delay the clean energy transition by siphoning resources away from solutions like electric appliances and vehicles."

The report comes hot on the heels of a high-profile Twitter spat between prominent climate researchers on the promise – or threat – of blue hydrogen, as well as a new U.K. government strategy laying out how Britain intends to develop and use the element to advance its decarbonization goals.

How Green Is Blue?

The Earthjustice paper shows that in the U.S., some 10 million metric tons of hydrogen are produced from oil and gas annually. But with only 1% of global hydrogen production using carbon capture and storage to reduce emissions, the hydrogen industry worldwide has a bigger carbon footprint than the nation of Germany. And even when carbon capture and storage equipment is fitted to such facilities, it can only cut out 85% to 95% of a facility's greenhouse gas emissions, and does not eliminate emissions of other harmful pollutants such as particulate matter and nitrogen oxide.

If hydrogen is to be a climate solution, Earthjustice argues, governments should focus on supporting the development of "green" hydrogen, which uses renewable energy to separate hydrogen from water. But the green hydrogen industry is still in its infancy, producing only a tiny fraction of the hydrogen needed for industry and other uses. Further, green hydrogen production requires a lot of electricity to power the electrolysis process – electricity that could otherwise be used to directly power homes, transportation and industry.

This being the case, Earthjustice recommends employing green hydrogen only for limited applications. **"**This report shows that green hydrogen can be a useful tool but it's no substitute for going big on the proven solutions we have today – powering the grid with renewable energy and electrifying our buildings and transportation systems," said Jill Tauber, Earthjustice's vice president of litigation for climate and energy.

But, even among climate researchers, there is not yet a consensus on what hydrogen's role should be in the decarbonization effort.

Jan Rosenow, European director for the Regulatory Assistance Project, an independent think tank focused on the energy system transition, explained.

"Green hydrogen is the only truly zero-carbon form of hydrogen, while blue hydrogen can never be 100% carbon capture as there will always be some leakage somewhere," Rosenow told me. "But people disagree about just how carbon intensive blue hydrogen is."

This disagreement led to the aforementioned Twitter spat between energy and climate experts. In a paper that received widespread media attention, professors Mark Jacobson and Robert Howarth concluded that blue hydrogen has an even worse carbon footprint than fossil gas (or even, in

some circumstances, coal). Other experts criticized the research, saying the data had been cherry picked to show blue hydrogen in the worst possible light. Effective carbon capture and storage is eminently feasible, they contended, and simply requires further development.

"The debate got very heated indeed," Rosenow noted, "but I think what it shows is that the evidence isn't that clear on blue hydrogen yet. Some people are more optimistic and say we can get to above 90% of carbon captured, while on the other hand there are researchers who think it will be worse than burning coal. But even the most optimistic people would agree blue hydrogen isn't zero carbon."

The Hydrogen Hype Train

The central thrust of the Earthjustice report focuses on how oil and gas companies have established lobby groups in the U.S. to promote hydrogen from fossil fuels, noting that such groups have been active in Europe for some time. Research has shown such lobby groups spent €60 million ($71 million) attempting to influence the European Commission to endorse blue hydrogen – and that these efforts have been at least partially successful.

In Rosenow's view this is to be expected. "I think this goes to the core of what these companies are," he said. "They feel threatened by the whole net zero debate, where it's clear you can no longer sell unabated fossil fuels. So they're reacting in the same way the coal industry did 20 years ago."

The "clean coal" era, which emerged in the first decade of this century, was the coal industry's response to increasing public pressure in advanced economies to move away from the widespread use of coal. It saw the establishment of such groups as the now-defunct American Coalition for Clean Coal Electricity (ACCCE), which worked to maintain the viability of the coal industry. That push was all about adding carbon capture to coal-fired power plants. "They were saying 'we'll continue to burn coal and we can just fit a CCS to it later, so don't worry about it,'" Rosenow recalled.

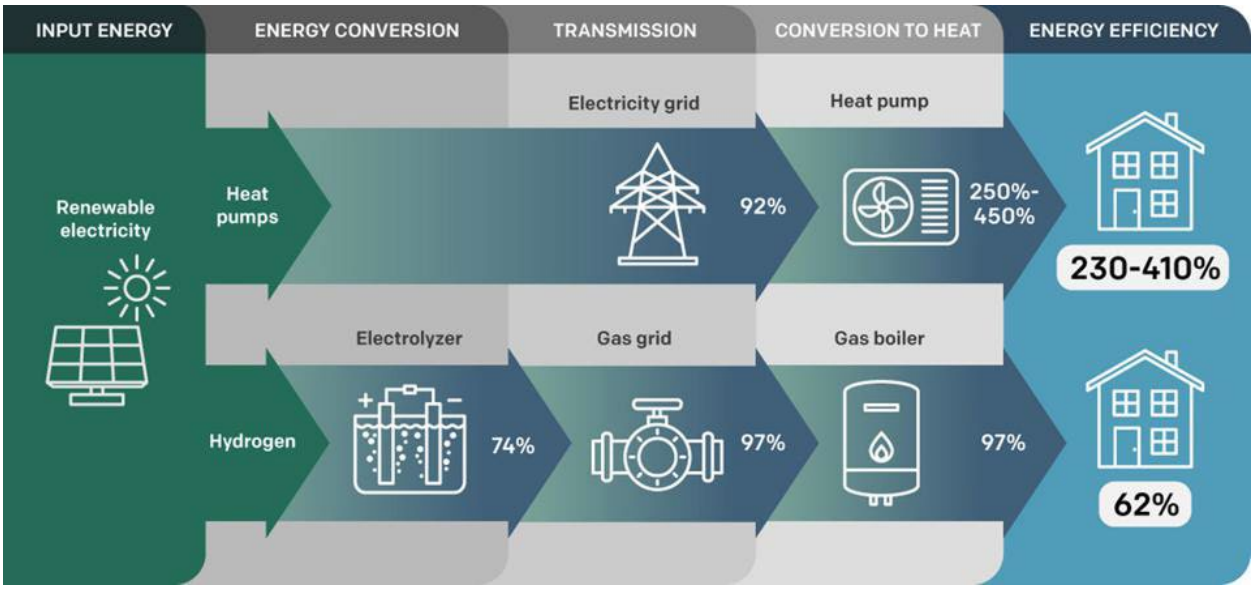
But despite billions of dollars of investment, carbon capture from coal turned out to be wildly expensive, difficult to implement and ultimately a dead-end. This year, the last CCS-equipped coal power plant in the U.S. shut down for good.

"The danger, I think, is that you can see a similar story with gas, where you just see a delay in getting out of combusting fuels, instead of developing technologies that we know are already proven and can deliver and that are probably superior," Rosenow said.

So if hydrogen isn't a great answer to the decarbonization question, where does it belong? And what should governments focus on instead?

Sasan Saadat was unequivocal: "In the future, green hydrogen may help us carry renewable energy into the toughest corners of the energy system, but it's no substitute for rapidly electrifying the bulk of our economy today."

Earthjustice proposes that hydrogen should be limited to applications for which electricity isn't suited – such as very high temperature industry processes and aviation. But, the authors said, it should have no part in applications that could be better served by electricity – such as heating homes or transportation – because it is far less energy efficient. A report from the International Council on Clean Transportation found that in homes, heat pumps are up to six times more efficient than hydrogen boilers as they transfer rather than generate heat, and because green hydrogen is very energy intensive to produce.



Using electricity to run a heat pump is a far more efficient way of heating a home than using green hydrogen. Tanja Geis for Earthjustice

"Contrary to industry marketing, it makes no sense to burn hydrogen in our homes," said Sara Gersen, a report co-author and attorney on Earthjustice's Right to Zero campaign, adding another reason: "The gas distribution system can't deliver significant volumes of hydrogen to homes and businesses without creating safety hazards in pipelines and household appliances." Instead, she said, the best way forward for homes is, once again, electrification.

Rosenow said this makes sense, but noted the report completely rules out the possibility of using hydrogen for electricity generation. In a future electricity system largely reliant on wind and solar energy, he said, "there will be gaps in generation, and batteries are not going to do that by themselves. I think most serious models out there assume some form of large-scale, dispatchable, zero-carbon generation. Hydrogen plants, in my view, deserve attention and a critical look."

Reaching An Accord

So it turns out that in some areas, consensus on the usefulness of hydrogen is beginning to form. Many energy researchers and a growing number of firms and industry bodies agree that hydrogen is inferior to electricity in heating homes and buildings.

Yet against this advice, governments are leaving the door open to the possibility of hydrogen in homes. The U.K. hydrogen strategy, for example, commits the country to a "'twin track' approach to hydrogen production, supporting both electrolytic and CCUS-enabled hydrogen," and that a decision on the use of hydrogen for heating should be made as late as 2026.

Rosenow said the U.K. strategy is muddled.

"On heating the strategy is completely unclear. It sort of says 'we expect a range between zero and something like 50% of current heat demand,' so it doesn't tell you much," he said. "I think that's unfortunate because it suggests there could be a pathway that's heavily dominated by hydrogen."

This differs markedly from the EU's hydrogen strategy, which clearly recognizes zero-carbon green hydrogen as the endgame.

So given all the current controversy and uncertainty surrounding hydrogen, what should governments do?

"I think firstly it's pretty clear at this point that there isn't a vast potential for generation of blue hydrogen in the next 10 years," Rosenow said. "So for a policymaker who's elected for the next four or five years, if they want to reduce emissions now I would say that blue hydrogen is not going to do that for you because it's not going to be ready."

No matter how enticing blue hydrogen might be made to sound, Rosenow suggested, decision makers should consider all the options available. "As this report shows, there are simply better and lower emission alternatives for many of these sectors," he said.

But equally, anyone concerned with the ultimate goal of stopping global warming should take careful note of where the pressure to back a particular solution is coming from.

"Policymakers should really pay close attention to who puts the arguments forward, and what sort of agenda people have when they make those arguments," Rosenow said. "It's not always an objective discussion between experts who disagree. This report shows very clearly that, in quite a few cases, the arguments for hydrogen are being used deliberately to push a certain vision forward around the continued use of fossil fuels."

The Earthjustice report can be downloaded here.