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Press Release

New Study: How Carbon Accounting Rules Shape Incentives for Hydrogen Production

A new study by University of Mannheim researchers Gunther Glenk, Philip Holler, and Stefan Reichelstein examines how the assessment of carbon emissions affects the incentives for the production of electrolytic hydrogen. Its key finding: even stringent accounting rules generally provide sufficient investment incentives. However, they do not necessarily guarantee low-carbon hydrogen.

Governments around the world have launched comprehensive support programs for hydrogen to drive industrial decarbonization. Numerous programs tie the level of subsidy to the assessed carbon intensity of the hydrogen produced. In the United States, for example, producers can receive a tax credit of up to three US dollars per kilogram of hydrogen produced. There is currently a policy debate over which carbon accounting rules are appropriate: Should the renewable electricity used for electrolysis be matched on an hourly basis, or is annual accounting sufficient? If stricter requirements are adopted, will companies still have sufficient incentives to make the necessary investments? And do the rules ensure that subsidized hydrogen is actually “green”?

The Mannheim-based research team addressed these questions in the context of the US Inflation Reduction Act. The researchers examined electrolytic hydrogen, in which water is split using electricity in so-called Power-to-Gas systems. The study’s findings were published today in the prestigious journal *Nature Communications*. Unlike many earlier analyses, this study takes the perspective of commercial investors that require adequate returns in order to invest in Power-to-Gas plants.

Contrary to frequently expressed views, the researchers find that strict carbon accounting rules with hourly matching provide sufficient investment incentives for Power-to-Gas plants, with estimated internal rates of return ranging from eight to 15 percent. However, the hydrogen produced is not necessarily “green”. With higher hydrogen prices, it becomes economically attractive for operators to increasingly power electrolyzers with electricity from the general power grid. As a result, the average carbon intensity can rise to the level of “blue” hydrogen, which is produced from natural gas with carbon capture.

Less stringent regulations – with annual rather than hourly checks – increase the estimated returns to as much as 23 percent, well above typical renewable-energy returns. In this case,

the carbon intensity can rise to the level of traditional “grey” hydrogen, which is produced from fossil fuels without carbon capture.

“Our analysis shows that stricter rules do not generally deter investment, as is often claimed. However, they do not necessarily result in “green” hydrogen either,” explains Dr. Gunther Glenk, Assistant Professor at the Mannheim Institute for Sustainable Energy Studies (MISES). “How you assess the carbon content of the hydrogen matters,” adds MISES doctoral candidate Philip Holler. “The accounting rules ultimately determine how effective public policy is in achieving industrial decarbonization.”

Implications for Germany and Europe

Germany has signed numerous agreements to import significant quantities of hydrogen from Canada, North Africa, Australia, and other regions. Current EU rules for renewable hydrogen stipulate that, until 2030, a monthly matching of electricity generation and hydrogen production is sufficient. After that, matching must take place on an hourly basis. However, there is currently a debate over whether this stricter requirement should be postponed by a few years to ensure the economic viability of the production facilities.

“Even though our calculations are calibrated for reference plants in the US, the key findings are applicable for Europe,” says Stefan Reichelstein, holder of the endowed chair in Business Administration at the University of Mannheim. “Strict carbon accounting rules lead to significantly lower-emission hydrogen production and are likely to provide sufficient investment incentives, particularly in regions with abundant renewable resources.”

Original study

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