Technoeconomic Analysis of Industrial Green Hydrogen Production

Cody E. Finke, Hugo F. Leandri, Evody Tshijik Karumb, David Zheng, Michael R. Hoffmann, and Neil A. Fromer, *Economically advantageous pathways for reducing greenhouse gas emissions from industrial hydrogen production under common, current economic conditions*. Energy & Environmental Science (2021). https://doi.org/10.1039/d0ee03768k

Scientific Achievement

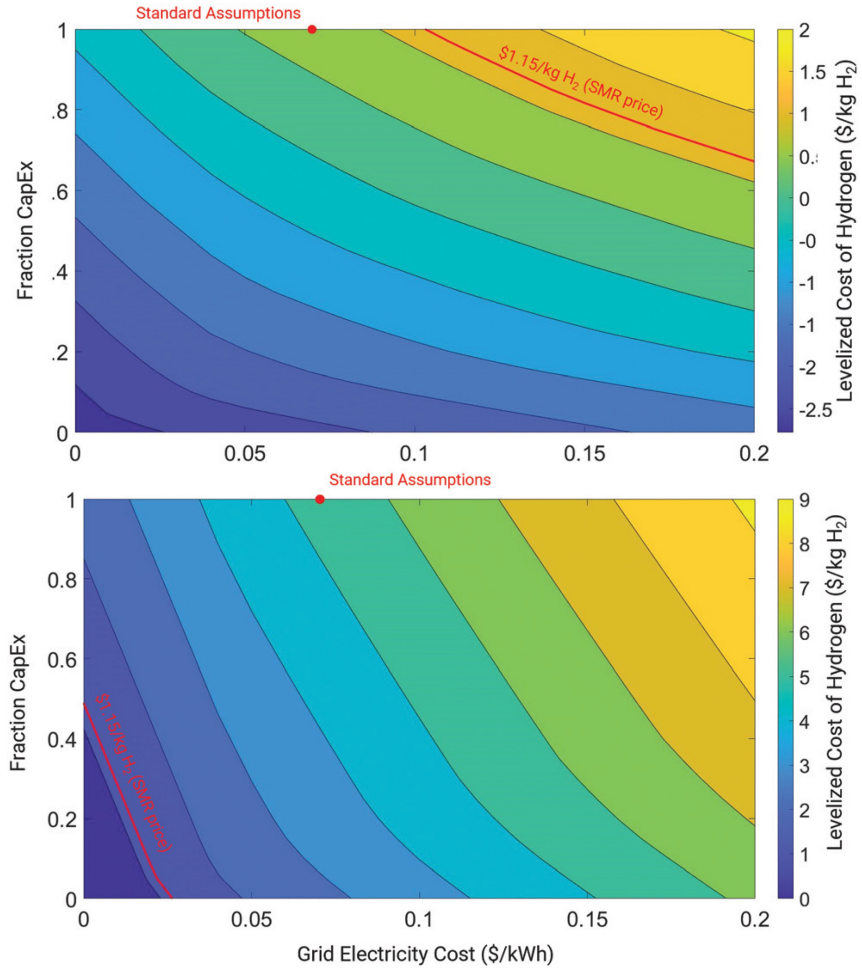
- We developed a model to compare real costs of building and operating an electrochemical hydrogen production facility to traditional hydrogen generation

Significance and Impact

- There are methods of producing hydrogen, such as sulfur electrolysis (coproduction of hydrogen and sulfuric acid) that could be cheaper and cleaner than steam methane reforming. Water splitting may not be one of them.

Technical Details

- The model calculates levelized cost of hydrogen based on real data for capital and operating costs.
- While the high energy inputs and lack of a coproduct make water splitting uneconomic, we identify several reactions that together could meet global hydrogen demand.



These plots show the levelized cost of hydrogen produced by sulfur electrolysis (SE, top) and water electrolysis (WE, bottom), as a function of the cost of electricity and the cost of the capital equipment. The red lines show current real hydrogen costs from steam methane reforming. While modest reductions in capital or electricity costs make SE a viable alternative, drastic reductions in both are needed for WE to be competitive. From C. E. Finke, et al, Energy Environ. Sci., 2021, Advance Article – reproduced by permission of the Royal Society of Chemistry.

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