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Clean hydrogen market remains hazy, even as Biden spends billions

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1 of 3

Isabelle Kitowski, an ALLEX engineer, left, talks to Andrew Garrett, vice president hydrogen syngas, last year at the Air Liquide hydrogen plant in La Porte.

Brett Coomer, Houston Chronicle / Staff photographer

WASHINGTON - In the Houston of the future, as imagined by the city's oil companies and civic institutions, a network of clean hydrogen plants and pipelines will by mid-century deliver carbon-free fuel around the state and the world, generating $100 billion a year for the Texas economy.

Driven by billions of dollars in federal grants and generous tax incentives, this new industry is projected to grow rapidly over the next seven years, as the Biden administration outlined in a report earlier this year. By 2030 U.S. hydrogen production will theoretically hit 10 million tons of production a year - enough to replace most of the existing carbon-emitting hydrogen plants in the United States.

But it is unclear whether there will be enough customers willing to buy anywhere close to that volume of clean hydrogen. Oil refineries and chemical plants, which account for the bulk of the existing market and which the Biden administration envisions as early adopters, are unlikely to make the switch under current prices, even accounting for the subsidies passed by Congress last year, according to experts and industry insiders.

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A report earlier this year by Energy Futures Initiative, founded by Ernest Moniz, energy secretary during the Obama administration, found a substantial "cost gap" between what industrial users that make up more than 90 percent of the existing hydrogen market currently pay and what they are likely to pay for clean hydrogen.

"Right now that switch is going to be tough," said Alex Kizer, senior vice president for research at the nonprofit Energy Futures Initiative. "A demand signal (for existing hydrogen customers) doesn't exist in the United States right now and that's what everyone is working through."

The refining and petrochemical industries remain upbeat about the prospect of cleaning up their hydrogen supplies, but they are resistant to signing the long-term contracts hydrogen producers will need before they start construction.

A refinery, for instance, would need to spend at least three times as much on clean hydrogen as it does on standard carbon-intensive hydrogen, factoring in federal tax incentives, according to the report from Moniz's group. An ammonia plant would need to pay at least twice as much.

“It’s all going to depend on what the costs look like,” said Brendan Williams, vice president of government relations at PBF, a New Jersey-based refining company with operations along the Gulf Coast. “Refineries are already a very cost intensive business and it’s a volatile business.”

Houston hub

The primary interest among refineries in the near term is not using clean hydrogen themselves but producing it to sell into the transportation market, primarily for use by medium- and heavy-duty trucks, Williams said.

There is already a market for clean hydrogen in warehouses and ports to power forklifts and other short distance moving equipment, as large retailers like Amazon and Walmart look to reduce their carbon footprints.

But it’s a small market, and it’s unclear when the larger transportation market will be ready to buy clean hydrogen at the scale new industry will need.

In a planning document released by the Department of Energy earlier this year, the administration said it did not expect the transportation market for clean hydrogen to develop until the late 2020s. And that was dependent on achieving cost savings in production and transportation through early adoption by refineries and chemical plants.

“This transition phase is so important,” Kizer said. “If we can get some projects done, we can have a lot of learning and drive down cost.”

The concerns around the economics of clean hydrogen come as Houston and other regions around the country compete for $7 billion in federal grants to fund so-called hydrogen hubs that are intended to marry producers with nearby users.

The Gulf Coast, with its abundance of refineries and petrochemical plants, is viewed as a natural ecosystem in which to develop clean hydrogen, and developers from Louisiana to Corpus Christi are competing for funding.

Brett Perlman, president of the Center for Houston's Future, is working with a coalition of oil and hydrogen companies including Exxon Mobil and Air Liquide to win a hub for Houston. He said there was some understanding among companies that they would be paying a “green premium” for clean hydrogen, but ultimately additional incentives for hydrogen buyers like they are being established in Europe, the United Kingdom and Japan would be needed.

“That’s the key,” he said. “It’s really the early projects that need the demand side incentives to start the cycle of development.”

Asked if the Biden administration was working on creating additional incentives, a spokesman for the Department of Energy declined to comment.

So far, there has been little action to develop additional tax credits or other funding mechanisms, like those created to help drive demand for wind and solar energy over the past decade, said Frank Wolak, president of the trade group Fuel Cell and Hydrogen Energy Association.

"With all of the other renewable technologies, there's been an emphasis on creating demand through things like state rebates or utility programs," he said. "We do not yet have those parallel mechanisms as it relates to hydrogen."

Cost barrier

That has left industries that the Biden administration is targeting for the clean hydrogen market of the future uncertain what, if any, role they might play.

Steel plants, which require incredible amounts of energy to heat their furnaces to temperatures of 3,000 degrees Fahrenheit, have been seen as a natural new market for highly-flammable hydrogen. Traditionally reliant on carbon intensive coal, clean hydrogen could theoretically help the sector reduce its carbon footprint.

But the majority of U.S. steel plants are already running on electric furnaces, which are less emissions intensive, and the gains of switching to hydrogen would be relatively small, said Phillip Bell, president of the Steel Manufacturers Association.

“The problem with hydrogen is availability, transport and all the retrofitting of equipment,” he said. “Why would you invest billions of dollars in this when you have electric furnaces making pretty clean steel already?”

Those same calculations are happening in industries across the United States.

A recent forecast by the research firm Wood Mackenzie projected clean hydrogen would account for less than 20 percent of refineries' total hydrogen demand a decade from now.

And a spokesman for the American Chemistry Council, which represents large ammonia and methanol producers, said that even if production costs for clean hydrogen come down substantially the lack of hydrogen infrastructure around most of the country was likely to add considerable costs through delivery.

The Department of Energy found in its report earlier this year that hydrogen fueling stations in California were paying $13 per kilogram for hydrogen fuel, “more than three times higher than the cost required to be competitive” with diesel fuel.

“Ultimately, I think there will be a role hydrogen plays, but it’s going to take more investment and take much longer than people realize,” Bell said.

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Reach James on

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