

Clean Hydrogen Developers Should Track Incentives, Risks

By **Pamela Wu and Kirstin Gibbs** (December 2, 2022, 5:12 PM EST)

Hydrogen is expected to play a key role in addressing the global climate crisis, by supporting a reduction in the amount of greenhouse gas emissions produced by human activity, thus allowing the achievement of net-zero goals and a sustainable clean energy future.

As a versatile energy carrier and chemical feedstock, hydrogen can be used as a fuel for applications that do not have competitive or efficient clean alternatives. While not a new energy source, hydrogen offers many advantages when leveraged with renewable energy, nuclear energy, and fossil fuels with carbon capture and storage.

Developers and investors should bear in mind several key factors when evaluating clean hydrogen projects, including the potential to qualify for new funding opportunities made available by the U.S. Department of Energy, and tax benefits for the production of qualified clean hydrogen under the Inflation Reduction Act.

It is also important to consider how to mitigate the risks associated with developing a project that is reliant on new and evolving technology.

Under the Bipartisan Infrastructure Law passed in 2021, the DOE is required to develop and release a technologically and economically feasible national clean hydrogen strategy and road map. The department is required to update this strategy and road map every three years.

In September, the DOE released a draft report providing an overview of hydrogen production, transport, storage and use in the U.S., and the opportunities for clean hydrogen to help reduce emissions. The DOE solicited comments on the draft report, which were due by Dec. 1.

The draft report identifies several opportunities for using clean hydrogen to support the transition to net zero. Sectors that are more difficult to decarbonize with traditional approaches are expected to be priority markets for clean hydrogen.

The development and increasing use of fuel cell forklifts have paved the way for fuel cells in the trucking sector — particularly for fleets with heavy-duty vehicles, routes longer than 500 miles, and multi-shift operations that require rapid refueling — as well as for buses.



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Hydrogen is also expected to be an essential feedstock for producing liquid fuels for the aviation, rail and marine sectors, including sustainable aviation fuels produced from biomass. In addition, hydrogen is expected to play a key role in decarbonizing the steel and chemical markets.

However, challenges including cost, durability, reliability, availability, manufacturing at scale and the lack of hydrogen infrastructure will need to be addressed.

The draft report identifies the following key strategies that the DOE intends to implement to ensure that clean hydrogen is developed as an effective decarbonization tool that achieves maximum benefits for the U.S.:

- Target strategic, high-impact uses for clean hydrogen to ensure that clean hydrogen will be used in the highest value applications, and produce 10 million metric tons per year of clean hydrogen by 2030;
- Reduce the cost of clean hydrogen, enabling prices of \$2 per kilogram via electrolysis by 2026, and \$1 per kilogram by 2031; and
- Focus on regional networks, including deploying four or more regional hydrogen hubs to enable large clean hydrogen production and end-use in close proximity to each other, and ramp up scale.

To support these key strategies, the DOE will continue to advance research, development, demonstration and deployment, or RDD&D, efforts to reduce the cost of clean hydrogen to \$1 per kilogram in one decade. The department is fostering partnerships across industry, academia and national laboratories to investigate and advance technologies and innovation.

The DOE's initiatives include the H2NEW consortium on electrolyzer technologies, the M2FCT consortium to advance fuel cells for heavy-duty trucks, the H-Mat consortium on hydrogen materials compatibility, and other projects and demonstrations funded through previous solicitations.

Near-term action items that the DOE seeks to achieve by 2025 include:

- Laying the regulatory groundwork for large-scale clean hydrogen production, processing, delivery, storage and end use;
- Developing streamlined guidance on hydrogen pipeline and large-scale project permitting with stakeholder engagement, and addressing environmental, energy and equity priorities;
- Assessing compatibility of pipeline and component materials with hydrogen and hydrogen blends with natural gas;
- Establishing a clean hydrogen standard;
- Demonstrating clean hydrogen production technologies from multiple pathways, including pyrolysis, waste, renewables and nuclear;

- Initiating the transition to clean hydrogen for hard-to-decarbonize industrial applications, and identifying specific locations for potential scale-up — e.g., ammonia, refineries, steel;
- Supporting demonstrations including forklifts and other material-handling equipment, transit buses, long-haul heavy-duty trucks, heavy machinery in mining, construction, and agriculture, refineries, and ammonia production;
- Reducing the cost of electrolyzers at scale through RDD&D in manufacturing, stacks, and balance of plant components, and reducing the cost of thermal conversion technologies through RDD&D in modular designs and process intensification;
- Developing technologies for high-throughput dispensing of hydrogen for heavy-duty vehicles; and
- Advancing efficient end-use technologies — e.g., fuel cells and other forms of power conversion with low or zero emissions — and selecting for scale-up.

The DOE has stated that its funding has already resulted in more than 1,100 hydrogen and fuel cell patents, 30 commercial technologies and more than 65 technologies that could be commercial in the next several years.

With respect to currently available funding, the Bipartisan Infrastructure Law allocated \$8 billion for the development of regional clean hydrogen hubs, and \$1 billion for the Clean Hydrogen Electrolysis Program, which will improve the efficiency and cost-effectiveness of electrolysis technologies by supporting RDD&D to enable \$2 per kilogram clean hydrogen from electrolysis by 2026.

The infrastructure law also allocated \$500 million for clean hydrogen manufacturing and recycling RDD&D activities, to support manufacturing of clean hydrogen equipment.

The DOE is currently reviewing the concept papers that were submitted in response to the regional clean hydrogen hub funding announcement. The department is expected to issue notifications soon encouraging or discouraging the submission of full applications, which are due in April 2023, and to announce selected projects in the fall of 2023.

The developers and investors of hydrogen projects that are not selected, or that ultimately do not receive regional clean hydrogen hub funding from the DOE, should expect to have other opportunities to seek funding from the department, and should pay attention to other funding opportunity announcements. Such funding opportunities will likely continue to spur investment and innovation in clean hydrogen production, storage, transportation and end uses.

Hydrogen project developers and investors should also consider taking advantage of the tax benefits available under the IRA. The act added a new annual production tax credit, or PTC, under Section 45V of the Internal Revenue Code for qualified clean hydrogen produced and sold or used after Dec. 31 of this year at a qualifying facility on which construction starts before 2033.

This PTC would apply for the 10-year period beginning on the date that the eligible facility is placed in service. The amount of the Section 45V credit depends on the lifecycle GHG emissions rate of the facility, and on whether the taxpayer satisfies certain U.S. Department of Labor wage and apprenticeship standards.

The maximum credit could be \$3 per kilogram of hydrogen produced, which some believe is more than half the cost of producing clean hydrogen. In addition, a capital expenditure-based, front-loaded investment tax credit may be claimed in lieu of the Section 45V clean hydrogen PTC.

Industry experts predict that these funding opportunities and tax credits will revolutionize the burgeoning hydrogen economy, by spurring the investment in and development of clean hydrogen projects at scale.

However, developers and investors should also account for risks associated with the early stage of development of clean hydrogen technologies, by building appropriate language into contracts to ensure adequate protection against risks.

Other considerations that developers and investors should be mindful of include securing sources of energy for hydrogen production that will ensure compliance with GHG emission targets and make it possible to receive funding or tax credits; entering into commercially reasonable offtake agreements with credit-worthy counterparties to support project economics; and addressing and planning for potential supply chain disruptions that are plaguing the industry in light of the lingering effects of the pandemic and the war between Russia and Ukraine.

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