Key issues for development and expansion of hydrogen fueling infrastructure

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The production of hydrogen fuel cell vehicles is growing steadily and is expected to accelerate in the next few years. The market for hydrogen fuel cell vehicles totaled about $1.2 billion in 2022 and is expected to expand to more than $40 billion by 2030.

The Biden administration has identified hydrogen as the option that provides the greatest long-term opportunity for decarbonizing the heavy-duty transportation sector and has made significant investments to support the continued development of hydrogen fuel cell technologies. "Issues and Opportunities in Hydrogen Fuel Cell Development," Pamela Wu, Law360, April 11, 2023 (https://bit.ly/3MR06HF).

Hydrogen fuel cell technologies have significant potential in the heavy-duty transportation sector because during vehicle operations, hydrogen fuel cells do not emit greenhouse gases and only emit water and heat as byproducts. In addition, compared to battery electric vehicles, hydrogen fuel cell vehicles can achieve longer ranges, transport larger sized cargos, and can be refueled quickly. The development and production of hydrogen fuel cell vehicles are underway and quickly gaining traction.

The development of additional hydrogen fueling infrastructure across the United States (as well as a regulatory framework) will need to keep pace with the projected production and use of hydrogen fuel cell vehicles. Further development of hydrogen fueling infrastructure across the United States is essential to enable hydrogen fuel cell vehicles to be deployed successfully and achieve its full potential. This article discusses several key issues relevant to the development and expansion of the hydrogen fueling infrastructure.

Current hydrogen fueling infrastructure and available incentives

The hydrogen fueling stations that exist today are located predominantly in California, which limits the overall range and reach of hydrogen fuel cell vehicles in the United States. Additional stations in other areas of the United States are under development and in progress, and mobile refueling stations are also currently being developed and deployed.

The Biden administration has made significant investments through grants and incentives to encourage and accelerate the development of hydrogen fueling infrastructure. The Department of Energy recently awarded grants that support the development of hydrogen refueling infrastructure plans in the Midwest corridor and between Houston and Los Angeles.

In addition, the Section 30C alternative fuel vehicle refueling property credit that was made available under the Inflation Reduction Act provides for a credit of up to $100,000 for alternative fuel (including hydrogen) vehicle refueling property in low-income and rural areas.

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Some states, including California, have made significant investments towards developing the hydrogen fueling station infrastructure. For example, the California Energy Commission provides funding through the Clean Transportation Program for the development of hydrogen stations across the state. In addition, the California Air Resources Board's Low Carbon Fuel Standard Program provides credits to hydrogen fueling stations based on the capacity of the fueling stations, in addition to the fuel sold.

Key issues relevant to hydrogen fueling infrastructure

The development of hydrogen fueling stations is a resource and time-intensive exercise, with costs currently estimated at around $2 million per station, and is dependent on the production and deployment of hydrogen fuel cell vehicles. Discussed below are several key issues relevant to developers of hydrogen fueling stations.

Source of the hydrogen

The production site of the hydrogen that is dispensed from a fueling station directly impacts the scope and design of a hydrogen fueling station. Hydrogen may be produced offsite and then transported to the fueling station by truck or by pipeline, or it may be produced

onsite using technologies such as electrolysis or steam methane reformation.

If hydrogen is delivered to the hydrogen fueling station, the station operator can negotiate a contract with a hydrogen supplier for the delivery of hydrogen. Hydrogen can be delivered in a gaseous state to an onsite storage tank or it can be delivered in a trailer or other container that is swapped out at the hydrogen fueling station.

For larger stations, the delivery of liquid hydrogen has become more common as it is more economical to transport large quantities of hydrogen in liquid form. However, liquid hydrogen must be stored at cryogenic temperatures and requires more equipment (and space at the fueling station) than hydrogen that is delivered in a gaseous state.

There remains a lack of a comprehensive regulatory framework that applies to hydrogen and the infrastructure that is used to produce, transport, and store hydrogen in the United States.

On the other hand, hydrogen can be produced onsite through an electrolyzer, which uses electricity and small quantities of feed water to produce gaseous hydrogen by splitting water molecules into hydrogen and oxygen. An electrolyzer can be powered through direct connections to the electric grid, which requires arrangements for service to be made with the local utility.

Depending on the source(s) of hydrogen dispensed at a fueling station, larger hydrogen fueling stations may have greater electricity demands and may require upgrades to the utility infrastructure. An electrolyzer can also be powered by renewable electricity sourced through power purchase agreements or direct connections to adjacent solar panels or wind generators.

Hydrogen can also be produced onsite through steam methane reforming, which produces hydrogen from natural gas or biogas as the feedstock.

Ownership of and access to hydrogen fueling stations

Ownership of the site, easements, and any title restrictions will also impact the development and permitting of a hydrogen fueling station. A station owner may not necessarily own the property and instead may elect to lease the site to develop and establish the hydrogen fueling station. If the station owner leases the property, some of the issues that must be considered and addressed include how the station owner may use the property, what the station owner may install on the property, and the obligations and requirements that the parties must satisfy.

In addition, whether the hydrogen fueling station will be made available for public use or if it will be limited to use by a specific type or fleet of hydrogen fuel cell vehicles will also need to be addressed. The station owner will need to ensure that the dispensing equipment is compatible with the hydrogen fuel cell vehicles the station is intended to serve.

Purity of the hydrogen

The purity of the hydrogen delivered to the fueling station or produced at the fueling station is critical because hydrogen fuel cells are generally sensitive to contamination. In particular, if the hydrogen is delivered by pipeline, the station owner will need to ensure that the hydrogen delivered meets the purity requirements for use in a hydrogen fuel cell vehicle because hydrogen that is transported by pipeline for other purposes such as oil refining generally does not have the same purity as hydrogen used in hydrogen fuel cell vehicles. Thus, hydrogen fuel quality testing should be performed to ensure that the hydrogen that is made available to consumers at the fueling station meets the quality and purity requirements for use in a hydrogen fuel cell vehicle.

Uncertainty of regulatory framework applicable to hydrogen fueling station components

There remains a lack of a comprehensive regulatory framework that applies to hydrogen and the infrastructure that is used to produce, transport, and store hydrogen in the United States. The Occupational Safety and Health Administration, Environmental Protection Agency (EPA), and Pipeline and Hazardous Materials Safety Administration (PHMSA) currently exercise some form of regulation over hydrogen.

Other federal agencies could also play a role in regulating hydrogen and the development of hydrogen infrastructure. For example, the Federal Energy Regulatory Commission (FERC), which regulates the rates, terms, and conditions under which interstate natural gas pipelines provide service, may exercise jurisdiction over interstate natural gas pipelines that transport a blend of hydrogen and natural gas as well as facilities that store hydrogen.

The Surface Transportation Board has the authority to exercise economic regulation over pipelines transporting any commodity other than water, gas, and oil, and may assert and exercise jurisdiction over hydrogen pipelines, although it has not yet done so.

Addressing these regulatory uncertainties will be critical to facilitate efforts to establish a nationwide hydrogen fueling infrastructure and the continued development of hydrogen pipelines and storage facilities.

Conclusion

A chicken and egg situation remains in the hydrogen fueling sector, but the tax incentives and funding that have been made available at both the federal and state levels are expected to encourage the development and expansion of the hydrogen fueling infrastructure. To address range anxiety, operators of hydrogen fuel cell vehicles need confidence that hydrogen fueling stations will be accessible and available along their travel route.

At the same time, potential investors and developers of hydrogen fueling stations need to ensure that adequate hydrogen fuel cell vehicles will frequent their stations to justify their investment in and development of hydrogen fueling stations.

Alignment of the development and deployment of hydrogen fuel cell vehicles and the availability and accessibility of hydrogen fueling stations will be critical to the successful incorporation of hydrogen fuel cell vehicles into transportation fleets to decarbonize the heavy-duty transportation sector. The issues and considerations discussed in this article are some of the issues that investors and developers of hydrogen fueling stations should keep front of mind as they continue to expand the hydrogen fueling infrastructure to accommodate the expected increase and use of hydrogen fuel cell vehicles.

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About the author

Pamela T. Wu, a partner at **Morgan Lewis**, represents companies in the energy industry in a range of matters involving rates, market rules and regulation, and energy commodity trading before the Federal Energy Regulatory Commission (FERC) and Commodity Futures Trading Commission (CFTC). She advises clients seeking to reduce their carbon footprint through new infrastructure assets, clean energy technologies, and transacting carbon credits and carbon offsets. An active member of the firm's energy commodity trading and compliance working group, hydrogen working group, electric vehicles working group, and renewables working group, she is resident in the Washington, D.C., office and can be reached at pamela.wu@morganlewis.com.

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