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Going Green: Can a Hydrogen Economy and Offshore CCS Present New Opportunities for the Gulf of Mexico?

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With the oil and gas industry seeking ways to adapt to our current climate-driven world, some might argue that the oil and gas industry is leading the global energy transition. It is happening across the industry from the development of pore space lease agreements, to multi-company sequestration hubs, to offshore sequestration, to blue and green hydrogen projects, to offshore wind. Companies are recognizing that they need to invest in and find new ways to develop technology in the renewable space in order to remain relevant, profitable, and responsive to public perception. These new technologies are focused on decarbonizing output with the goal of being net-zero carbon by 2050. Green hydrogen and offshore carbon capture and sequestration will play a major role as the two go hand-in-hand as the keys to decarbonization in the future.

Opportunities for Emerging (Green) Hydrogen Economy

"Green hydrogen" is hydrogen that is produced using clean energy. Offshore wind, in particular, is an attractive option, as it allows for hydrogen to be produced offshore and sent back to shore – thus, potentially alleviating congested power grids. In the offshore concept, hydrogen earns the "green" label as it is created out of desalinated seawater with electrolyzers that run on renewable wind energy.

Europe has already begun to use offshore wind technology as a way of producing green hydrogen, and it's using strategy development, policy, and demonstration projects to advance green hydrogen. It has considerable offshore wind already installed and a 70-gigawatt target for 2028, which could play an important role in the production of green hydrogen on a worldwide basis. Green hydrogen proponents tout it as a means to decarbonize hard-to-abate sectors and industries, as well as serve as a grid-scale, energy storage solution that could offer reliability, flexibility, and stability benefits for the future. Pilot projects are underway (such as in the North Sea) but significant obstacles remain to wide-scale implementation around the globe (mainly, in terms of cost and fabrication).

The United States is just beginning to get into offshore wind and green hydrogen arenas, and it currently produces more than 10 million metric tons of hydrogen per year, about one-seventh of the global supply. Natural gas is currently the primary fuel source used to produce hydrogen.

Hydrogen can also be produced through water electrolysis, where water molecules are split into oxygen and hydrogen using an electric current generated from clean energy sources, like wind or nuclear energy. When the electricity used in electrolysis comes from renewable energy resources, no carbon emissions are released into the environment. While many renewable energy sources can be used for hydrogen production, governments and energy companies around the globe are showing interest in offshore wind for this use, in particular to decarbonize industrial sectors. Several projects have either been proposed or are in early stages of development globally.

Although green hydrogen could be an important source of energy in the future, limitations still exist. Because it currently costs more to produce, hydrogen from renewables accounts for less than 1 percent of annual hydrogen production, while hydrogen from natural gas represents 95 percent. To reduce the carbon footprint of

hydrogen production and enable at-scale hydrogen use, U.S. Department of Energy announced the "Hydrogen Shot," aiming to reduce the cost of clean hydrogen by 80 percent to \$1 per 1 kilogram.

Because hydrogen is flammable, similar to other gaseous fuels, and has low energy density (*i.e.*, it takes up physical space), storage and transport is also a challenge. Bulk transportation of hydrogen will require further investments in pressurizing, cooling, transport pipelines, and local hydrogen production for direct use. Hydrogen from renewables is also currently less efficient due to the conversion processes, with some energy lost during electrolysis. However, ongoing research and demonstrations to tackle this challenge and to improve the efficiency in the electricity conversion process are underway.

The United States' Role on the Global Green Energy Stage

Despite being behind Europe in the development of technology for green hydrogen, the United States has taken steps to achieve the production of renewable energy offshore and to get closer to decarbonization. On November 1, 2021, the United States' Bureau of Ocean Energy Management (BOEM), which governs federal leases in the Gulf of Mexico where such "green" technology would be developed offshore, issued a request seeking information from industry, investors, developers, academia, research laboratories, government agencies, and other stakeholders on potential hydrogen demonstration projects in the United States. Green hydrogen project concepts are currently being developed in the states of Connecticut, New York, Maine, Oregon, and along the Gulf Coast (including Louisiana, Mississippi, and Texas). Production of green hydrogen represents an opportunity for oil and gas companies to not just lower their carbon footprints, but to leverage billions of dollars' worth of existing offshore infrastructure. Then, on January 11, BOEM announced that it will prepare a draft environmental assessment to consider the impacts of potential offshore wind leasing in the federal waters in the Gulf of Mexico, which you can read more about [here](#).

Additionally, President Biden's Infrastructure Investments and Jobs Act (Infrastructure Bill), which was passed into law on November 15, 2021, included key amendments to the Outer Continental Shelf Lands Act (OCSLA) that pave the way for carbon sequestration in offshore federal waters. Prior to the Act's passage, OCSLA (as amended by the Energy Policy Act of 2005) authorized the United States Department of Interior to issue leases in federal waters for certain types of renewable energy projects. However, these provisions did not directly address leasing for carbon sequestration. The Act amended OCSLA to expressly authorize Interior to issue leases, easements, and rights-of-way for activities that "provide for, support, or are directly related to the injection of a carbon dioxide stream into sub-seabed geologic formations for the purpose of long-term carbon sequestration." The Act defines "carbon sequestration" as "the act of storing carbon dioxide that has been removed from the atmosphere or captured through physical, chemical, or biological processes that can prevent the carbon dioxide from reaching the atmosphere." The Act requires that Interior promulgate regulations to carry out the amendments within one year of passage of the Act. The Department of Interior will likely engage with industry as it attempts to issue regulations that address the various technical and environmental issues associated with leasing and permitting carbon sequestration projects.

In Louisiana, a new project is underway at CF Industries in Donaldsonville that will produce green hydrogen using a state-of-the-art electrolyzer developed by Thyssenkrupp. The project began construction in the second half of 2021 and is projected to be complete by 2023. The project is expected to produce the equivalent of 20 megawatts of green hydrogen through electrolysis. CF is also in the process of reducing its CO₂ carbon footprint through the use of carbon capture and sequestration and other carbon-abatement methods.

Takeaways: Leveraging wind energy and the production of "green" hydrogen in the Gulf of Mexico is on the horizon, though there are still cost, technology, and regulatory considerations that will impact development. The comments to BOEM's request for information from stakeholders will be key, as the comments will provide insight into where the industry is headed and whether the industry believes that investing in wind energy and green hydrogen can be a sustainable way to produce energy and achieve net-zero emissions by 2050. If you

have any questions about the evolving areas of "green" hydrogen or carbon capture, utilization, and sequestration related to the Gulf of Mexico, please reach out to your Baker Donelson attorney.

Additionally, The Business Network for Offshore Wind, a nonprofit organization with a mission to develop the US offshore wind renewable energy industry and its supply chain, has established a Green Hydrogen Working Group to advance this significant opportunity to reduce carbon and grow the US offshore wind energy sector. If you are interested in learning more about this effort, please contact [Joe Tirone](#), Baker Donelson Shareholder and chair of the Green Hydrogen Working Group.