OFFSHORE WIND AND GREEN HYDROGEN: WHAT OPPORTUNITIES LIE AHEAD

Laura Morton and Aubri Margason
Perkins Coie LLP

The development of clean hydrogen—a key component to meeting the Biden administration's ambitious clean energy goals—was bolstered recently by the administration's announcements of the Pathways to Commercial Liftoff: Clean Hydrogen report and of $750 million in funding for research, development, and demonstration of clean hydrogen technologies. Advanced electrolysis technologies are essential for the growth of "green" hydrogen, a subset of clean hydrogen that is produced using renewable energy and has no associated carbon emissions.[1] Because of its reliance on renewable energy, green hydrogen presents a significant opportunity for the offshore wind industry. As highlighted in the White House Ocean Climate Action Plan (OCAP), released on March 21, 2023, offshore wind development is a priority in the United States, with the administration's goal to deploy 30 gigawatts (GW) of offshore wind by 2030 and 15 GW in floating offshore wind by 2035. Coupling offshore wind generation and the production and storage of climate-neutral green hydrogen can benefit both industries, help sustainably meet the nation's energy needs, and advance pathways to decarbonization.[2]

Biden Administration's Commitment to Incentivizing Production of Clean Hydrogen

Clean hydrogen energy has received a significant boost under the Biden administration. The Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure

[1] Hydrogen presents a "rainbow" of opportunities, with each "color" representing different energy sources and therefore different levels of carbon intensity (the lifecycle carbon emissions associated with each unit of energy). The Green Hydrogen Coalition, in its Green Hydrogen Guidebook, has developed a helpful table showing some of the colors of hydrogen and their associated energy and production sources.

Color	Primary Feedstock	Primary Energy Source	Primary Production Process	Carbon Intensity $kgCO_2e/kgH_2$
Brown	Coal or Lignite	Chemical Energy in Feedstock	Gasification & Reformation	
Gray	Natural Gas	Chemical Energy in Feedstock	Gasification & Reformation	
Blue	Coal, Lignite, or Natural Gas	Chemical Energy in Feedstock	Gasification with Carbon Capture and Sequestration	
Pink	Water	Nuclear Power	Electrolysis	
Green	Water	Renewable Electricity	Electrolysis	
	Biomass or Biogas	Chemical Energy in Feedstock	Gasification, Reformation, & Thermal Conversion	

Figure 3 | The Colors of Hydrogen

Source: Figure 3, Green Hydrogen Coal., *Green Hydrogen Guidebook, 2d ed.* (Apr. 2022).

[2] A long-term goal of the OCAP is to "[i]nvestigate the potential of offshore wind and marine energy to power applications in and beyond the sustainable ocean economy by advancing coupled wind or marine energy-storage to allow for … production and storage of climate-neutral green hydrogen and other clean fuels to electrify various sectors of the economy, including the Marine Transportation System."

Law (BIL), included $9.5 billion for clean hydrogen technology development. The IIJA program focuses comprehensively on factors that are "common to the development of hydrogen infrastructure and the supply of vehicle and electric power for critical consumer and commercial applications." It envisions the widely adopted use of distributed hydrogen electricity generation and storage.[3]

The U.S. Department of Energy (DOE) is also moving to scale up the hydrogen industry under section 40314 of the BIL, which authorizes and appropriates $8 billion to establish a program to support at least four Regional Clean Hydrogen Hubs.[4] DOE issued a Funding Opportunity Announcement for the Regional Clean Hydrogen Hubs (H_2Hubs) on September 22, 2022. DOE will pick at least one hub centered on "green" hydrogen produced by renewable energy.[5] As required by the IIJA, DOE must prioritize "regional clean hydrogen hubs that are likely to create opportunities for skilled training and long-term employment to the greatest number of residents in the region." Consistent with that requirement, any application must include a Community Benefits Plan.[6] DOE is currently assessing concept papers for the regional hydrogen hubs, and full applications were due on April 7, 2023.

The H_2Hubs initiative follows the 2021 launch of DOE's Hydrogen Shot and the release of DOE's draft National Clean Hydrogen Strategy and Roadmap (Hydrogen Roadmap), which provides an overview of the potential for hydrogen to "contribute to national decarbonization and economic development goals." The Hydrogen Roadmap provides a comprehensive overview of the potential for hydrogen production, transport, storage, and use in the United States and outlines how clean hydrogen can contribute to national decarbonization and economic development goals.

Excitement Grows for Green Hydrogen Production from Offshore Wind

Green hydrogen production is scalable only if there is a sufficient supply of renewable energy. Offshore wind presents a significant opportunity for green hydrogen production, as recognized by DOE in its Hydrogen Roadmap.

The potential for hydrogen production from offshore wind generation has drawn particular attention to the Gulf of Mexico, which already has an existing energy infrastructure network of 48 hydrogen production plants and over 1,000 miles of dedicated hydrogen pipelines

---

[3] Building on the IIJA, the Inflation Reduction Act (IRA), passed August 16, 2022, also incentivizes clean hydrogen projects, including through a new 10-year hydrogen production tax credit under 26 U.S.C. § 45V of the Internal Revenue Code (IRC).

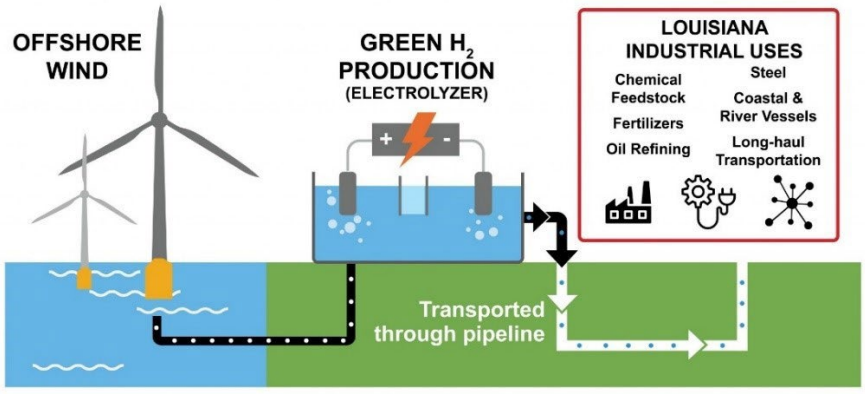
[4] Section 813 of the Energy Policy Act, as amended by BIL, requires the development of at least four regional clean hydrogen hubs that: demonstrably aid the achievement of the clean hydrogen production standard; demonstrate the production, processing, delivery, storage, and end-use of clean hydrogen; and can be developed into a national clean hydrogen network to facilitate a clear hydrogen economy.

[5] Green hydrogen can be produced by splitting water into hydrogen and oxygen molecules (electrolysis) using renewable energy. Unlike clean hydrogen, which requires the capture and storage of carbon emitted as part of its production, green hydrogen production has no associated carbon emissions.

[6] DOE is now requesting that Community Benefits Plans accompany all agency funding opportunity announcement-related projects. These plans advance four of the administration's policy priorities: invest in America's workforce; engage community and labor; advance diversity, equity, inclusion, and accessibility; and contribute to Justice 40.

and transport structure. For example, Louisiana, Oklahoma, and Arkansas signed an agreement in March 2022 to coordinate on a joint application for one of the H_2Hub grants (the HALO Hydrogen Hub) from DOE. The agreement notes the significant infrastructure already in place in the Gulf region, and the ability of hydrogen to help "repurpose infrastructure, jobs, and resources" to support a clean-energy transition, including offshore wind and clean hydrogen co-generation. The HALO Hydrogen Hub intends to use public-private partnerships that will lead to deployment and development of an extensive hydrogen network in the three constituent states and has a number of supporters, including companies developing offshore wind projects. DOE encouraged the HALO Hydrogen Hub to submit a full application for the H_2Hubs funding.

In September 2022, another coalition, H2theFuture, led by the Greater New Orleans Development Foundation, received approximately $50 million in funding from the U.S. Department of Commerce's Economic Development Administration to build a clean hydrogen energy cluster, including a focus on retaining, developing, and upskilling its workforce through, in part, supporting offshore wind and green hydrogen jobs.[7]



Source: https://h2thefuture.org/hydrogen/

In February 2023, the State of Louisiana, in support of its Climate Action Plan, which concludes that a new market for clean hydrogen and development of offshore wind can generate significant job opportunities in Louisiana, approved $75 million in federal and state dollars for H2theFuture.

A Houston-based coalition of nonprofits, universities, and companies, including those developing offshore wind, has also jumped into the clean hydrogen game, applying for DOE's regional hydrogen energy hub grants for its HyVelocity Hub. The coalition's concept paper outlines how it will leverage existing hydrogen production assets, infrastructure, and customers

[7] H2theFuture's Private Sector Participation includes GNOWind Supply Chain Initiative and the GNOWind Alliance, each of which includes developers focused on the future of offshore wind in the Gulf of Mexico. https://www.eda.gov/sites/default/files/2022-09/H2theFuture.pdf

in the Gulf Coast to accelerate the development of clean hydrogen projects. It anticipates that approximately 40% of the hydrogen produced will be green.

The Gulf of Mexico is not alone in considering the means to expand clean and green hydrogen production. Seven states (New York, Connecticut, Maine, Massachusetts, New Jersey, Rhode Island, and Vermont) and more than 100 partners, including offshore wind companies, formed the Northeast Clean Hydrogen Hub to develop one of the regional hydrogen hubs. The coalition, which will focus on integration of renewables, including offshore wind, into the clean hydrogen pipeline, also submitted a concept paper to DOE to compete for the $8 billion in hub funding and is moving toward filing its full application. In addition, Atlantic Shores Offshore Wind, which will be developing a 1,510 MW wind project offshore New Jersey, is launching an innovative 10 MW green hydrogen pilot with South Jersey Industries.

BOEM Explicitly Calls Out Potential Opportunities to Couple Offshore Wind with Green Hydrogen Production

The offshore co-location of wind and hydrogen facilities is gaining attention worldwide. DOE's 2022 Offshore Wind Market Report highlights a number of global projects, both proposed and in early development, that seek to link offshore wind farms with green hydrogen production facilities. Recognizing its potential role in this emerging energy sector, the Bureau of Ocean Energy Management (BOEM) commissioned a report to assess its jurisdiction over hydrogen-offshore wind (H_2-OSW) co-generation in U.S. waters.[8] The study determined that, with the number of projects in development, offshore wind is a significant renewable energy resource that could support utility-scale hydrogen production in the United States. However, it found that "research and development to improve safety, efficiency, and commercial readiness of such coupling are still in early stages."[9] Moreover, a regulatory framework for BOEM and the Bureau of Safety and Environmental Enforcement for permitting, regulation, and oversight of H_2-OSW on the OCS would need to be quickly developed given the anticipated scope and scale of federal, state, and private sector investments in green hydrogen in the next decade.[10]

BOEM is now actively considering a means to green hydrogen production, starting with its just-announced offshore wind lease auction in the Gulf of Mexico. In a November 21, 2021, Call for Information on Commercial Leasing in the Gulf of Mexico (Call), BOEM asked the public to provide comments on "the viability, economic or otherwise, of using offshore wind to power green hydrogen production in the [Gulf of Mexico]." Informed by a number of comments from potential bidders and other parties to the Call and a subsequent Draft Wind Energy Areas in the Gulf of Mexico,[11] BOEM ultimately decided to propose a bidding credit to incentivize green

[8] In addition to analyzing and recommending updates to the existing regulatory framework and permitting guidance, the study does a deep dive into different technologies to produce green hydrogen and the technical components of co-generation, including the commercial readiness of different technologies. Jennifer Banks et al., AECOM Tech. Servs., Inc., "Assessment of BOEM's Role in Reviewing Hydrogen Production as a Complement to Offshore Wind" (June 2022) (Report No.: OCS Study BOEM 2022-xxx).

[9] *Id.* at 1.

[10] *Id.*

[11] As American Clean Power Association stated in its comments on BOEM's Call for Information and Nominations, "[t]he industrial and shipping industries present in south Louisiana uniquely position the state to take advantage of the opportunity for producing green hydrogen with offshore wind, and has become a strategic focus for

hydrogen in its recent Proposed Sale Notice (PSN) for up to three lease areas off the coasts of Texas and Louisiana. Bidders could receive a credit of up to a 20% of their cash bid for supply chain development efforts that advance the manufacturing of offshore wind components or subassemblies that could be used to generate green hydrogen. BOEM's inclusion of this bidding credit recognizes the potential benefits of leveraging offshore wind to generate green hydrogen in a region with existing infrastructure and workforce.

Conclusion

In 2023, the Biden administration has redoubled its commitment through funding and other incentives to build momentum for a green hydrogen revolution. The potential clean energy generation opportunities from offshore wind and green hydrogen are becoming more evident with regional hydrogen hub proposals in the Gulf of Mexico and the Northeast that include integration of offshore wind as part of their hydrogen pipeline. With the bidding credits included in the recent Gulf of Mexico PSN, BOEM is taking its first steps toward making a long-term goal of co-generation a reality.

---

many of the energy firms and economic development organizations in the region." https://www.regulations.gov/comment/BOEM-2021-0077-0024