Hydrogen in Louisiana

INTERSECTIONS WITH OFFSHORE WIND AND CARBON MANAGEMENT

NATIONAL WILDLIFE FEDERATION

Hydrogen in Louisiana

INTERSECTIONS WITH OFFSHORE WIND AND CARBON MANAGEMENT

Authored by: Sarah Kallgren

Cover image: Department of Energy, Offshore Wind Farm

Acknowledgments: Thank you to Jessica Arriens, Dr. Simone H. Stewart, Shannon Heyck-Williams, Lindsay Kuczera, Helen Rose Patterson, Thomas Zhu, Charles Sutcliffe, Veronica Ung-Kono, Amanda Moore, and David Weber for their contributions and review of this report.

NATIONAL WILDLIFE FEDERATION

National Wildlife Federation
1200 G Street, NW, Suite 900
Washington, D.C. 20005
www.nwf.org

Sealhyfe offshore hydrogen production pilot (Lhyfe), on WAVEGEM platform (GEPS Techno) and floating turbine (BW Ideol). On the SEM-REV offshore testing site (Centrale Nantes / OPEN-C).

Table of Contents

Introduction

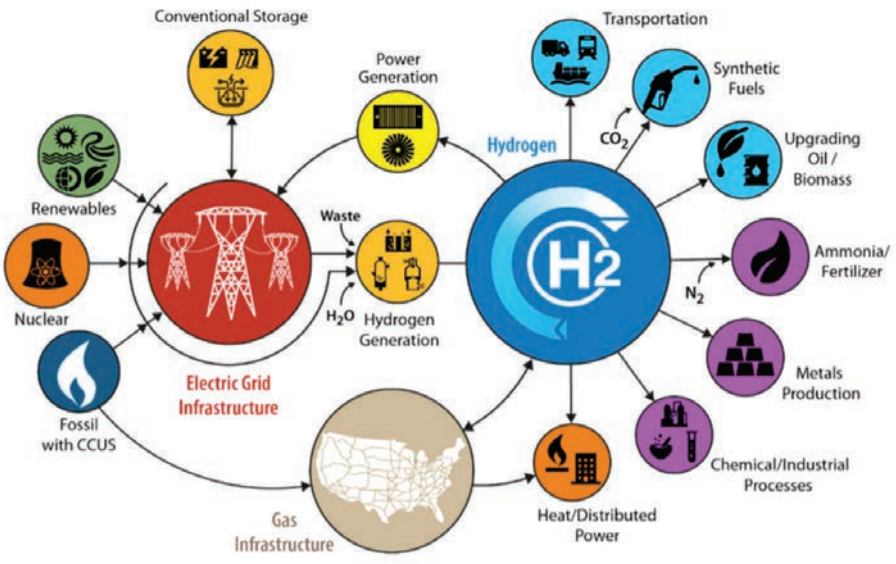
In a time when the impacts of climate change necessitate a shift away from fossil-powered energy, hydrogen offers a cleaner alternative.

Hydrogen is the most abundant element in the universe, is highly combustible, and can be used as a fuel that, when consumed in a fuel cell, creates water vapor as its only output.[1] In a time when the impacts of climate change necessitate a shift away from fossil-powered energy, hydrogen offers a cleaner alternative. However, scaling up the use of hydrogen for electricity generation, transportation, and other hard-to-decarbonize sectors comes with numerous challenges, risks, and considerations—particularly to ensure they become truly clean, responsible alternatives.

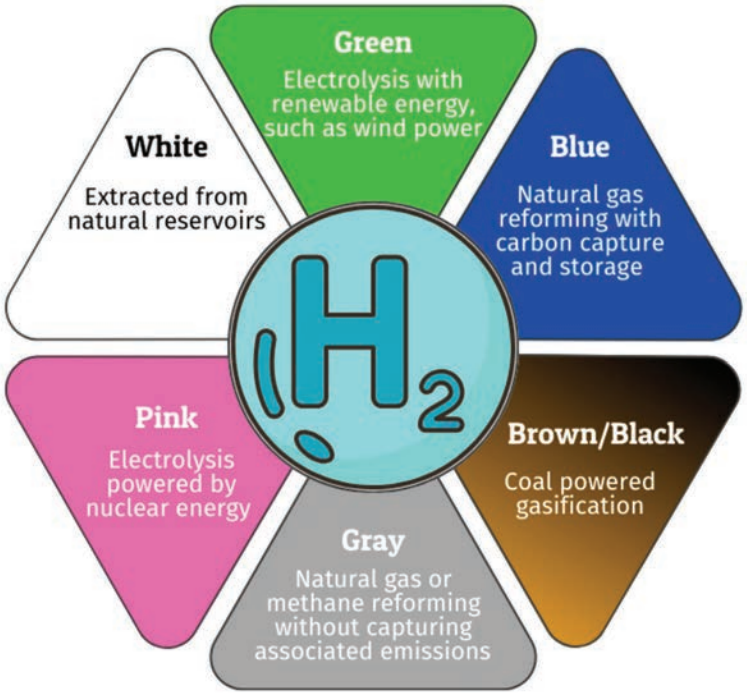
The vast majority of hydrogen is bound within other compounds, such as water.[2] Hydrogen must be extracted from these compounds and isolated to be used as a fuel source. This can be done through several methods, including electrolysis of water, which separates the hydrogen from the oxygen, or through natural gas reforming, a process where high-temperature steam is used on a methane source. The United States is well versed in producing hydrogen: the country currently produces 10 million metric tons of hydrogen annually, primarily for petroleum refining and ammonia production.[3]

How hydrogen is produced determines how "clean"—or how carbon-intensive—the hydrogen is considered to be. The Bipartisan Infrastructure Law (BIL) defines clean hydrogen as produced in a process that emits at least 50 percent less carbon dioxide compared to fossil-generated hydrogen on a lifecycle basis.[4] Hydrogen production methods are often denoted with different colors (see page 2). The vast majority of hydrogen produced in the U.S. today is made via natural gas reforming

Conceptual H2@scale (hydrogen at scale) energy system



Source: U.S. Department of Energy, *Hydrogen Program Plan*, Figure 3, November 2020
Note: CCUS is carbon capture, utilization, and storage.



and is referred to as gray hydrogen.[5] Currently, producing gray hydrogen is the least expensive option in most parts of the world, while green hydrogen—made with renewable energy—can be up to 16 times more expensive.[6] Green and blue hydrogen are most relevant for Louisiana, as green hydrogen could be produced one day with power from offshore wind if sited in the Gulf of Mexico, and blue hydrogen with natural gas reforming is already being made in-state and could include carbon capture, utilization, and storage (CCUS) to capture the associated emissions.

Recent federal investments, including BIL and the Inflation Reduction Act (IRA), aim to catalyze the U.S. clean hydrogen industry. Federal agencies are spurring this development through the IRA 45V tax credit that incentivizes hydrogen production, as well as providing funding for seven regional hydrogen hubs that will focus on developing localized networks of clean hydrogen production and end usage. The Department of Energy (DOE) projects that with the hubs in place, the U.S. will produce 10 million metric tons (MMT) of clean hydrogen annually by 2030, 20 MMT annually by 2040, and 50 MMT annually by 2040.[7] These metrics are ambitious and also have implications for the places where hydrogen will be produced.

This report will address the state and federal regulatory background for offshore wind and carbon management, specifically CCUS, as they each relate to the overall hydrogen economy in Louisiana. It will also identify policy gaps that need to be addressed for green and blue hydrogen to succeed in Louisiana and beyond, and finally, it will address existing concerns from environmental justice advocates about the continuation of Louisiana as an energy and industrial state.

Smoke from chimney at sunset. Photo by Hemz, Pexels

The Hydrogen Industry in Louisiana

Louisiana has a long history of energy production and industry writ large; the bulk of the state's greenhouse gas emissions (66 percent) are from the industrial sector, compared to only 17 percent nationally.[8] The state's Climate Action Plan—which calls for Louisiana to reach net zero emissions by 2050—includes a major focus on switching industrial fuels to low- and zero-carbon hydrogen. Given the strong role that industry plays in Louisiana's economy, industrial decarbonization and when applicable, electrification, will play a large role in its net zero strategy. With the state's existing industrial infrastructure, Louisiana may be able to transition to clean hydrogen production and use more easily than other states, but large expansions of infrastructure will be necessary.[9] It is also important to note that the continuation of any industry could have major implications for Louisiana's residents and natural resources, as not all Louisianians support its presence.[10]

Louisiana already has a strong network of existing hydrogen pipelines and, as of 2022, has 10 hydrogen-producing facilities[11] and is one of the centers of hydrogen production in the United States, along with the upper midwest and California.[12] These facilities produce hydrogen primarily from natural gas, methane, or coal.[13] According to the Louisiana Economic Development Agency, there have been over $20 billion of private sector investments into new hydrogen projects, which the agency claims will create over 10,000 new jobs in the state[14]—even though the state

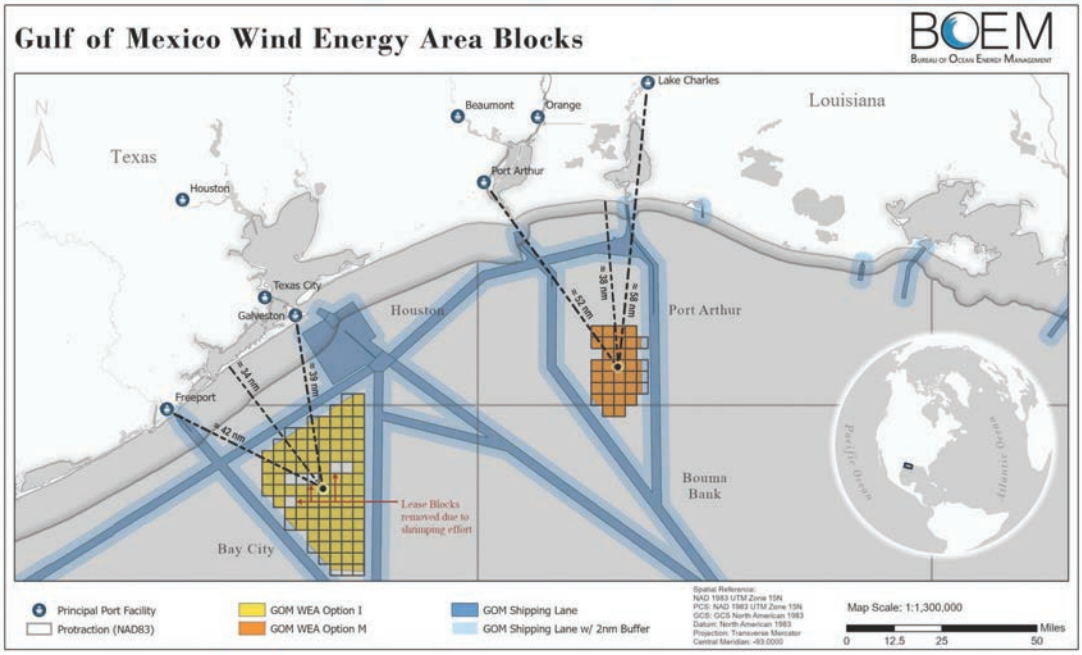
was passed over for a federally funded hydrogen hub. As the hydrogen industry expands in Louisiana, and nationwide, it is crucial to consider the opportunities—and obligations—the expansion holds for starting to undo the industrial harms that have been happening for decades in this region. In parts of "Cancer Alley," a stretch of land along the Mississippi River between Baton Rouge and New Orleans with high concentrations of petrochemical facilities and refineries, lifetime cancer risk is up to 47 times higher than what the EPA deems acceptable.[15] Many Louisiana communities are opposed to industry being allowed to continue polluting, and using their neighborhoods as "sacrifice zones" for the American energy system.[16] Environmental justice groups advocate for electrification of industry where possible and the growth of clean energy alternatives such as solar and wind power.

The federal government has produced a U.S. Hydrogen Strategy and Roadmap, which identifies the need for collaboration among stakeholders, especially those who have not had a seat at the table previously, such as Tribal and environmental justice communities.[17] This requires proactive and intentional engagement from project developers in host communities. DOE-funded projects now require community benefits plans, and while related processes are still being ironed out, there is a real opportunity for developers and decision-makers to engage communities meaningfully and creatively to discuss how these projects can potentially benefit those living nearby.

Offshore Wind and Hydrogen

Offshore wind at a state level is regulated by the Louisiana Department of Energy and Natural Resources (LDENR) and the State Mineral and Energy Board (SMEB). These entities share authority to lease wind energy in state waters, which extend approximately three nautical miles from the coast. Louisiana law allows for SMEB to lease state property, contingent on approval from the Secretary of the Department of Wildlife and Fisheries.[18] The state enabled offshore wind development in state waters for the first time in 2022, via Act 443. The law stipulates a 25,000-acre cap for offshore wind leases in state waters, and gives SMEB authority to accept whatever bid and lease it finds most advantageous to the state.[19] In December 2023, then-Governor Edwards and LDENR Secretary Tom Harris announced that SMEB approved two wind operating agreements in state offshore waters: a 6,152-acre property agreement for Diamond Offshore Wind (DOW) and a 59,653-acre agreement for Cajun Wind.[20] Louisiana, under the Coastal Zone Management Act, can in instances "review federal actions that will have reasonably foreseeable effects on the state's coastal resources and uses for consistency with the 'enforceable policies' of the Louisiana coastal management program."[21] While this does not allow for

The state enabled offshore wind development in state waters for the first time in 2022, via Act 443.



NOAA, Potential Wind Energy Areas in Gulf of Mexico

For hydrogen to be incorporated into federal offshore wind projects the Environmental Protection Agency (EPA) would conduct an environmental assessment of the project through the National Environmental Policy Act.

the state to regulate or manage offshore activities in federal waters, it does allow the state to identify and resolve issues.[22]

Federal waters, which include all waters off the Louisiana coast beyond three nautical miles, are regulated by the Bureau of Ocean Energy Management (BOEM). BOEM oversees leasing, permitting, and construction of offshore wind projects in these areas, including managing the environmental review and approval process for these projects. There have been no federal offshore wind projects used to create hydrogen in the U.S. to date. However, BOEM held the first auction for offshore wind leases in the Gulf in August of 2023 and there was speculation that these leases would be used for hydrogen production in the future.[23] For hydrogen to be incorporated into federal offshore wind projects the Environmental Protection Agency (EPA) would conduct an environmental assessment of the project through the National Environmental Policy Act.[24] Once EPA completes the environmental assessment and awards a finding of no significant impact, BOEM could incorporate hydrogen production into future leasing opportunities and provide existing lessees the option to include hydrogen production as a lease amendment upon site assessment.[25]

Federal Policy Gaps

There are some notable gaps in federal policy for the production of hydrogen with offshore wind power, which U.S. government agencies will have to address to grow the industry and meet climate goals. There is a general lack of clarity from BOEM in co-regulating hydrogen and offshore wind. BOEM created an assessment to guide their future regulation of hydrogen production from offshore wind; while this is a start, the regulations, codes, and standards are yet to be defined.

Many life cycle aspects of hydrogen transport and storage need to be better understood in order to scale up. For example, hydrogen produced by offshore wind can be used to synthesize green ammonia, which can then be transported to shore via pipeline or ships[26] for eventual use as a fertilizer. However, it is necessary to consider the hazards that may result from ammonia leaks or spills, as ammonia is toxic to marine life. Also, the salty brine discharge that electrolyzers produce when creating hydrogen from offshore wind may have long-term environmental impacts, which require further research.[27] Plus, ships that would be transporting hydrogen do not currently have a clean source of fuel. The construction of pipelines used to transport hydrogen on land can be disruptive to the environment and surrounding communities, which would add to the net emissions associated with hydrogen production.

State Policy Gaps

In Louisiana, there is a general lack of public oversight of offshore wind development projects. LDENR's Office of Mineral Resources does not require the typical 30-day comment periods that are common for many state and federal regulatory processes, such as permit applications, or the proposed operating agreements for offshore wind.[28] This missed opportunity for public comment on upcoming projects may undermine trust in the buildout of offshore wind, in a state where some communities already have great mistrust of industry.

In Louisiana, there is a general lack of public oversight of offshore wind development projects.

The environmental review process for awarding offshore wind leases in Louisiana is also insufficient, especially in comparison with BOEM's process. The current leasing process does not embrace

Department of Energy. Offshore Wind Research and Development

Wind farm. Photo from BOEM

the mitigation hierarchy (avoiding, minimizing, and mitigating unavoidable impacts) and does not have adequate rules to ensure effective, environmentally responsible siting as sites are often chosen before an analysis of alternative, lower-impact sites is completed.[29] There is also no requirement for the developer to submit an environmental analysis in addition to LDENR's environmental review for operating agreements, which is typical of the BOEM process.

Louisiana will also need to evaluate and adapt existing workforce skills, particularly from the oil and gas sector, to meet the demands of the offshore wind industry. This could be through the development of education and training programs, particularly at state universities and technical colleges, to bridge skill gaps and prepare the workforce for opportunities in offshore wind.[30] Additionally, Louisiana's status as a "right-to-work" state introduces uncertainties about its participation in the offshore wind industry, especially in projects looking for federal funding that offer additional incentives for using union labor. This factor could influence the competitiveness of Louisiana companies in securing contracts for offshore wind projects.[31]

Additionally, Louisiana's existing infrastructure, such as ports and shipping operations, needs to be strategically planned and developed to support the offshore wind industry.[32] Louisiana's Public Service Commission (PSC) will also play a role in the burgeoning green hydrogen industry given its influence over electricity pricing and regulations. Louisiana also should continue to engage with the Midcontinent Independent System Operator (MISO) in its long-range transmission planning process to ensure offshore wind can reliably connect with end users.[33] This transmission planning process continues to be a challenging space, given the large number of stakeholders involved in the process and the variety of roles that they play.[34]

Recommendations

More technical research is needed on hydrogen-offshore wind project construction design. Hydrogen technology configuration with offshore wind should be more deeply examined. For example, the electrical generator on an offshore wind turbine should be evaluated for "whether there are design solutions that can take advantage of the electrolyzer's

requirement for direct current power" as **BOEM's assessment** does not cover this or other technical questions such as the appropriate type of turbine configuration.[35] Infrastructure in the Gulf could include either piled or floating wind turbine configuration, but at this point in the development of the hydrogen-offshore wind sector, it is not clear if there are advantages to either. There are also lingering questions about the design of the turbine specifically around mooring and anchoring.[36]

Given the emerging nature of hydrogen production through offshore wind, BOEM should support knowledge exchanges between stakeholders through meetings and workshops. These meetings should focus on identifying research gaps and priorities as well as soliciting community feedback. They should also include a diverse set of stakeholders including other agencies, both state and federal, NGOs, academics, environmental justice organizations, and impacted communities and Tribes. Louisianians were disappointed "that BOEM didn't include incentives for developers to create community benefit agreements in the lease terms [for the Gulf of Mexico] as the agency did in California's offshore wind auction last year."[37] This enshrining of community consideration in large infrastructure projects ought to become common practice in coming years, especially given that DOE now requires projects with federal funding to include a community benefits plan in their applications.

BOEM should also learn from existing projects and regulations in Europe. This would enhance U.S. understanding of how stakeholders abroad worked through the complexities of connecting the hydrogen and offshore wind industries, and inform how the U.S. could connect these industries domestically.[38] Finally, BOEM should strengthen existing safety codes, standards, and procedures. Hydrogen-offshore wind has worker safety issues parallel to oil and gas, but adds other unique factors that need to be taken into account.

Manta Rays near Louisiana shore. Photo by US. Environmental Protection Agency

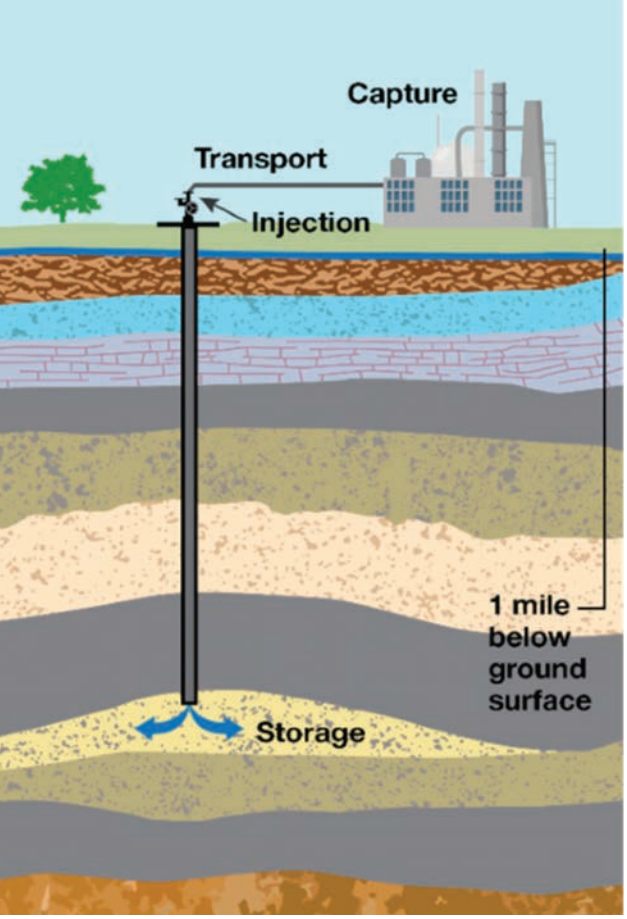
Carbon Capture Utilization and Storage (CCUS) and Hydrogen

Today, about 95 percent of hydrogen is produced through steam reforming of natural gas, and retrofitting these facilities with CCUS equipment can serve as a way to produce hydrogen with a smaller carbon footprint.[39] While CCUS is a controversial technology in many communities, it can be a helpful CO_2 emissions mitigation strategy in sectors that are difficult to decarbonize, such as chemicals and cement. It can also help reduce the emissions of harmful air pollutants that disproportionately impact low-income communities and communities of color. A recent study out of the Great Plains Institute found that when CCUS removes co-pollutants, such as nitrogen oxides (NOx) and sulfur dioxide (SO_2), along with CO_2 from emissions sources, it can provide anywhere from $6.8 million to $481.2 million in health benefits from improved air quality in the region where it is deployed.[40] Additionally, a nationwide study on the benefits of removing energy-related emissions in the U.S. (via multiple strategies) found that eliminating emissions could prevent 53,200 premature deaths annually and produce $608 billion in economic and health benefits from avoided illnesses and deaths.[41] These numbers speak to the broad benefits and opportunities that a clean energy future holds, but there are community, policy, and infrastructure considerations that must be addressed before we can reach our goals of a net zero future.

While CCUS is a controversial technology in many communities, it can be a helpful CO_2 emissions mitigation strategy in sectors that are difficult to decarbonize, such as chemicals and cement.

The foundation of CCUS in Louisiana began in 2009 with the passing of The Louisiana Geologic Sequestration of Carbon Dioxide Act, which allowed Louisiana to start sequestering CO_2 underground.[42] The state also supports CCUS investment in their multi-state Regional CO_2 Transport Infrastructure Action Plan, which includes sample state policies that encourage CCUS project deployment.[43] Additionally, the 2022 Louisiana state Climate Action Plan promotes CCUS as well as investments in low and zero-carbon hydrogen. Low/zero-carbon hydrogen serves as an addition to Louisiana's industrial decarbonization strategy and the state is working to develop a regulatory framework that responsibly deploys CCUS technologies."[44]

There are currently 10 facilities in Louisiana that produce gray hydrogen (without the use of CCUS). Meanwhile, Louisiana has the geologic capacity to store 802 billion metric tons of CO_2 in saline formations and also has the capacity for storage in fossil basins such as oil and gas fields.[45] Additionally, Louisiana has a large industrial sector with established transportation and delivery infrastructure, especially for natural gas. This existing infrastructure can help increase efficiency for blue hydrogen production and transportation as the industry grows.



Class VI injection well. Graphic by US. Environmental Protection Agency

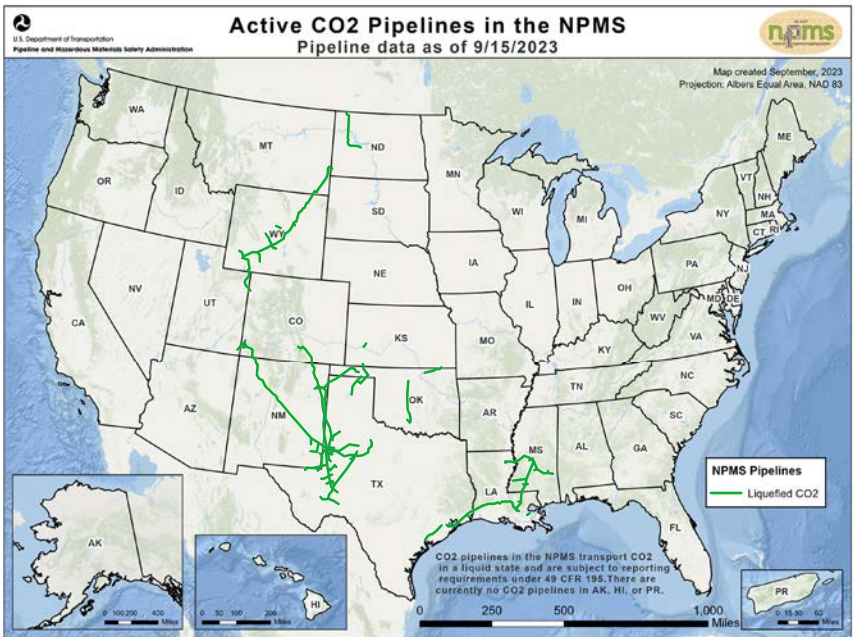
At the federal level, CO_2 underground storage is regulated and permitted by the Underground Injection Control (UIC) program within the EPA. The UIC program has six classes of wells that are divided by type and depth of the injection.[46] Class VI wells are used to inject CO_2 into deep rock formations that can store CO_2 emissions in perpetuity. The UIC program ensures that storage projects that use Class VI wells protect drinking water, and are placed in sites with appropriate geology to ensure the CO_2 stays within the injection zone while requiring site operators to have site monitoring and remedial capabilities. States can apply to the EPA for Primary Enforcement Authority, commonly called **primacy**, for Class VI wells. This allows the state to issue permits for and regulate Class VI wells in their state without requiring final authorization from the EPA. Louisiana was awarded primacy in late 2023, but Louisiana communities and the federal government have questioned the regulatory and enforcement capabilities of the state's agencies.

In a 2022 letter to Louisiana's environmental and health agencies, the EPA expressed concern at state officials having "dismissed residents' concerns about air quality, underplayed the dangers of chloroprene, conducted flawed health studies, and mischaracterized air monitoring data."[47] This history of mismanagement has made environmental justice groups question whether Louisiana state agencies are qualified to regulate Class VI wells. Groups including Deep South Center for Environmental Justice, EarthJustice, and the Climate Justice Alliance all raised concerns regarding the state's primacy application. EarthJustice worried that Louisiana's management of the wells would "degrade environmental justice."[48] Louisiana did incorporate environmental justice measures in their primacy application and the Deep South Center for Environmental Justice shared in a letter that "the inclusion of these environmental justice provisions is encouraging and must be enforced and referenced at every step of the process."[49] However, even with the inclusion of environmental justice considerations, some advocates still question CCUS as an effective and necessary tool for combating climate change. In a *Louisiana Illuminator* article, a campaign manager for the Center for International Environmental Law said that "no agency should be issuing carbon injection well permits, but especially not overwhelmed and understaffed agencies in fossil fuel states like Louisiana."[50]

In a *Louisiana Illuminator* article, a campaign manager for the Center for International Environmental Law said that "no agency should be issuing carbon injection well permits, but especially not overwhelmed and understaffed agencies in fossil fuel states like Louisiana."

Federal Policy Gaps

A variety of technical, economic, and institutional challenges must be addressed if hydrogen is going to contribute to the United States' energy system and industrial economy. The Pipeline and Hazardous Materials Safety Administration (PHMSA) within the Department of Transportation is charged with regulating the transportation of hydrogen and CO_2 across state lines.[51] In 2023 PHMSA invested $4 million in researching hydrogen infrastructure and safety.[52] PHMSA is focusing its research on strengthening infrastructure for local distribution, delivery, and refueling stations as hydrogen demand grows, as well as updating CO_2 pipeline regulation to enhance safety measures.[53] PHMSA plans to update current CO_2 pipeline regulations in 2024 due to the expansion of CCUS as well as in response to the 2020 pipeline leak in Satartia, MS.[54]



PHMSA, CO_2 Pipelines Map

DOE's Office of Energy Efficiency and Renewable Energy is researching ways to improve the process of compressing hydrogen and to decrease the associated costs.[55] DOE is also finding methods to decrease the cost and footprint of storing hydrogen.[56] Their research includes strategies for decreasing prices for pipeline materials, finding new approaches for hydrogen liquefaction, and creating updated systems for delivering and storing hydrogen with lighter-weight materials.[57] According to PHMSA, there are less than 1,000 miles of hydrogen-supplying pipelines operating now. Given the projected growth of hydrogen production and use, consistency and reliability in the design, construction materials, and safety of hydrogen pipelines must be assured through codified standards and regulations. The federal government is working with standards organizations from the private sector to identify "codes and standards, to facilitate the development of such standards, and to support publicly available research and certification investigations that are necessary to develop a basis for such codes and standards."[58]

State Policy Gaps

Louisiana will face similar regulation struggles as its hydrogen economy grows. The need to regulate increased transportation of both CO_2 and hydrogen, and to strengthen LDENR's ability to regulate and permit Class VI wells, will be a main focus for the state in the coming years. LDENR's pipeline division regulates CO_2 pipelines in the state and is responsible for safety inspections and enforcement of pipeline regulation.[59]

While Louisiana has an extensive existing pipeline network and rights of way for carbon transport, this network will likely expand as the CCUS industry does and will need to take hydrogen pipelines and their associated rights of way into account. To maximize efficiency and minimize project footprint, it is possible to co-locate new CO_2 and hydrogen pipelines along existing routes, as well as have new pipelines follow existing rights of way that have been established along Louisiana's oil pipelines. However, this approach would still require a large buildout of new pipelines, which may cause conflict with communities as pipeline buildouts contribute to wetland loss or other environmental degradation. Standards for pipeline safety at this increased scale will be of critical importance.[60] Given Louisiana's concentration of industry, projects may be able to co-locate clean hydrogen production with multiple end-users nearby, taking advantage of regional-scale development. This type of development allows companies across the supply chain to benefit from all aspects of the hydrogen economy being in close proximity to one another. This mirrors the U.S. Clean Hydrogen Strategy and Roadmap, which advocates for the creation of "networks of hydrogen producers, consumers, and local connective infrastructure to accelerate the use of hydrogen as a clean energy carrier."[61] While the closest DOE-funded hydrogen hub is located in Houston, Texas, the same regional implementation strategy still applies due to the interconnectedness of oil and gas—and soon CCUS—infrastructure along the Gulf Coast.

Industrial Infrastructure in New Orleans. Photo by Sarah Kallgren, NWF

Despite these challenges, new projects are already starting to appear in the state. In 2021, Air Products announced a $4.5 billion blue hydrogen clean energy complex near Burnside in Ascension Parish. It will be the world's largest permanent CO_2 sequestration project to date.[62] Former Governor John Bel Edwards said, "This is a major industrial investment that will create quality manufacturing jobs while limiting environmental impacts. This project is a clear demonstration of our ability to grow the Louisiana economy while lowering the carbon footprint of industry."[63]

To maximize efficiency and minimize project footprint, it is possible to co-locate new CO_2 and hydrogen pipelines along existing routes, as well as have new pipelines follow existing rights of way that have been established along Louisiana's oil pipelines.

Recommendations

Given the projected growth of the hydrogen industry, Louisiana and federal agencies will need to strengthen regulation around CCUS's role in hydrogen production, and also strengthen regulation around the production, transportation, and safety

Near the future site of Air Products' CCS project on Lake Maurepas. Photo by Sarah Kallgren, NWF

measures for hydrogen writ large. This must include regulations for projects that are using natural gas pipelines for CO_2 and hydrogen transportation, and clarity as to whether state or federal level agencies are responsible for permitting and regulating hydrogen pipelines in particular, as right now it is unclear.[64] State and federal agencies must also take upstream methane leaks associated with natural gas-based hydrogen production into account to get an accurate sense of total emissions impact.[65]

In 2022 PHMSA required that all gas and hazardous liquid pipelines, including CO_2 and hydrogen, have an automatic shut-off valve that can cut off pipeline flow within 30 minutes of an operator engaging the function.[66] This is a good start, but there are more aspects of these industries, such as siting and pipeline safety in response to natural disasters, that must be looked at for new regulations to protect the public and natural resources and improve public confidence.

According to PHMSA, the following regulatory considerations will need to be addressed across federal and state agencies to ensure that a hydrogen economy moves from a concept to a reality:[67]

1) A clear technical focus regarding the safety implications of infrastructure materials, designs, and systems;

2) Preparation to address any regulatory barriers toward a hydrogen economy;

3) Research in support of additional industry consensus standards; and

4) Efforts to educate and prepare emergency responders.

Environmental Justice Concerns

The legacies of industrial harm remain present and active in communities across Louisiana and the idea of allowing industry to operate with new technology is very unappealing to many communities. The Climate Justice Alliance shared in a letter regarding CCUS that "if we are to combat climate change we must do so with real, viable solutions—not unproven technologies that only promise to continue the legacy of dumping pollutants onto frontline communities."[68] Similarly, the Deep South Center for Environmental Justice says that expanding the hydrogen industry and relying on CCUS are "risky ventures that could prove harmful to environmental justice communities and worsen climate change."[69] There are a variety of concerns about these technologies ranging from safety and the continued use of fossil fuels to the continuation of sacrifice zones in environmental justice communities.

EPA visits Louisiana communities. Photo by Eric Vance, US EPA

In a 2023 letter to the Department of Energy, organizations in 28 states, two Indigenous Nations, and national and international organizations raised concerns about:

- **Risk of pipeline explosion and other disruptions that can cause disproportionate impacts on low-income communities, communities of color, and Indigenous communities;**
- **Environmental impacts of hydrogen leaks;**
- **The negative health impacts in overburdened communities of associated NOx production;**
- **Hydrogen production with fossil fuels preventing the phase-out of fossil fuels;**
- **The significant quantities of water required for hydrogen production;**
- **The inefficiency of using green hydrogen compared to the direct use of renewables for energy;**
- **Perpetuation of environmental injustice by continuing the legacy of sacrifice zones, which disproportionately occur in marginalized communities; and**
- **Lack of transparency and community engagement in the decision-making process of creating hydrogen hubs.**

The Alliance for Affordable Energy, a Louisiana-based consumer advocate organization, expressed uncertainty about costs related to developing new pipelines and modifying existing power infrastructure for hydrogen combustion.[70] The organization has raised concern about the potential for federal clean energy subsidies to enable utilities to receive substantial hydrogen subsidies without significant reductions in pollution. The Alliance has called for the Louisiana Public Service Commission to rigorously evaluate emerging technologies rather than approving them based on speculation. Deep South Center for Environmental Justice also expressed concerns over inadequate regulations to protect environmental justice communities. The organization does not support the financial incentives

The legacies of industrial harm remain present and active in communities across Louisiana.

for hydrogen and suggests that agencies are overlooking natural solutions to store carbon such as biological carbon sinks, mangrove restoration, and soil improvements.[71] Environmental justice groups more broadly worry that utilizing CCUS for the creation of blue hydrogen will lock in continued usage of fossil fuels, and help the industry continue to grow in their communities. These concerns reflect the experience of those on the ground in Louisiana who have lived through generations of harm at the hands of fossil fuel-based industry and policy that places the growth of industry above the needs of communities.

Given the recent federal investments... Louisiana residents may now be in a better position to negotiate with companies planning energy projects in their communities.

Given the recent federal investments through BIL and IRA that now require community benefits plans in any DOE-funded grant application, Louisiana residents may now be in a better position to negotiate with companies planning energy projects in their communities. BOEM does not require the inclusion of community benefit plans, but the DOE-funded hydrogen hubs and CCUS projects do. It is vital that upcoming projects conduct proactive, transparent, and holistic community engagement that seeks out trusted community leaders to inform communities about proposed projects, and their potential impacts and benefits. However, it is also important to note that the influx of energy projects that now require community engagement may be burdensome on community groups and local governments that may want to engage but do not have the capacity to engage on multiple projects at once. Currently over 65 labor organizations support the selected hydrogen hubs, several of which have project labor agreements that ensure fair labor standards, but community benefits cannot stop with workforce benefits.[72] There are a variety of community benefits that these companies can provide to the communities they work in. Some of these include, but are not limited to[73]:

EPA exploring New Orleans waters with community members. Photo by Eric Vance, US EPA

• Host or Development Agreements. These are agreements between a developer and a host community that say the host will accept certain project guidelines from the community to gain community support.

• Project Labor Agreements. These are agreements between developers and construction unions that agree to hire a certain number of people to work on the project. These agreements also establish the terms and conditions of the employment.[74]

• Good Neighbor Agreements. These are legal agreements between community advocacy groups and a project developer that require the developer to make certain changes to the project to gain community support.

• Community Benefits Agreements. These are legal contracts between a community group or coalition and a project developer in which the developer agrees to provide certain agreed-upon benefits to the community in exchange for project support.

• Community Benefits Plans. These are not legally binding, but rather are plans that BIL- and IRA-funded projects are required to include in their applications to the DOE. These plans can include any of the previously mentioned legally binding agreements as a way to strengthen their application's commitment to community benefits.

If this is to be a truly just energy transition, communities that host industry projects must be meaningfully informed on the types of proposed energy projects and included in discussions around how to make projects appealing and beneficial to residents.

Conclusion

Clean hydrogen offers an alternative source of energy and material inputs in hard-to-abate industries that could, along with other strategies, help the US and other countries meet their climate change mitigation goals. Hydrogen production based on fossil fuels is already a growing industry, and many alternative methods are in development, including in association with renewable energy generation from offshore wind, or with the use of carbon capture technology. However, the rapid growth of this sector requires the strengthening and updating of existing federal and state regulations, as well as a continued focus on the importance of community engagement. Regulation must take into account potential new intersections with offshore wind and other renewables, carbon capture, and relevant infrastructure, plus an expanded need for additional pipelines. Regulators should also welcome knowledge sharing between countries to find best practices in creating the necessary physical infrastructure as well as in approaching regulations and policies.

While there is a sense of urgency to grow this industry, the build-out cannot be at the expense of communities that have already suffered at the hands of existing industry. Louisiana has a complicated relationship with industry—both its economic promise and the negative health and environmental impacts it has had on the state's people, land, and waters. With vast federal climate investments flowing to states like Louisiana, now is the moment for developers and regulators to take this lived history into account and design an equitable clean economy. Policymakers can require stronger community engagement metrics for publicly funded projects that bring trusted community leaders into the discussion around projects built in their communities. Unmitigated effects of climate change will have detrimental impacts on coastal populations, thus the policies and regulations surrounding climate change mitigation strategies must center the lives and livelihoods of those who will face the greatest challenges in the coming years.

Sources

Alliance for Affordable Energy, "Category: Hydrogen." https://www.all4energy.org/watchdog/category/hydrogen.

ReImagine Appalachia, "Part I: Community Benefits Plans: How Do They Work? A Deep Dive!," ReImagine Appalachia, December 19, 2023. https://reimagineappalachia.org/community-benefits-plans-how-do-they-work-a-deep-dive/.

BOEM, "Assessment of BOEM's Role in Reviewing Hydrogen Production as a Complement to Offshore Wind," 2022. https://www.boem.gov/sites/default/files/documents/renewable-energy/studies/BOEM-H2-OSW-Assessment-Final-Report.pdf.

Boem. https://www.boem.gov/sites/default/files/documents/renewable-energy/studies/BOEM-H2-OSW-Assessment-Final-Report.pdf.

"Climate Justice Alliance Warns Carbon Capture & Sequestration, Hydrogen Would Harm Frontline Communities & Perpetuate Climate Crisis despite Ambitious 90% Cuts to Power Plant Carbon Emissions." Climate Justice Alliance, May 11, 2023. https://climatejusticealliance.org/ccus-is-not-a-real-solution/.

Deep South Center for Environmental Justice (DSCEJ), "Statement by Environmental Justice Organizations on the National Symposium on Climate Justice & Carbon Management." https://www.dscej.org/the-latest/statement-by-environmental-justice-organizations-on-the-national-symposium-on-climate-justice-carbon-management.

Department of Energy and Natural Resources, State of Louisiana."Office of Conservation." https://www.dnr.louisiana.gov/index.cfm/page/54.

Department of Energy, "U.S. National Clean Hydrogen Strategy ... - hydrogen program." https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.

Doody, Kathleen L. "Louisiana's Future in Offshore Wind: Takeaways from Louisiana Wind Week." The Energy Law Blog, July 2, 2021. https://www.theenergylawblog.com/2021/07/articles/energy/energy-natural-resources/louisianas-future-in-offshore-wind-takeaways-from-louisiana-wind-week/.

EFI, "The U.S. Hydrogen Demand Action Plan." https://efifoundation.org/wp-content/uploads/sites/3/2023/02/EFI-Hydrogen-Hubs-FINAL-2-1.pdf.

Energy.gov, "Hydrogen Fuel Basics." https://www.energy.gov/eere/fuelcells/hydrogen-fuel-basics.

Environmental Law Institute, "Louisiana Offshore Wind Energy Framework," December 2022. https://www.eli.org/sites/default/files/files-pdf/Louisiana%20State%20Offshore%20Wind%20Energy%20Framework%20-%20Dec%202022.pdf.

EPA, "Underground Injection Control Well Classes." https://www.epa.gov/uic/underground-injection-control-well-classes.

Gagnon, Stephanie. "Securing Louisiana's Role in the Offshore Wind Industry." Center for Climate and Energy Solutions, June 29, 2023. https://www.c2es.org/document/securing-louisianas-role-in-the-offshore-wind-industry/.

Gallucci, Maria. "Why the Gulf of Mexico's First Offshore Wind Auction Wasn't a Smash..." Canary Media, August 29, 2023. https://www.canarymedia.com/articles/wind/why-the-gulf-of-mexicos-first-offshore-wind-auction-wasnt-a-smash-hit.

Great Plains Institute, "An Atlas of Carbon and Hydrogen Hubs." https://betterenergy.org/blog/gpi-carbon-and-hydrogen-hubs-atlas/.

Great Plains Institute, "Carbon Capture Co-benefits," August 2023. https://carboncaptureready.betterenergy.org/wp-content/uploads/2023/08/Carbon-Capture-Co-Benefits.pdf.

Great Plains Institute, "Louisiana Carbon and Hydrogen Hub." https://carboncaptureready.betterenergy.org/wp-content/uploads/2022/01/Louisiana_Carbon_Hydrogen_Hub.pdf.

Greenfield, Nicole. "Advocates Are Sparking a Revolution in Louisiana's 'Cancer Alley.'" Be a Force for the Future, November 10, 2022. https://www.nrdc.org/stories/advocates-are-sparking-revolution-louisianas-cancer-alley.

Groom, Nichola. First US gulf offshore wind auction to fuel region's green hydrogen ..., August 28, 2023. https://www.reuters.com/sustainability/first-us-gulf-offshore-wind-auction-fuel-regions-green-hydrogen-push-2023-08-28/.

IEA "Executive Summary – Global Hydrogen Review 2021 – Analysis." https://www.iea.org/reports/global-hydrogen-review-2021/executive-summary.

Ishaq, Haris. "Transient Modeling of a Green Ammonia Production System to Support Sustainable Development." International Journal of Hydrogen Energy, August 4, 2023. https://www.sciencedirect.com/science/article/abs/pii/S0360319923034274#:~:text=The%20offshore%20wind%20power%20is,for%20long%20distance%20marine%20transport.

Jyotishi, Shalin. "Labor Unions at the Center of $7B Hydrogen Hubs Program." New America, October 31, 2023. https://www.newamerica.org/education-policy/edcentral/labor-unions-at-the-center-of-7-billion-hydrogen-hubs-program/.

LaRose, Greg. "Environmental Interests React to EPA Giving Louisiana CO_2 Storage Permit Power, Louisiana Illuminator." Louisiana Illuminator, December 29, 2023. https://lailluminator.com/2023/12/29/carbon-storage/.

LED Louisiana Economic Development, "Air Products Announces $4.5 Billion Blue Hydrogen Clean Energy Complex - Led: Louisiana Economic Development." https://www.opportunitylouisiana.gov/news/air-products-announces-4-5-billion-blue-hydrogen-clean-energy-complex.

Louisiana Economic Development, "Hydrogen - Energy Diversity: Louisiana Economic Development." https://www.opportunitylouisiana.gov/key-industry/energy/energy-diversity/hydrogen.

Louisiana Illuminator,"Louisiana Issues Its First-Ever State Offshore Wind Energy Leases, Louisiana Illuminator," December 14, 2023, https://lailluminator.com/briefs/louisiana-wind-energy/.

Louisiana State Mineral and Energy Board, "Public Comments Received, Re Proposed Operating Agreements," December 13, 2023. https://www.dnr.louisiana.gov/assets/OMR/media/forms_pubs/Wind_Energy_Public_Comments_12-13-23_SMEB_Meeting.pdf.

National Grid Group, "The Hydrogen Colour Spectrum." https://www.nationalgrid.com/stories/energy-explained/hydrogen-colour-spectrum.

Nicholas A. Mailloux, "Nationwide and Regional PM2.5-related Air Quality Health Benefits from the Removal of Energy-related Emissions in the United States," GeoHealth 6, no. 5, May 2022. https://doi.org/10.1029/2022gh000603.

Office of the Governor, "Louisiana Climate Action Plan." https://gov.louisiana.gov/assets/docs/CCI-Task-force/CAP/Climate_Action_Plan_FINAL_3.pdf.

PHMSA, "Pipeline Safety Stakeholder Communications." https://primis.phmsa.dot.gov/comm/hydrogen.htm.

ProPublica, "The Most Detailed Map of Cancer-Causing Industrial Air Pollution in the U.S." November 2, 2021. https://projects.propublica.org/toxmap/#hotspot/2.

Regional Carbon Capture Deployment Initiative, "Louisiana Implementing Carbon Capture and Storage Technology." https://carboncaptureready.betterenergy.org/wp-content/uploads/2023/05/Louisiana-fact-sheet-2023.pdf.

S.1807 - 117th Congress (2021-2022): Clean H2 Production Act ... https://www.congress.gov/bill/117th-congress/senate-bill/1807?s=1&r=4.

Shirizadeh, Behrang. "The Impact of Methane Leakage on the Role of Natural Gas in the European Energy Transition." Nature Communications 14, no. 1 (September 16, 2023). https://doi.org/10.1038/s41467-023-41527-9.

Song, Lisa. "EPA Finally Calls out Environmental Racism in Louisiana's Cancer Alley." Grist, October 19, 2022. https://grist.org/regulation/epa-finally-calls-out-environmental-racism-in-louisiana-cancer-alley/.

U.S. Department of Labor, "Project Labor Agreement Resource Guide." https://www.dol.gov/general/good-jobs/project-labor-agreement-resource-guide.

U.S. Department of Transportation "Fueling America's Economy: Legislation to Improve Safety and Expand U.S. Pipeline Infrastructure." https://www.transportation.gov/fueling-americas-economy-legislation-improve-safety-and-expand-us-pipeline-infrastructure.

Terry L. Jones, Floodlight. "How Ocean Wind Power Could Help the Oil Industry, Louisiana Illuminator." Louisiana Illuminator, December 30, 2022. https://lailluminator.com/2022/12/30/how-ocean-wind-power-could-help-the-oil-industry/.

Endnotes

1. Energy.gov, "Hydrogen Fuel Basics."
2. Ibid.
3. Ibid.
4. S.1807 - 117th Congress (2021-2022): Clean H2 Production Act.
5. National Grid Group, "The Hydrogen Colour Spectrum."
6. IEA "Executive Summary – Global Hydrogen Review 2021 – Analysis."
7. Department of Energy, "U.S. National Clean Hydrogen Strategy ... - hydrogen program."
8. Office of the Governor, "Louisiana Climate Action Plan."
9. PHMSA, "Pipeline Safety Stakeholder Communications."
10. Nicole Greenfield, "Advocates Are Sparking a Revolution in Louisiana's 'Cancer Alley,'" Be a Force for the Future, November 10, 2022.
11. Great Plains Institute, "An Atlas of Carbon and Hydrogen Hubs."
12. EFI, "The U.S. Hydrogen Demand Action Plan."
13. Floodlight Terry L. Jones, "How Ocean Wind Power Could Help the Oil Industry, Louisiana Illuminator," Louisiana Illuminator, December 30, 2022.
14. Louisiana Economic Development, "Hydrogen - Energy Diversity: Louisiana Economic Development."
15. ProPublica, "The Most Detailed Map of Cancer-Causing Industrial Air Pollution in the U.S." November 2, 2021.
16. Nicole Greenfield, "Advocates Are Sparking a Revolution in Louisiana's 'Cancer Alley,'" Be a Force for the Future, November 10, 2022.
17. Department of Energy, "U.S. National Clean Hydrogen Strategy ... - hydrogen program."
18. Ibid.
19. Ibid.
20. Louisiana Illuminator,"Louisiana Issues Its First-Ever State Offshore Wind Energy Leases, Louisiana Illuminator," December 14, 2023.
21. Environmental Law Institute, "Louisiana Offshore Wind Energy Framework," December 2022.
22. Ibid.
23. Nichola Groom, "First US gulf offshore wind auction to fuel region's green hydrogen ...," August 28, 2023.
24. BOEM, "Assessment of BOEM's Role in Reviewing Hydrogen Production as a Complement to Offshore Wind," 2022.
25. Ibid.
26. Haris Ishaq, "Transient Modeling of a Green Ammonia Production System to Support Sustainable Development," International Journal of Hydrogen Energy, August 4, 2023.
27. BOEM, "Assessment of BOEM's Role in Reviewing Hydrogen Production as a Complement to Offshore Wind," 2022.
28. Louisiana State Mineral and Energy Board, "Public Comments Received, Re Proposed Operating Agreements," December 13, 2023.
29. BOEM, "Assessment of BOEM's Role in Reviewing Hydrogen Production as a Complement to Offshore Wind," 2022.
30. Stephanie Gagnon, "Securing Louisiana's Role in the Offshore Wind Industry," Center for Climate and Energy Solutions, June 29, 2023.
31. Ibid.
32. Ibid.
33. Stephanie Gagnon, "Securing Louisiana's Role in the Offshore Wind Industry," Center for Climate and Energy Solutions, June 29, 2023.
34. Kathleen L Doody, "Louisiana's Future in Offshore Wind: Takeaways from Louisiana Wind Week," The Energy Law Blog, July 2, 2021.
35. Ibid.
36. Ibid.
37. Maria Gallucci, "Why the Gulf of Mexico's First Offshore Wind Auction Wasn't a Smash...," Canary Media, August 29, 2023.
38. Maria Gallucci, "Why the Gulf of Mexico's First Offshore Wind Auction Wasn't a Smash...," Canary Media, August 29, 2023.
39. Energy.gov, "Hydrogen Fuel Basics."
40. Great Plains Institute, "Carbon Capture Co-benefits," August 2023.
41. Nicholas A. Mailloux, "Nationwide and Regional PM2.5-related Air Quality Health Benefits from the Removal of Energy-related Emissions in the United States," *GeoHealth* 6, no. 5, May 2022.
42. Regional Carbon Capture Deployment Initiative, "Louisiana Implementing Carbon Capture and Storage Technology."
43. Regional Carbon Capture Deployment Initiative, "Louisiana Implementing Carbon Capture and Storage Technology."
44. Office of the Governor, "Louisiana Climate Action Plan."
45. Great Plains Institute, "An Atlas of Carbon and Hydrogen Hubs."
46. EPA, "Underground Injection Control Well Classes."
47. Lisa Song, "EPA Finally Calls out Environmental Racism in Louisiana's Cancer Alley," Grist, October 19, 2022.
48. Lisa Song, "EPA Finally Calls out Environmental Racism in Louisiana's Cancer Alley," Grist, October 19, 2022.
49. Email from Deep South Center for Environmental Justice, Inc. <media@dscej.org>, December 29, 2023.
50. Greg LaRose, "Environmental Interests React to EPA Giving Louisiana CO_2 Storage Permit Power Louisiana Illuminator," Louisiana Illuminator, December 29, 2023.
51. PHMSA, "Pipeline Safety Stakeholder Communications."
52. U.S. Department of Transportation "Fueling America's Economy: Legislation to Improve Safety and Expand U.S. Pipeline Infrastructure."
53. PHMSA, "Pipeline Safety Stakeholder Communications."

54. U.S. Department of Transportation “Fueling America’s Economy: Legislation to Improve Safety and Expand U.S. Pipeline Infrastructure.”
55. PHMSA, “Pipeline Safety Stakeholder Communications.”
56. Ibid.
57. Ibid.
58. PHMSA “Pipeline Safety Stakeholder Communications.”
59. Department of Energy and Natural Resources, State of Louisiana.“Office of Conservation.”
60. Regional Carbon Capture Deployment Initiative, “Louisiana Implementing Carbon Capture and Storage Technology.”
61. Department of Energy, “U.S. National Clean Hydrogen Strategy ... - hydrogen program.”
62. LED Louisiana Economic Development, “Air Products Announces $4.5 Billion Blue Hydrogen Clean Energy Complex - Led: Louisiana Economic Development.”
63. Ibid.
64. U.S. Department of Transportation “Fueling America’s Economy: Legislation to Improve Safety and Expand U.S. Pipeline Infrastructure.”
65. Behrang Shirizadeh, “The Impact of Methane Leakage on the Role of Natural Gas in the European Energy Transition,” *Nature Communications* 14, no. 1, September 16, 2023.
66. U.S. Department of Transportation “Fueling America’s Economy: Legislation to Improve Safety and Expand U.S. Pipeline Infrastructure.”
67. PHMSA, “Pipeline Safety Stakeholder Communications.”
68. Climate Justice Alliance, “Climate Justice Alliance Warns Carbon Capture & Sequestration, Hydrogen Would Harm Frontline Communities & Perpetuate Climate Crisis despite Ambitious 90% Cuts to Power Plant Carbon Emissions,”May 11, 2023.
69. Deep South Center for Environmental Justice (DSCEJ), “Statement by Environmental Justice Organizations on the National Symposium on Climate Justice & Carbon Management.”
70. Alliance for Affordable Energy, “Category: Hydrogen.”
71. Deep South Center for Environmental Justice (DSCEJ), “Statement by Environmental Justice Organizations on the National Symposium on Climate Justice & Carbon Management.”
72. Shalin Jyotishi, “Labor Unions at the Center of $7B Hydrogen Hubs Program,” New America, October 31, 2023.
73. ReImagine Appalachia, “Part I: Community Benefits Plans: How Do They Work? A Deep Dive!,” ReImagine Appalachia, December 19, 2023.
74. U.S. Department of Labor, “Project Labor Agreement Resource Guide.”

Pelican silhouette. Photo by Lael Butler, Environmental Protection Agency

NATIONAL WILDLIFE FEDERATION

National Wildlife Federation
1200 G Street, NW, Suite 900
Washington, D.C. 20005
www.nwf.org