US Gulf of Mexico eyed for overlapping offshore wind, carbon storage like North Sea

10 May 2022 | Amena Saiyid

Renewable developers and oil majors are eyeing Gulf of Mexico waters straddling the US' southeastern border as a potential site for building overlapping sites to generate offshore wind and store CO2 captured from the coast's petrochemical and other manufacturing facilities.

Firms say they want to tap into the expertise of an offshore oil and natural gas industry that already populates the Gulf Coast states of Texas, Louisiana, and Mississippi just as they did in the North Sea—the shared body of water between the UK, Norway, the Netherlands, Belgium, Denmark, France, and Germany.

The North Sea is one of the largest offshore drilling areas in the world. It is also home to two out of four worldwide operating offshore carbon capture and storage (CCS) sites as well as nearly 100% of Europe's installed offshore wind capacity, totaling about 27 GW, according to analysts with S&P Global Commodity Insights.

Unlike its North Sea counterpart, the Gulf of Mexico as yet has no operating offshore wind or CCS sites, but federal offshore oil production in this water body accounts for 15% of total US crude

production and 5% of total US dry gas output.

But that may all change as the Biden administration evaluates how both sets of clean energy technologies—offshore wind and offshore CCS—can be deployed in its quest to reach a net-zero economy by 2050.

Can offshore wind and CCS be deployed together?

The key question that companies supplying and installing technology in the renewables and oil spaces are expecting US Department of Interior's Bureau of Ocean Energy Management (BOEM) to answer is whether these two technologies can be safely deployed in the same basin along with existing oil and gas infrastructure. And if so, how?

"How do we ensure that the waters remain viable for multiple uses?" US Representative Pete Stauber (Republican-Minnesota) asked at a 28 April US House of Representatives subcommittee hearing on the risks posed by offshore CCS in the Gulf of Mexico.

The Biden administration has not answered this question yet, and BOEM has not indicated whether it will develop a plan that accounts for multiple energy uses in the Outer Continental Shelf (OCS), according to Romany Webb, senior research fellow with the Sabin Center for Climate Change Law at the Columbia University in New York City.

"I'm not aware of any comprehensive study that has mapped out how different areas of the offshore could be used for different purposes, and what areas might be most suitable for multiple uses," Webb told *Net-Zero Business Daily* by S&P Global Commodity Insights.

Webb said the Sabin Center is involved in a study with Ocean Networks Canada that is looking at the feasibility of deploying a direct air capture system powered by offshore wind energy that would pull CO2 from the atmosphere and store it in the seabed. So, there are ongoing studies that are looking at the impacts of combining and deploying different clean energy technologies offshore while evaluating suitable locations. In terms of planning for permitting and leasing of those sorts of technologies, Webb said: "I have seen no such study yet."

Learn lessons from UK

The UK already has experience with installing offshore wind in the North Sea. BOEM, for instance, could take lessons from the Crown Estate, which is charged with managing and issuing leases for government-controlled waters in England, Northern Ireland, and Wales, as well as its Scottish counterpart.

The UK agencies in a June 2021 report recommended practices that government regulators and developers can exercise to minimize risks that installation of these technologies could pose.

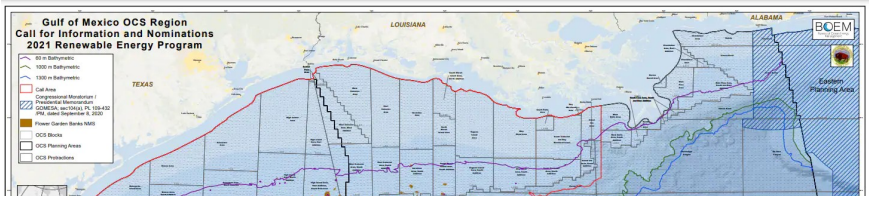
In addition to calling for an oversight body to oversee development and planning, the report called for immediate action to study the minimum allowable closest distance between the two sets of complementary technologies to avoid accidents and disruption of operations. It also identified the potential for corrosion of offshore wind equipment as a result of the displacement of brine through the injection of CO2 into saline aquifers in the seabed.

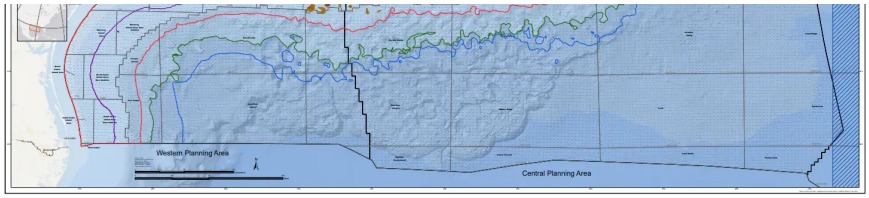
BOEM is authorized under the Outer Continental Shelf Lands Act of 1953 and subsequent amendments to issue not just oil and gas leases, but other energy extraction activities, such as offshore wind. Last November, the Infrastructure Investment and Jobs Act authorized BOEM for the first time to issue offshore CCS permits too in the OCS.

In October, Secretary of the Interior Deb Haaland promised to hold as many as seven lease sales before 2025 in the Gulf of Maine, New York Bight, Central Atlantic, and Gulf of Mexico, as well as off the coasts of the Carolinas, California, and Oregon.

At the start of the year, BOEM announced it would prepare an environmental assessment for potential offshore wind leasing that is due out this summer. This announcement followed BOEM's November call for information and nominations to initiate the commercial offshore wind process for the areas it had identified in an earlier notice.

The OCS extends from 3 nautical miles (3.45 miles) out to 200 nautical miles (230.16 miles) beyond states' jurisdictional waters, except in Texas and Florida where it begins at 9 nautical miles (10.36 miles).





Source: US Bureau of Ocean Energy Management

BOEM needs to plan

Energy analysts, engineers and attorneys familiar with the policies and regulations that underlie the deployment of these two clean energy technologies told *Net-Zero Business* Daily by S&P Global Commodity Insights they can co-exist in the Gulf of Mexico, but substantive planning on the part of BOEM would be required.

Susan Hovorka, a senior research scientist with University of Texas at Austin's Bureau of Economic Geology, is of the opinion that offshore wind and CCS can be co-designed because they deal with different parts of the same existing asset.

For instance, Hovorka said, an offshore wind turbine would be connected to the top of an existing oil and gas platform while the captured CO2 would be injected below the seabed.

BOEM has to plan and design for how it will factor not just offshore wind and CCS, but also other competing uses, such as oil and gas production, commercial shipping and fishing and tourism along with protection of marine species.

"When BOEM does environmental reviews, it looks at cumulative impacts of other uses to figure out how it will work. It may very well consider the impact of one use or activity on another as part of this review," James Auslander, a natural resources and environment attorney with Beveridge & Diamond law firm, said 6 May.

Offshore wind fueling hydrogen economy

The Department of Energy's National Renewable Energy Laboratory in 2020 estimated that offshore wind has the largest technical resource potential of 508 GW among all US offshore renewable resources, such as offshore solar, ocean currents, tidal, and wave energies. Across all Gulf of Mexico states, the NREL study said Texas and Louisiana show the highest overall technical offshore wind resource potential.

Although wind speeds in the Gulf of Mexico (7-8 m/s) are not as strong as those found in the North Sea (9-11 m/s) or even along the eastern seaboard of the US, the proximity to a workforce and an industry that has expertise in offshore activity has made the region viable, according to the study.

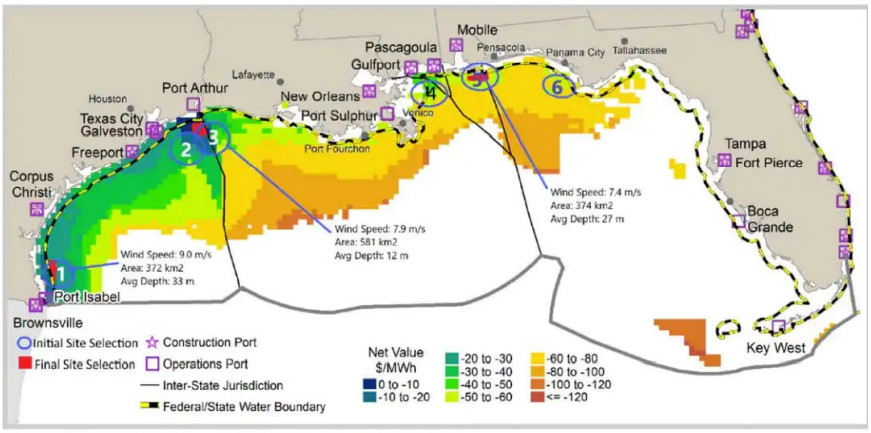


Figure 1. Estimated net value for Gulf of Mexico (2030 Commercial Operation Data)

Source: US Bureau of Ocean Energy Management

The NREL study also found that the Gulf's relatively weak wind speeds are compensated for by the shallow waters, which reduce the need for tall, expensive turbines, and its warm temperatures and smaller wave heights are expected to make construction and maintenance easier and less expensive than other offshore technologies.

However, the study pointed out that the challenge posed by frequent hurricanes in the Gulf cannot be overlooked.

In 6 December comments to BOEM's call for information on commercial offshore leasing, Shell said the Gulf of Mexico has "a unique opportunity" to tap into its decades of experience in offshore oil and gas operations, supply chain, coastal ports, and workforce to "lead the nation's buildout of an integrated renewable energy basin, with offshore wind as the primary offshore renewable energy generator."

Moreover, it added that the issuance of OCS renewable energy leases will provide the flexibility to test, and eventually scale, additional offshore technologies that could potentially include hydrogen, solar, and energy storage systems.

Shell said utility-scale offshore wind generation is needed to create a hydrogen economy and pathway to at least 10 GW of renewable energy in the Gulf region.

In another comment letter, Ørsted, the world's largest developer

of offshore wind, reminded BOEM that the potential for offshore wind development in the region is not limited to wholesale electricity generation, but can also present opportunities for green hydrogen.

ExxonMobil already has announced plans to set up a hydrogen production plant at its Baytown petrochemical facility in Texas. This plant also will be equipped with the ability to capture CO2 and transport it to a storage hub in the Gulf that it is planning with 13 other oil majors, petrochemical and chemical manufacturers, and utilities as part of a $100-billion carbon capture and storage hub.

CCS potential

Meantime, DOE is investigating the potential of the region for storing carbon for decades as another part of the US' GHG emissions strategy. DOE has estimated that the geology of the Gulf of Mexico could allow storage of as much as 500 billion metric tons (mt) of CO2—or more than 130 years' worth of total US carbon emissions, based on the country's tally in 2018.

The Gulf of Mexico has the potential to store "hundreds of gigatons of CO2," Tip Meckel, senior research scientist with the University of Texas at Austin's Bureau of Economic Geology, said at the 28 April congressional hearing.

As yet, there is no offshore CCS facility in the Gulf of Mexico, or in the US for that matter, though three projects have been announced.

As recently as 3 May, Chevron signed an agreement with oil exploration firm Talos Energy and Carbonvert, a CCS project financing company, to take a 50% stake in the Bayou Bend CCS project, which secured a lease from Texas as part of an effort to undertake CCS projects in state waters near the industrial corridor around Beaumont and Port Arthur. The lease spans around 40,000 acres and encompasses a formation that the National Ocean Industries Association said has the potential to store as much as 275 million mt of CO2.

Chevron's announcement follows one by ExxonMobil on forming the CCS hub in Texas waters. The industrial cluster's goal is to store 50 million mt each year from the area's petrochemical, manufacturing, and power generation facilities by 2030, and to double that to 100 million mt annually by 2040.

ExxonMobil in November bid on 94 shallow water plots in an auction of oil and gas leases in the Gulf of Mexico, which analysts from S&P Global say is an indication the company is making tangible investments in these reservoirs to achieve potential scale in CCS. However, the fate of those bids remains mired in litigation as a federal appeals court has put a hold on the results of the auction while it reviews a challenge by environmental groups.

Currently, only four offshore CCS projects are storing 6.3 million mt of CO2e annually worldwide, but about 20 projects representing a total carbon capture capacity of 68.4 million mt are in the pipeline, according to the Global CCUS tracker maintained by S&P Global.

Of the four operating CCS facilities, Petrobras in Brazil has been capturing 4.6 million mt since 2013, while oil major Equinor is behind two of them—Sleipner, which has been capturing 1 million mt a year since 1996; and the Snøhvit project that has been capturing 700,000 mt a year of CO2 from LNG production since 2008. Both Equinor projects are located off Norway's North Sea coast. Last August, China National Offshore Oil Corporation launched its first CCS project in the South China Sea, which will capture 300,000 mt of CO2 annually.

Equinor also is the principal developer behind the Northern Lights project off Norway's coast that is expected to begin operating in 2024.

"Projects in the North Sea represent 75% of the global offshore CCS capacity in advanced stages of development, with projects either in the financing and [Front-End Engineering Design] stages expected to be operational by the mid-2020s," said Paola Perez Pena, principal analyst with the climate and sustainability team with S&P Global.

The one thing BOEM wants to avoid is the type of conflict that BP and Ørsted find themselves embroiled in the North Sea, according to Andrei Utkin, principal research analyst for clean technology services with S&P Global.

The Danish renewable energy developer is seeking to attach the fixed-bottom turbines of its 2.6-GW Hornsea offshore wind project to seabed that overlaps with the Northern Endurance Partnership (NEP) CCS project in the North Sea off the UK coast. Ørsted argues the partnership is seeking protective provisions

that will not allow it to build in the overlap zone. The case is now before the UK Planning Inspectorate.

While the Gulf of Mexico is still at the announcement stage in terms of CCS projects, and even further away still when it comes to offshore wind, BOEM should start carefully planning now to avoid such conflicts, Utkin said.

Posted 10 May 2022 by Amena Saiyid, Senior Climate and Energy Research Analyst

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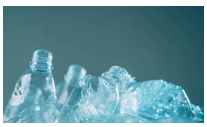

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