

The Promise of Floating Offshore Wind Power in the Gulf of Maine: New Developments and New Challenges

by Jack Shapiro

INTRODUCTION

Maine has set ambitious climate and clean energy goals in the past few years, requiring an economy-wide transition toward clean energy and away from fossil fuels. This transition includes displacing fossil fuel power generation in the New England grid, as well as electrifying major end uses of energy in heating our buildings and fueling our vehicles. This transition will require significant amounts of new renewable energy coming from new sources, including floating offshore wind in the Gulf of Maine.

Floating offshore wind, in addition to being a key element of the state and federal government's plans for mitigating climate change, represents a once-in-a-century economic opportunity for Maine. Because other eastern states are pursuing fixed-bottom offshore wind projects, by developing a floating offshore wind industry in the Gulf of Maine, Maine has the opportunity to be a first mover in this space on the Eastern Seaboard, and an early adopter globally, with major potential economic benefits.

Maine took an enormous step forward in 2023 by enacting LD 1895 (An Act Regarding the Procurement of Energy from Offshore Wind Resources), a new law supported by environmental groups, organized labor, and a key fishing industry group, setting a procurement framework to deploy 3 gigawatts of offshore wind by 2040. Challenges

remain, however, including the permitting and construction of necessary port infrastructure and transmission facilities, macroeconomic trends, and lengthy local, state, and federal permitting processes.

FLOATING OFFSHORE WIND IN THE GULF OF MAINE

The Gulf of Maine contains one of the world's best offshore wind resources (Musial 2018), with stronger and more consistent winds than nearly anywhere else in the world. Because of the deep waters in the Gulf of Maine, offshore wind development in the Gulf will use floating offshore wind turbines anchored to the ocean floor in deep water, rather than turbines constructed on foundations built directly on the seabed. Two-thirds of US offshore wind potential lies in waters with depths that require floating turbines (Lopez et al. 2022). As the offshore wind capacity necessary to meet our national and global climate goals is built, demand for floating offshore wind technology will outstrip that for fixed-bottom technology. States that built the first facilities designed for floating offshore wind turbine production and develop technologies that can reach economies of scale first will receive significant economic benefits.

Offshore wind has several other advantages as a renewable energy source. New England's reliance on natural gas generation has contributed to significant

price volatility for Maine ratepayers. Gas price volatility resulted in an 83 percent supply rate increase in 2022 (Terkel 2021), and a 49 percent supply rate increase in 2023 (Carpenter 2022). In contrast, offshore wind will contribute to price stability. A 2023 study found that "Long-term renewable contracts, which lock in steady prices for decades at a time, provide benefits that offer less price volatility and lower electricity market prices" as well as provide a hedge against volatile natural gas prices (Pullaro 2023: 4). Other studies confirm that large-scale wind development will have beneficial impacts on wholesale power market prices: "offshore wind power could help lower wholesale electricity prices on average for six states in New England" by reducing the severity of price spikes during modeled cold snaps when demand is high (Akdemir et al. 2022).

Offshore wind is likely to bring other energy system benefits as well. Offshore wind complements solar because it peaks at night and in the winter, whereas solar peaks during the day and in the summer (Musial et al. 2023). Moments of peak demand ultimately drive electricity costs. Thus, a more diverse renewable energy portfolio can require less infrastructure and energy storage investments to meet system peaks as Maine and the New England grid transition to renewable energy, lowering the overall costs of the energy transition.

MAINE POLICY CONTEXT

Maine has set ambitious climate and clean energy goals, including reducing gross greenhouse gas emissions by 45 percent by 2030, 80 percent by 2050, and achieving net zero emissions by 2045 (38 MRSA § 576-A). In 2019,

the legislature created the Maine Climate Council, which developed a comprehensive climate action plan, *Maine Won't Wait*, in December 2020. The climate action plan is wide ranging, but its overarching strategy has two main components. The first element is to transition the primary end-uses of fossil fuels to electricity, including replacing heating oil, propane, and gas with high-efficiency electric heat pumps, and increasing the use of zero-emission vehicles. The second element is increasing the deployment of renewable energy to displace existing fossil fuel generation, including solar, onshore wind, and offshore wind, and to serve the new electricity demand that will be required to electrify homes, businesses, and transportation (Maine Climate Council 2020).

Maine has been considering offshore wind development for more than a decade, particularly through the work done by the University of Maine's Advanced Structures and Composites Center. In 2013, the first grid-connected floating offshore wind turbine in the United States, a 1:8 scale model using the University's VoltturnUS floating platform design, was installed off Castine (Dagher et al. 2017). More recently, the University of Maine, along with commercial partners, has been pursuing a single-turbine demonstration project south of Monhegan Island.¹

Governor Janet Mills launched the Maine Offshore Wind Initiative in June 2019 to ensure Maine realizes the potential of offshore wind for economic development and jobs, infrastructure investments, and climate and clean energy benefits. The initiative takes into account Maine's history, environment, and cultural context aiming to "balance this industry development with our state's maritime heritage and existing marine uses to ensure sustainable preservation of the natural

resources in the Gulf of Maine."² The initiative, led by the Governor's Energy Office, includes efforts to construct a twelve-turbine research array using the University of Maine's floating platform design, an offshore wind research consortium to develop a research agenda covering wildlife, the environment, fisheries, and other interactions with the ocean environment and users, as well as state engagement with the federal siting process led by the Bureau of Ocean Energy Management (BOEM), among other. Work is also underway to evaluate potential sites for an offshore wind port, crucial to garnering the economic benefits that will come with offshore wind development in the Gulf of Maine.³

A critical piece of offshore wind policy development conducted under the Maine Offshore Wind Initiative has been the Maine Offshore Wind Roadmap, published in February 2023. The roadmap process launched in July 2021 and included nearly 100 working group members, more than 50 meetings, and multiple technical analyses, covering transmission, energy needs, supply chain and workforce issues, socioeconomic analyses, and more. Among the top recommendations from the roadmap was to: "Establish a responsible [offshore wind] procurement target and phased solicitation addressing a meaningful percentage of Maine's electricity needs" (GEO 2023: 12).

FEDERAL POLICY CONTEXT

The central strategic thrust of Maine's climate action plan predates but tracks with developments in federal policy in the past few years. The federal Bipartisan Infrastructure Law, and the Inflation Reduction Act contain multiple provisions and incentives for vehicle electrification, grid infrastructure, home

electrification, and renewable energy. Specific to offshore wind, the Inflation Reduction Act extended federal renewable energy tax credits by a decade.

In 2021, the Biden administration set a goal to deploy 30 gigawatts of offshore wind in federal waters by 2030, including the Gulf of Maine (The White House 2021). The same year, BOEM announced a timeline to designate areas for wind energy in the Gulf by mid-2023 and enter lease sales for those areas by mid-2024 (Department of Interior 2021). In 2022, the Biden administration announced an effort aimed at reducing floating offshore wind costs by more than 70 percent by 2035 to \$45 per megawatt-hour (The White House 2022).

In the Gulf of Maine, the federal leasing process for commercial wind development is underway. BOEM prepares for a commercial offshore wind lease sale by releasing and gathering public feedback through a lengthy multistep process intended to identify the areas with the least amount of conflict and the most commercial interest and potential. In the Gulf of Maine, BOEM first released a "Planning Area" in May 2022, followed by a "Request for Interest" in August 2022. BOEM then published a draft "Call for Information and Nominations," commonly known as a "Call Area," with a final Call Area published in April 2023. The next steps will include draft and then final "Wind Energy Areas" within which individual leases will eventually be offered for sale.⁴

RECENT POLICY DEVELOPMENTS

In July 2023, Governor Mills signed into law LD 1895 (An Act Regarding the Procurement of Energy from Offshore Wind Resources), an offshore wind procurement bill introduced

by Sen. Mark Lawrence, the chair of Maine's Energy, Utilities and Technology Committee, along with a coalition of labor and environmental groups including the Natural Resources Council of Maine (Office of Governor 2023). The new law builds on many recommendations in Maine's Offshore Wind Roadmap, including setting a procurement schedule that would result in 3 gigawatts of offshore wind installed by 2040. Three gigawatts of offshore wind is roughly equivalent to half of Maine's electricity load by 2040, taking into account growth in electricity demand from electrifying heating and transportation in Maine over that time. The law includes dedicated environmental and wildlife mitigation and research funding, encourages regional collaboration in procurements and in transmission development, and removes permitting barriers to offshore wind port construction. It also applies strong labor and workforce standards to offshore wind project and offshore wind port construction and includes crucial incentives for projects to be sited outside of Lobster Management Area 1, Maine's most important lobster fishing area (P.L. 2023, ch. 481).

LD 1895 charges the Governor's Energy Office with developing an request for proposals (RFP) through a public process in 2025, after the expected BOEM commercial offshore wind lease sale occurs, that will specify requirements for bidders around stakeholder engagement, economic and community benefits, diversity, equity, and inclusion, fisheries and environmental research, monitoring, and mitigation, investment in fishing communities, and to meet specific workforce requirements. The Maine Public Utilities Commission will issue the RFP in early 2026 and will evaluate bids first based on cost-effectiveness for ratepayers, then prioritizing projects based on a number of

criteria related to siting, economic development, community benefits, employment, among others.

A top recommendation from the Maine Offshore Wind Roadmap Fisheries Working Group, and emphasized by the Maine Lobstering Union, the fishing group supporting the bill, was to site offshore wind projects outside of federal Lobster Management Area 1 (LMA1). As the recommendations point out, the

Scale of fishing effort inside this boundary, largely due to lobster fishery, is significantly greater than what is seen elsewhere on eastern seaboard. Maine has approximately 1,260 federal lobster permit holders operating inside this line, who make approximately 260,000 trips annually. All other federal permits combined (including vessels from Maine to North Carolina) operating in Gulf of Maine (inside and outside of this line) total 929 permits making 42,000 trips annually. (FWG 2022: 11)

Avoiding conflict with this heavily fished zone in the Gulf of Maine as LD 1895 creates incentives, could have significant benefits in reducing conflict with Maine's iconic and economically important fishing industry and could in turn have benefits in facilitating the permitting, surveying, and construction work that is necessary to bring commercial-scale offshore wind development to fruition in the Gulf of Maine.

CHALLENGES AND OPPORTUNITIES

The year 2023 will undoubtedly mark a watershed in the development of floating offshore wind in the Gulf of Maine, with the release of the Offshore Wind Roadmap, the passage of LD 1895, and definitive steps by the federal government towards commercial leasing. However, many years and many hurdles

remain before commercial scale floating offshore wind projects are generating renewable energy for Maine.

Ports

Building a port designed for the construction of floating offshore wind platforms and turbines is an essential ingredient in the timely and successful development of these projects. Unlike fixed-bottom turbines, which are constructed at sea, floating offshore wind turbines are constructed in port, and towed to their final location. So floating offshore wind ports have specific requirements, including large areas to stage components, access to deep water to float platforms, tall cranes to erect towers and install nacelles (outer casing) and blades, and open access to the sea to tow turbines. The Maine Department of Transportation (MDOT) has been leading an effort to identify a suitable site for port development that fits all of the necessary criteria, evaluating a site in Eastport, and three options in Searsport. If a port proposal is not selected and permitted, projects may not be able to be built.

Much of the economic activity and benefits from offshore wind flows through a future port in Maine. A report prepared as part of Maine's offshore wind roadmap process found that developing the first 1,600 megawatts of offshore wind in Maine would generate between \$114 and \$362 million in economic activity from construction and \$36 to \$133 million in economic activity every year from ongoing operations and maintenance. According to the same report, Maine could experience up to 33,000 short-term and 13,000 long-term jobs from the offshore wind build out (DNV 2022).⁵ The roadmap also found that 80 Maine companies are already engaging in the U.S.'s offshore wind industry, and that "[w]orkforce opportunities in offshore

wind cover nearly 120 occupations in Maine, such as engineering, electricians, metalworkers, marine operations, surveying, boat building and maintenance, and research and development” (Office of the Governor 2023). If a port is not built, most of this economic activity will flow elsewhere.

Regional Collaboration

Joint procurement and other forms of regional collaboration, for example, on transmission development, can speed development and lower costs for rate-payers. Maine’s near-term electricity demand remains small, and it is possible that in early rounds of procurement, Maine may collaborate with Massachusetts to purchase portions of one initial project to lower costs for both states. Recent analysis shows that shared regional offshore grid infrastructure can significantly lower costs and impacts associated with transmission development, with one study finding that proactive offshore transmission planning could save \$20 billion and result in 60 percent to 70 percent fewer shore crossings (Pfeifenberger et al. 2023).

Siting

Locating offshore wind development outside of LMA1 could be extremely important to achieving public acceptance and in reducing legal, political, and other risks to bringing projects online. Despite the preferences expressed in Maine’s Offshore Wind Roadmap and incentives included in LD 1895, Maine policy-makers have limited ability to determine siting, as siting decisions are under federal authority and also influenced by other Gulf of Maine states. BOEM’s ultimate siting decisions will have significant ramifications for the long-term prospects of individual projects and the overall enterprise of offshore wind development in the Gulf of Maine.

CONCLUSION

Many years of effort have gone into offshore wind innovation and policy development in Maine, and many challenges remain before there is commercial scale “steel in the water” off of Maine’s coast. However, in the past two years, major steps taken by the legislature, offshore wind advocates, and the Mills Administration, and through supportive federal legislation and focused effort from the Biden Administration, Maine is closer to realizing the promise of a new offshore wind industry that helps achieve its climate and clean energy goals, while respecting the voices of existing ocean users, protecting the environment, wildlife, and ecosystem in the Gulf of Maine, building on Maine’s maritime heritage, and ensuring that the economic benefits of this new industry are shared widely.

NOTES

- 1 <https://www.energy.gov/nepa/ea-2049-university-maines-new-england-aqua-ventus-i-offshore-wind-advanced-technology>
- 2 <https://www.maine.gov/energy/initiatives/offshorewind>
- 3 <https://www.maine.gov/mdot/ofps/oswpag/>
- 4 <https://www.boem.gov/renewable-energy/state-activities/maine/gulf-maine>
- 5 This is the full jobs impact including direct manufacturing and installation jobs. It also includes indirect jobs in the supply chain and induced jobs created from investment and economic activity, i.e., “Installation, manufacturing, and supply chain jobs are those needed to directly construct or operate the wind turbines, such as on-site construction crews, equipment manufacturers, consultative services and design firms, security crews, and maintenance personnel. This category also includes indirect jobs such as legal services, natural resource suppliers, construction equipment suppliers, accounting services, and wholesalers. Induced jobs are the additional jobs created in the economy by the spending of the people with manufacturing

and supply chain jobs. These include jobs from retailers, restaurants, health care providers, food providers, and housing markets” (DNV 2022: 6).

REFERENCES

- Akdemir, Kerem Ziya, Jordan D. Kern, and Jonathan Lamontagne. 2022. “Assessing Risks for New England’s Wholesale Electricity Market from Wind Power Losses during Extreme Winter Storms.” *Energy Volume* 251. <https://doi.org/10.1016/j.energy.2022.123886>.
- Carpenter, Murray. 2022. “CMP Customers Will See Rate Hikes Next Year.” *Maine Public*, November 16, 2022. <https://www.maine-public.org/business-and-economy/2022-11-16/cmp-customers-will-see-rate-hikes-next-year>.
- Dagher, Habib, Anthony Viselli, Andrew Goupee, Richard Kimball, and Christopher Allen. 2017. *The VoltumUS 1:8 Floating Wind Turbine: Design, Construction, Deployment, Testing, Retrieval, and Inspection of the First Grid-Connected Offshore Wind Turbine in US*. <https://doi.org/10.2172/1375022>.
- DNV. 2022. *Socioeconomic Analysis of Offshore Wind in the Gulf of Maine*. <https://www.maineoffshorewind.org/technical-studies/>.
- FWG (Fisheries Working Group). 2022. “Fisheries Working Group Recommendations.” Submitted to Maine Offshore Wind Roadmap Advisory Committee. <https://www.maineoffshorewind.org/working-group-recommendations/>.
- GEO (Governor’s Energy Office). 2023. *Maine Offshore Wind Roadmap*. Augusta, ME: GEO. <https://www.maine.gov/energy/initiatives/offshorewind/roadmap>.
- Lopez, Anthony, Rebecca Green, Travis Williams, Eric Lantz, Grant Buster, and Billy Roberts. 2022. *Offshore Wind Energy Technical Potential for the Contiguous United States*. <https://www.nrel.gov/docs/fy22osti/83650.pdf>.
- Maine Climate Council. 2020. *Maine Won’t Wait: A Four-Year Plan For Climate Action*. <https://www.maine.gov/climateplan/the-plan>.
- Musial, Walter. 2018. *Offshore Wind Resource, Cost, and Economic Potential in the State of Maine*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-70907. <https://doi.org/10.2172/1421598>.

Musial, Walt, Suzanne MacDonald, Rebecca Fuchs, Gabriel R. Zuckerman, Scott Carron, Matt Hall, Daniel Mulas Hernando, Sriharan Sathish, and Kyle Fan. 2023. *Considerations for Floating Wind Energy Develop in the Gulf of Maine*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-86550. <https://www.nrel.gov/docs/fy23osti/86550.pdf>.

Office of Governor Janet T. Mills. 2023. "Governor Mills Signs Bill to Create Jobs, Advance Clean Energy and Fight Climate Change Through Responsible Offshore Wind." Press release, July 27, 2023. <https://www.maine.gov/governor/mills/news/governor-mills-signs-bill-create-jobs-advance-clean-energy-and-fight-climate-change-through>.

Pfeifenberger, Johannes P., Joe DeLosa III, Linquan Bai, Cornelis Plet (DNV), Carson Peacock, Ryan Nelson. 2023. *The Benefit and Urgency of Planned Offshore Transmission: Reducing the Costs of and Barriers to Achieving U.S. Clean Energy Goals*. Brattle Group. <https://cleanpower.org/resources/the-benefit-and-urgency-of-planned-offshore-transmission/>.

Pullaro, Francis. 2023. Benefits of Wind Energy for New England. *RENEW Northeast*. <https://renewne.org/the-value-of-wind-in-winter/>.

Terkel, Tux. 2021. "Costly Electricity Supply Will Add \$30 to Average Home's Monthly CMP Bill in 2022." *Portland Press Herald*, November 18, 2021.

US DOI (Department of Interior). 2021. "Secretary Haaland Outlines Ambitious Offshore Wind Leasing Strategy." Press release, October 13, 2021. <https://www.doi.gov/pressreleases/secretary-haaland-outlines-ambitious-offshore-wind-leasing-strategy>.

The White House. 2021. "Fact Sheet: Biden Administration Jumpstarts Offshore Wind Energy Projects to Create Jobs." Statement release, March 29, 2021. <https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/>.

The White House. 2022. "Fact Sheet: Biden-Harris Administration Announces New Actions to Expand U.S. Offshore Wind Energy." Statement release, September 15, 2022. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-actions-to-expand-u-s-offshore-wind-energy/>.

Jack Shapiro is the Climate and Clean Energy Program director at the Natural Resources Council of Maine (NRCM). He has led NRCM's climate and clean energy work since 2021, including the passage of Maine's landmark offshore wind bill in 2023. He joined NRCM following over a decade of work at the federal level advocating for ambitious policies to address climate change, and serving in federal government.