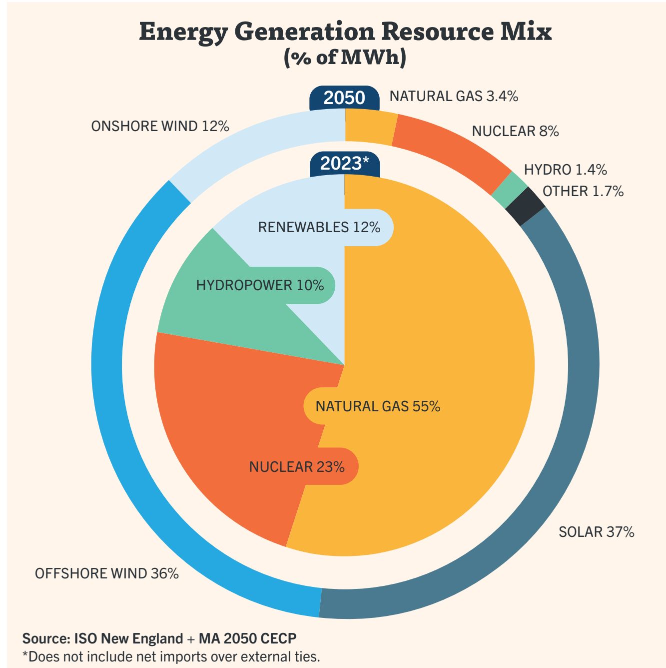
ACADIA CENTER EXPLAINS

Offshore Wind

Summary and Recommendations - Fall 2024

WHAT IS OFFSHORE WIND?

Offshore wind refers to the process of generating electricity through large wind turbines located offshore, typically in ocean waters. Just as with onshore wind, electricity is generated by capturing the force of the wind with the long blades of a wind turbine generator, which spin a rotor within the hub (or "nacelle") of the turbine. That rotation is transferred to a drive shaft that turns magnets inside a coil of wire, which produces electrical energy. This energy is transmitted to the broader power grid via subsea transmission cables. Offshore wind is one of the most cost-effective, large-scale, emissions-free sources of power, with an especially strong technical potential off the coast of the Northeast U.S. and Canada.



Offshore wind is distinct from onshore wind power in several important respects. Onshore wind power is limited by traditional land-use restrictions and suitability criteria. The average onshore wind turbine is about 340 feet tall (hub height) and requires notable available land for siting. While this can work out reasonably well in states with large amounts of empty or compatible agricultural land, like Texas or Iowa, or elevated topographies like New York and Maine, it is much more challenging for states with limited open land, like Massachusetts or Connecticut. Thus, offshore wind, taking advantage of the large amount of available open ocean, becomes an attractive option for many coastal states, especially with the shallower waters off the coast of the load centers in Southern New England and New York – and with emerging technology options for floating offshore wind in deeper waters. Offshore siting also comes with additional advantages, as the more open nature of the ocean allows for the installation of larger turbines with greater capacity, and the wind resources offshore are generally stronger and more consistent – leading to greater production levels and capacity factors than onshore wind.

Offshore wind is an incredibly advantageous energy source for decarbonization because it can displace traditional large-scale fossil fuel resources that have traditionally provided large amounts of power to the grid, like fossil gas plants. Unlike fossil fuels, which require large-scale investment in extraction and infrastructure such as pipelines and wells, and which also require purchasing of globally traded commodities that can fluctuate wildly in cost, offshore wind contracts are fixed and allow for stable and predictable prices. Because the "fuel" (the wind) is free, offshore wind can help provide a key price hedge to guard against volatility in energy prices, especially during winter periods – and the significant up-front costs for construction can be spread out over 20+ year contract terms.

WHAT PERCENTAGE OF REGIONAL ENERGY SUPPLY COMES FROM OFFSHORE WIND? AND HOW MUCH IS PROJECTED BY 2050?

Currently? Not so much. At the moment, the region's power operator, ISO-NE, is receiving offshore wind power from two sources, the 30 megawatt (MW) Block Island Wind Farm and some level of power from the partially completed 800 MW Vineyard Wind project. Those figures pale in comparison to our expected need. Five prominent studies modeled the amount of power the region will need by 2050 to meet its climate goals: the lowest projected figure from those studies is 21,900 MW (21.9 GW) of offshore wind, and the average across all studies is 35.9 GW. The region has a lot of ground to make up to meet these ambitious targets, but thankfully, recent procurement announcements are helping close that gap.

HOW DOES TRANSMISSION FOR OFFSHORE WIND WORK?

Every offshore wind project needs a way to bring the power that it generates to the grid and to customers onshore. That is where transmission comes in: offshore wind projects rely on subsea transmission cables buried on the ocean floor, which make landfall on shore and interconnect into the regional grid at substations/converter stations. To date, all of the projects procured in the U.S. have relied on direct "radial" lines that connect a single project directly to shore, and this remains true for the three projects awarded earlier this month (see table below). In the future, an optimized offshore transmission build-out will likely include a combination of direct lines, collector stations, offshore substations, and even multi-project transmission backbones or mesh networks that integrate the generation from many offshore wind projects, in a manner that reduces costs, construction times, and environmental impacts.

PROJECT NAME	DEVELOPER	STATE(S) PROCURING CAPACITY	PROPOSED TRANSMISSION DETAILS
New England Wind 1	Avangrid	Massachusetts: 791/791 MW	**Offshore cables:** Two 275 kV HVAC offshore export lines, approved in 2023 by regulators. All cables in their own consolidated corridor, five total cables when you add New England Wind 2 project as well. Offshore cables route to a landfall site beneath the parking lot of Craigville Beach, Barnstable, MA. **POI:** West Barnstable substation, at the edge of 345 kV system. And new sub-station site planned too (TBD, also in Barnstable on Shootflying Hill Road) to step up voltage from 275 kV to 345kV to interconnect at West Barnstable.
Vineyard Wind 2	Vineyard Offshore (Copenhagen Infra-structure Partners)	Massachusetts: 800/1200 MW TBD – Connecticut: 400/1200 MW	**Transmission system, including offshore and onshore export cable routes:** TBD (not public information yet) **POI:** Montville, CT, at 345 kV Substation
South Coast Wind	EDP and Engie	Massachusetts: 1,087/2,400 MW Rhode Island: 200/2,400 MW	**Transmission System Information:** Export cables (320 kV) to be converted from HVDC to 345 kV HVAC at converter station in Somerset, MA (Brayton Point), then routed to substation. Export route cable will go up the Sakonnet River; onshore crossing of Aquidneck Island as well. **POI:** Brayton Point 345-kV substation in Somerset, MA.

WHAT CHALLENGES DOES OFFSHORE WIND FACE?

As with the development of any energy resource, the development of offshore wind faces a number of challenges and barriers. Initial pricing on offshore wind procurements in the United States was relatively low and more or less cost-competitive with fossil fuels. However, a number of factors have arisen that have since raised costs, including global inflation, higher interest rates in the United States, global supply chain issues, and other financial and energy market impacts from the Russian war against Ukraine. Rhode Island and Massachusetts recently awarded new procurement capacity to offshore wind developers, and the prices for those contracts will become available later in the fall or winter. These factors have generally affected the development of large-scale energy resources across the board, including the oil and gas industry.

In addition to pricing issues, there have also been some issues with project siting. The fishing industry has voiced concerns regarding whether offshore wind farms may disrupt their traditional fishing routes and fishing grounds. These concerns have been mitigated in some instances with agreements between developers and/or states and industry groups. Further, some coastal communities have raised concerns over the projects, driven by both aesthetic objections and concerns about where their transmission cables have been proposed to make landfall. In some cases, these objections have been addressed through mechanisms like community benefit agreements and alterations to proposed routes.

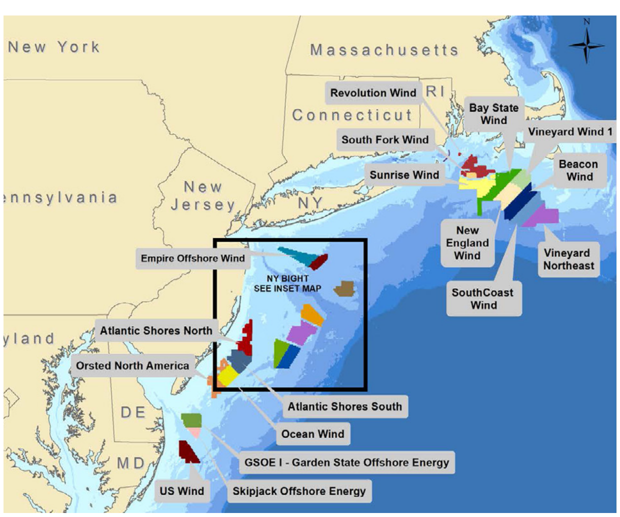
Finally, certain bad actors, many fronted by incumbent fossil fuel interests, have sought to take advantage of the newness of offshore wind and spread disinformation. For example, some groups have tried to promote the baseless claim that offshore wind farms and development harm whales – an assertion for which there is no evidence. In fact, whales are threatened in the near term by vessel strikes, including from the heavy maritime shipment of fossil fuels, and the greatest long-term threat to whales is of course impacts from unmitigated climate change.

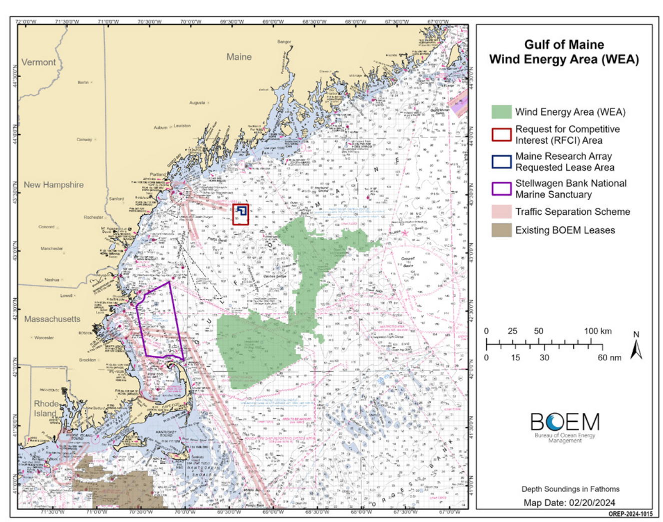
WHERE ARE OFFSHORE WIND PROJECTS AND PROCUREMENTS CURRENTLY HAPPENING? WHERE DO THEY NEED TO HAPPEN?

On September 6th, Massachusetts and Rhode Island announced the joint procurement of 2,878 MW of offshore wind. Specifically, Massachusetts selected the full New England Wind 1 project (791 MW) and did a partial procurement of the Vineyard Wind 2 project (800 MW/1,200 MW), as well as the majority of the interstate SouthCoast Wind project (1,087 MW/1,287 MW) – the remaining 200 MW of which was procured by Rhode Island. This is an important step in the right direction to get the region's industry back on track, and this was the first jointly announced multi-state offshore wind procurement. Massachusetts' commitments are promised to power 1.4 million homes, making up 20% of energy demand in the state today. However, it is notable that Massachusetts, Rhode Island, and Connecticut accepted less than their original total appetite for bids, which initially signaled a willingness to purchase up to 6,800 MW.

As stated above, Rhode Island joined Massachusetts in procuring new offshore wind capacity in the most recent New England RFP, picking up 200 MW of capacity from SouthCoast Wind. Rhode Island's purchase will help ensure that the region's four offshore wind ports, including its own at the Port of Providence, will have designated project capacity through at least 2032.

Despite being part of the joint tri-state procurement, Connecticut has (as of September 17, 2024) not yet elected to join Massachusetts and Rhode Island in procuring capacity. Their decision on the procurement is delayed and is indicated to be hinging on the potential procurement of the remaining 400 MW portion of the Vineyard Wind 2 project. It is unclear if Connecticut will proceed with this procurement in the near future, but Massachusetts Governor Maura Healey did indicate hope that Connecticut would join forces with her state's decision. In 2019, Connecticut authorized the procurement of up to 2,000 MW of offshore wind energy by 2030, equivalent to 30% of the state load and the largest authorization of any state in the region at the time. The Connecticut Department of Energy and Environmental Protection (DEEP) estimated an additional 3,745 to 5,710 MW of offshore wind would be needed to meet the state's 2040 zero carbon goals. With $389M in federal funding recently awarded through the Grid Innovation Program to support Power Up New England, Connecticut is now able to upgrade a key point of interconnection in Southeast Connecticut to ready the transmission system for up to 4,800 MW of additional offshore wind. But more decisive and ambitious procurements are now needed to take advantage of that vital federal funding support.





While not quite as mature of a market as southern New England states, Maine is poised to harness one of the world's greatest resources of wind, the Gulf of Maine. Acadia Center and other Maine nonprofits helped pass new laws that have already begun a robust process to install offshore wind turbines in the Gulf of Maine. Fully developed, the Gulf of Maine wind energy area could provide 32 GW of clean energy, significantly advancing Maine's goal of 100% clean power by 2040 and the region's broader goals (see map above).

Offshore wind development in North America is not limited to the lease areas off the coast of New England, and in fact is happening not only up and down the Atlantic Coast but also off the Pacific Coast and in the Gulf of Mexico. Development activities in New York, New Jersey, Delaware, and Maryland will be especially important for the New England States in terms of coordinated transmission planning.

HOW IS OFFSHORE WIND PROCURED?

In the Northeast, offshore wind procurements are a heavily state-driven process. To begin, after legislation is enacted to authorize offshore wind procurements, states or their utilities issue a 'request for proposals' (RFP) soliciting bids for offshore wind generation. These RFPs outline the elements to be procured (typically: energy and Renewable Energy Credits, or RECs) and the amount of power that can be purchased (in MW or MWh). The RFPs officially launch the process for developers to assemble and submit their bids, oftentimes with multiple project configurations. State agencies and/or utilities then evaluate these proposals – which are hundreds of pages long and immensely detailed – and ultimately identify their award decisions for projects to enter into long-term contracts, which are key for projects to secure financing. The RFP process includes not only pricing/cost information but a variety of policy elements as well, with the level of flexibility determined by the state. For instance, in Massachusetts' RFP process, they allowed developers to incorporate tax incentives, grants for transmission upgrades, and equity considerations to support low-income ratepayers in their proposals. These policy provisions ensure RFPs don't just consider the costs of a project, but other factors as well.

At the federal level, prior to all of the state-level activity mentioned above, the Bureau of Ocean Management (BOEM) controls offshore renewable energy development leasing in ocean waters. States typically do not bid in the auctions that BOEM conducts, where BOEM auctions off massive lease areas of federal waters. Developers, instead, are primarily the entities involved in bidding for the rights to develop these lease areas. As such: developers bid in BOEM auctions and propose and plan projects; states release their RFPs; developers apply to the RFP; and states select projects to enter into long-term contracts. There are many, many other steps included along the way, including with respect to federal and state permitting.

WHAT DOES ACADIA CENTER RECOMMEND FOR OFFSHORE WIND AND ITS PROCUREMENT?

It is a pivotal time for coordinated, non-siloed offshore wind and transmission planning to happen in the Northeast. State procurements must continue apace to drive more capacity additions for the 2030s and beyond, with enhanced contractual provisions to provide flexibility around market conditions like inflation and future-proof investments for transmission compatibility/interoperability. On the transmission side, with FERC Order 1920 compliance starting soon, and ISO-NE's Long Term Transmission Plan (LTTP) Phase II changes approved by FERC, it will be crucial to optimize transmission planning to integrate offshore wind development cost-effectively and ensure the best return on ratepayer investments. ISO-NE's 2050 Transmission study did reference offshore wind in its solution roadmaps, including one recommended interconnection point – in Brayton Point, MA – that was incorporated in one of the three recent winning bids. Multi-state and regional collaboratives like the Northeast States Collaborative on Interregional Transmission present key forums to develop the right frameworks needed to reach state goals in New England and beyond, and the recent MA-RI-CT procurement also is a step in the right direction and a model for multistate collaboration. Finally, over the long-term, the region should think about its immense offshore wind resources in the broader macro-regional context, with the potential to send power bidirectionally, both west and north, and operate in synergy with clean power sources in eastern Canada, New York, and beyond.

For more information:

Bridging the Gap: New England's transmission planning and Order 1920
Acadia Center Explains: Clean Energy Standards
Observations and Takeaways from the Vineyard Wind Blade Incident

acadiacenter.org • info@acadiacenter.org
Acadia Center, PO Box 583, Rockport, ME 04856-0583

Acadia Center

Boston, MA 617-742-0054 • **Hartford, CT** 860-246-7121 • **New York, NY** 212-256-1535 • **Providence, RI** 401-276-0600 • **Rockport, ME** 207-236-6470