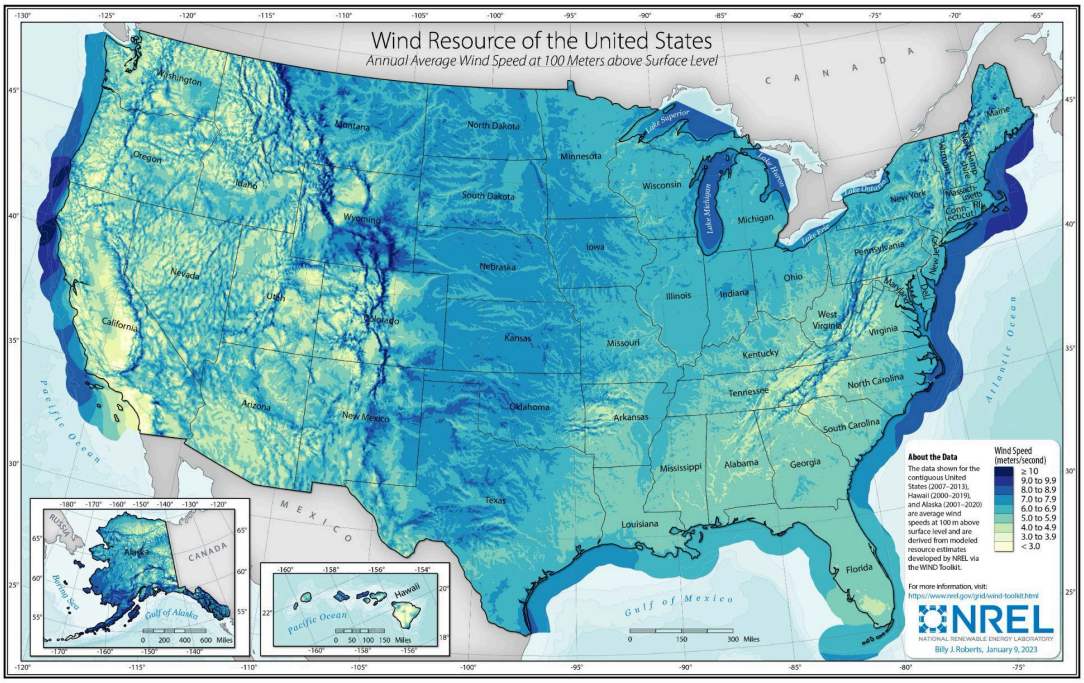
Introduction to Wind Energy

The U.S. produced over 400 billion kilowatt-hours of electricity from wind energy in 2022, equating to more than 10% of the nation's utility-scale electricity generation[1]. The generation of energy by wind turbines that we know today is based on longstanding technologies. Humans have used wind power for thousands of years as a means of energy, such as through traditional windmills[2]. Modern wind turbines continue to advance in design and capacity to maximize the efficiency of wind farms, which has led to an increase in wind electricity generation in recent decades.

Offshore wind energy (OWE) refers to the capturing of wind energy by turbines over a body of water, such as an ocean where winds are generally stronger and less turbulent than over land[3]. OWE is a global industry that is relatively novel to the U.S., despite land-based wind farms existing across the U.S. for decades. Coastal regions of the mid-Atlantic U.S. have been identified as potential areas for OWE development, with some projects already operating or being constructed. Delaware's role in OWE may vary depending on state and local involvement with projects off our coast.



Description: A map of annual average wind speeds at 100 meters above surface level in the U.S. Darker areas indicate higher wind speeds, while lighter areas indicate lower wind speeds. The dark regions of the mid- and northern-Atlantic coastlines demonstrate the suitable conditions for offshore wind energy development.
Source: National Renewable Energy Laboratory

[1] Electricity generation from wind - U.S. Energy Information Administration (EIA)
[2] History of wind power - U.S. Energy Information Administration (EIA)
[3] Wind Resource Maps and Data | Geospatial Data Science | NREL

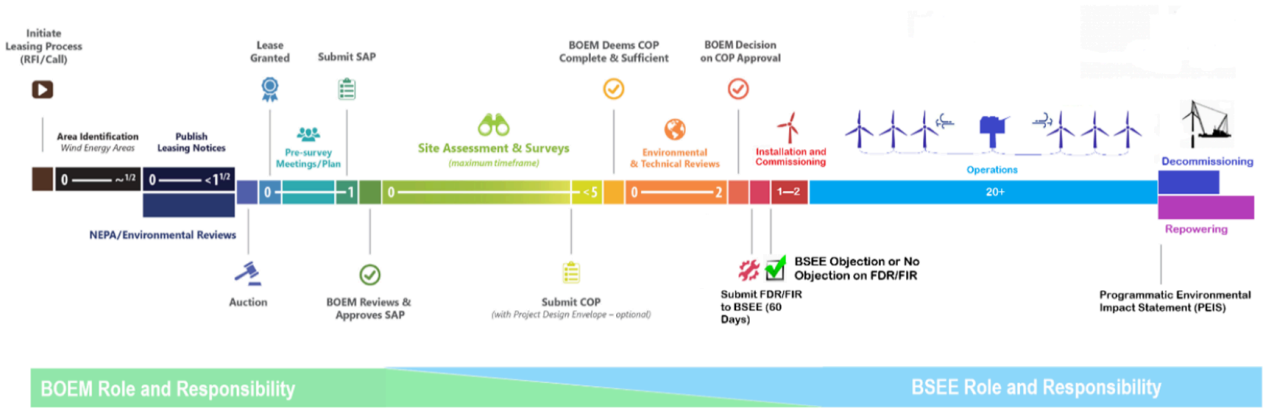
The goal of Delaware Sea Grant is to provide objective information from the best-available science. Learn more about offshore wind energy by navigating through the topics below and through the Additional Resources section.

Table of Contents/Overview

Offshore Wind in the U.S.

In the U.S., commercial offshore wind energy (OWE) projects are leased and permitted by a federal agency, the Bureau of Ocean Energy Management (BOEM). These projects are built in federal waters, which includes waters from 3 nautical miles (0-3 nm is state jurisdiction) to 200 nautical miles off of a state's shoreline. Private wind development companies obtain leases by paying an initial purchase amount and annual rent for an offshore wind area pre-determined by BOEM. Lease sales occur competitively through auction, or non-competitively if only one developer expresses interest in a lease area. There are also limited wind energy areas permitted for research purposes which do not produce commercial-scale energy.

When a lease area is finalized and sold to a developer, it cannot be moved. Purchasing a lease does not guarantee that a developer will be able to build a project in the lease area because the project must undergo review and collaboration with various entities throughout the planning process. It is possible that a resource user conflict not previously identified could prevent the lease area, or a portion of the lease area, from being developed. The process of scoping, siting, leasing, construction, and commissioning of a project typically takes up to ten years due to the extensive technical, environmental, and economic processes required.



The federal processes for developing offshore wind energy projects.
Image: [Bureau of Safety and Environmental Enforcement]

BOEM

The federal agency tasked with responsibly managing and developing resources on the outer continental shelf is the Bureau of Ocean Energy Management (BOEM) within the U.S. Department of the Interior. BOEM oversees the planning and leasing process through the approval of a project's Constructions and Operations Plan ("COP").

BSEE

The U.S. Bureau of Safety and Environmental Enforcement (BSEE) oversees the installation, operations, and decommissioning portions of a project. BSEE takes over responsibility of a project from BOEM after BOEM approves a project's Constructions and Operations Plan ("COP").

Why is the federal government responsible for permitting offshore wind?

The **Outer Continental Shelf Lands Act (OCSLA)**[4] was enacted by Congress in 1953 and it affirms the federal government's control over the Outer Continental Shelf (OCS). The OCS consists of all submerged lands from a state's jurisdiction to the extent of U.S. jurisdiction (200 nautical miles). The **Energy Policy Act of 2005**[5] provides BOEM the authority to lease and manage renewable energy activities on the OCS. States have jurisdiction over submerged lands from their coastlines to 3 nautical miles into the ocean through the **Submerged Lands Act of 1953**[6].

What other federal laws are involved in offshore resource management?

BOEM is required to assess a proposed offshore wind project's compliance with other federal laws and regulations. These include the **Clean Air Act (1970)**, the **Coastal Zone Management Act (1972)**, the **Clean Water Act (1977)**, and additional environmental protection laws:

The **Marine Mammal Protection Act of 1972 (MMPA)**[7] prohibits "taking" of marine mammals in U.S. waters and by U.S. citizens on the high seas. A take is defined by the MMPA as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal"[8]. Exemptions can be granted for offshore energy and minerals exploration under an Incidental Take Authorization (ITA), which allows for unintentional takes that may occur during a specified time period in a wind project area. An ITA can only be issued if the offshore activity would have a negligible impact to marine mammals. ITAs require public review, a public comment period, and monitoring and reporting of takes.

The **Endangered Species Act of 1973 (ESA)**[9] requires that federal agencies work with the National Marine Fisheries Service (Department of Commerce) or the U.S. Fish and Wildlife Service (Department of Interior) to ensure that an agency's action "is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of an endangered or threatened species' critical habitat."

The **National Environmental Policy Act of 1970 (NEPA)**[10] requires that federal agencies evaluate the environmental effects of their proposed actions prior to making decisions on an action. The NEPA process ensures that federal agencies consider the "significant environmental consequences of their proposed actions" and that the public are informed about this decision making. For offshore wind energy projects, BOEM follows the NEPA process, which requires public engagement at various stages. See the graphic below to understand how federal agencies like BOEM make decisions on proposed actions under NEPA.

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[4] Outer Continental Shelf Lands Act (boem.gov)
[5] The Energy Policy Act of 2005 (boem.gov)
[6] Submerged Lands Act (SLA) of 1953 (boem.gov)
[7] Marine Mammal Protection Act (MMPA) | Bureau of Ocean Energy Management (boem.gov)
[8] Glossary: Marine Mammal Protection Act | NOAA Fisheries
[9] Endangered Species Act (ESA) | Bureau of Ocean Energy Management (boem.gov)
[10] National Environmental Policy Act (NEPA) | Bureau of Ocean Energy Management (boem.gov)

National Environmental Policy Act (NEPA) Review Process

A federal agency develops a proposal to take a major federal action--an activity or decision subject to federal control and responsibility.
Examples include adoption of official policy, adoption of programs, or approval of specific projects.

Will the action have significant environmental impacts?

Yes

Environmental Impact Statement (EIS) prepared if the proposed action is expected to have significant environmental impacts

Process

Public engagement via public comment periods and stakeholder workgroups occur throughout the EIS process.

An agency publishes a **Notice of Intent** in the Federal Register to inform the public of the analysis

A **Draft Environmental Impact Statement** is published for public review and comment

A **Final Environmental Impact Statement** is published and includes responses to public comments

Uncertain

Environmental Assessment (EA) prepared by a federal agency to determine whether or not a federal action has the potential to cause significant environmental effects

Will the action have significant environmental impacts?

No

Finding of No Significant Impact (FONSI) explains why an agency concludes that there are no significant environmental impacts expected from the proposed action

Yes

EIS process is conducted

No

Categorical Exclusion (CATEX) a detailed environmental analysis is not required if the proposed action does not normally have a significant effect on the human environment

Decision is made on proposed action and action is implemented

Understanding the Environmental Impact Statement (EIS)

An EIS is a document that is prepared by a federal agency when required by the NEPA process, as shown in the flowchart above. An EIS describes, in detail, the expected impacts of a proposed federal action on the environment. BOEM produces Environmental Impact Statements for offshore wind projects, because these projects have expected significant environmental impacts. Many partners including other federal agencies, Tribal governments, state and local governments, scientists and technical experts may be involved in developing an EIS.

An EIS includes details about the proposed action, the environment that would be affected, alternatives to the proposed action, and an analysis of impacts of the proposed action and alternatives. BOEM typically includes potential mitigation and monitoring measures in an EIS for consideration. The EIS helps BOEM and its decision-making partners consider all of the factors before deciding whether or not to approve a project.

Learn more from BOEM about what's included in an EIS and the process of developing an EIS at these links:
https://www.boem.gov/environment/environmental-assessment/what-environmental-impact-statement-eis-process.
https://www.boem.gov/environment/environmental-assessment/environmental-impact-statement-eis-format-and-content-process

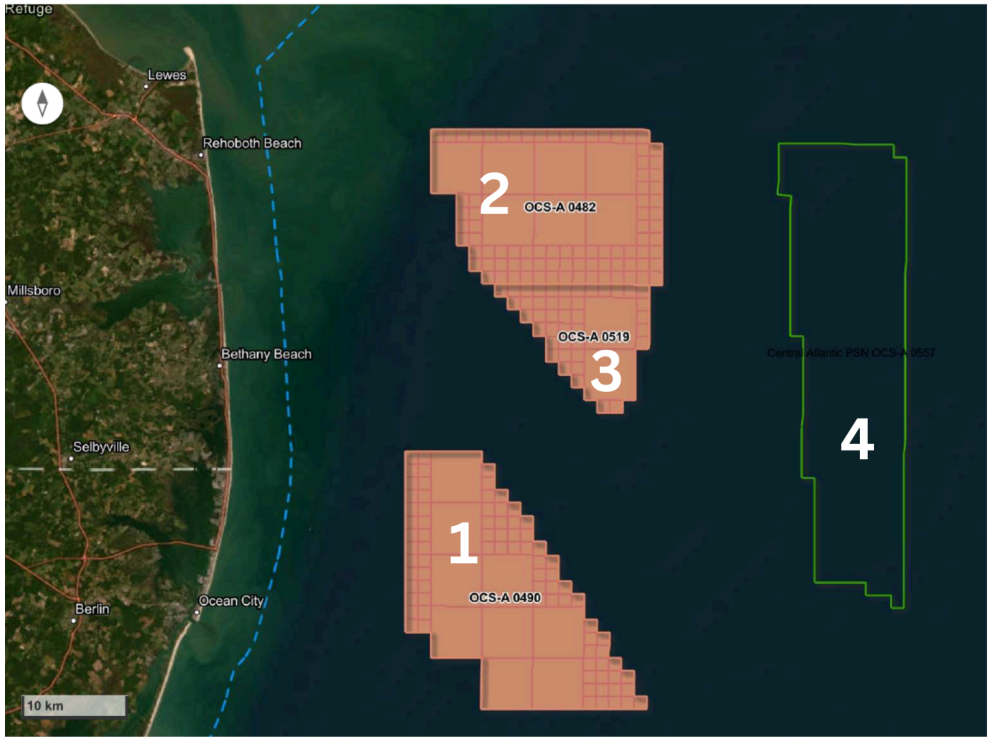
At the State Level

While commercial offshore wind projects in the U.S. occur mostly in federal waters, transmission of the power generated offshore to the electrical grid may require cable landfall and transmission through state, local, or Tribal lands and waters. The process for obtaining permits for landfall and transmission are separate from the federal process between a developer and BOEM/BSEE. A developer must coordinate with the local entity–such a state's natural resources agency or private landowner–whose property would be affected by the cable landfall.

Procurement of OWE and its renewable attributes also typically occurs at the state level. One state, a group of states, or a regional electric utility company may purchase the energy produced by an offshore wind project. The attributes of renewable energy generated from an OWE project are quantified through mechanisms such as offshore renewable energy credits (ORECs). States seek these ORECs to fulfill requirements set forth in their respective Renewable Portfolio Standards (RPS), which mandate how much of a state's energy purchased is from renewable sources. The Delaware Renewable Portfolio Standards Act was adopted in 2005 and requires Delmarva Power–the primary electric utility in Delaware–to report their compliance with these standards to the Public Service Commission.

Stay tuned for more information on procurement strategies.

Offshore Wind and Delaware



Offshore wind energy areas off Delaware's coast. See table below for descriptions.
Original image: BOEM

There are currently no built or operating commercial offshore wind energy projects off the coast of Delaware. There are leases off the Delaware coast in federal waters which are at various stages in the permitting process prior to being developed. Projects are listed and described in the table.

How can the public provide input on projects to BOEM?

Since offshore wind development is a federally-driven process, there are limited opportunities for public engagement. BOEM and other federal agencies are required to provide opportunities for public participation during the National Environmental Policy Act (NEPA) process. A minimum 45-day public comment period is initiated when BOEM publishes a NEPA document in the Federal Register, such as an Environmental Assessment or Environmental Impact Statement. Read tips from BOEM on how to provide a meaningful comment here.

For information on Delaware-specific projects receiving comments at the federal and state levels, please see the *Opportunity for Public Engagement* section.

OWE Projects Off Delaware's Coast

Location on Map	Developer	Project Name	Lease Area (acres)	Permitting Status	Public Comment Opportunity
1	US Wind Inc.	Maryland Offshore Wind Project	79,707	Active lease; awaiting final EIS	Closed; comments on draft EIS closed Nov 20, 2023[11] Next opportunity: Publication of final Environmental Impact Statement (estimated early fall 2024)
2	GSOE I, LLC (Ørsted)	GSOE 1	70,098	Active lease; conducting Site Assessment Activities	Closed Next opportunity: Notice of Intent to prepare an Environmental Impact Statement
3	Ørsted	Skipjack Wind	26,332	Active lease; conducting Site Assessment Activities (jointly with GSOE 1); Developing Construction and Operations Plan	Closed Next opportunity: Notice of Intent to prepare an Environmental Impact Statement
4	*Not yet leased to a developer*	Central Atlantic Wind Energy Area A-2	101,767	Lease auction scheduled for August 14, 2024	Closed Next opportunity: Notice of Intent to prepare an Environmental Assessment or Environmental Impact Statement

Developer: US Wind
Project(s): Maryland Offshore Wind Project (three phases: MarWin, Momentum Wind, additional unplanned phase)
Lease Number: OCS-A 0490
Lease Area (acres): 79,707

[11] Federal Register :: Notice of Availability of a Draft Environmental Impact Statement for US Wind Inc's Proposed Wind Energy Facility Offshore Maryland

Status: Draft environmental impact statement (EIS) published by BOEM in September 2023, awaiting final EIS (estimated early fall 2024)

Description

The Maryland Offshore Wind Project by US Wind lies off the coast of Ocean City, Maryland, and Fenwick Island, Delaware. There are three phases of the project. Two of the phases (MarWin and Momentum Wind, the easternmost two phases) have received offshore renewable energy credit awards from the Maryland Public Service Commission. This means that if approved by BOEM, these projects are likely to move forward with construction because Maryland has agreed to purchase the power that the projects will generate. No awards for offshore wind energy have been issued for this project by the State of Delaware.

BOEM published the Draft Environmental Impact Statement (EIS) for the Maryland Offshore Wind Project in September 2023. This draft proposes that the cable which brings energy generated by the project to the shore make landfall at 3R's Beach. This would include inshore cables routing through the Indian River Bay, and connecting to the electric grid at new US Wind-built substations and the existing Indian River substation[12]. Learn more about US Wind's project, including the proposed agreements with the State of Delaware, by visiting the *Maryland Offshore Wind Project* section below.

Developer: GSOE I, LLC
Project(s): GSOE 1
Lease Number: OCS-A 0482
Lease Area (acres): 70,098
Status: Early planning phase

Description

Lease area purchased from Bluewater Wind in 2012 by Garden State Offshore Energy (GSOE) I, LLC. In 2018, developer GSOE I submitted a site assessment plan (SAP) as part of the permitting process. BOEM approved the plan in 2019, which allowed the developer to place a buoy at the lease site to monitor meteorological and oceanographic conditions. As of June 2024, site assessment activities are underway. BOEM has not yet published an EIS for this project and the developer has not submitted a Construction and Operations Plan.

Developer: Skipjack Offshore Energy, LLC (Ørsted)
Project(s): Skipjack Wind
Lease Number: OCS-A 0519
Lease Area (acres): 26,332
Status: Early planning phase

Description

Developer Ørsted withdrew from its OREC agreements with the Maryland PSC in January 2024. Ørsted cited economic challenges, that "the payment amounts for ORECs set forth in the [OREC agreements with Maryland PSC] are no longer commercially viable because of today's challenging market conditions, including inflation, high interest rates and supply chain

[12] Figure ES-1. Maryland offshore wind project area. Maryland Offshore Wind Draft Environmental Impact Statement (boem.gov)

constraints"[13]. Ørsted maintains ownership of the lease area and is continuing to develop the construction and operations plan (COP) for the lease. However, since withdrawing from the OREC agreements with the Maryland PSC, Ørsted will have to seek future bidding opportunities (with Maryland or another state) to sell the power generated by the project. It is uncertain when this might occur, and restarting the bidding process will likely delay the time to commissioning and operation.

Other Wind Energy Areas

Central Atlantic Wind Energy Area (WEA) A-2
Lease Area (acres): 101,767 acres; 26 nm from Delaware Bay
Status: Final Environmental Assessment (EA) published by BOEM in June 2024
Description:

Lease auction to be held on August 14, 2024. See the *Opportunity for Public Engagement* section to learn more.

Maryland Offshore Wind Project (US Wind)

What's going on with the US Wind Project?

US Wind Inc., an offshore wind developer, won a BOEM lease auction in August 2014 for the wind energy area now called the Maryland Offshore Wind Project. Once US Wind was granted this lease, they began the federal process with BOEM which includes site assessment, creating a construction and operations plan, and conducting environmental and technical reviews of the site before any part of the wind farm can be built. As of summer 2024, there has been no construction offshore related to this project. In order for the project to be finalized and begin construction, BOEM must publish a Final Environmental Impact Statement and Record of Decision which approves the project. Approval of the project also requires BOEM's approval of US Wind's Construction and Operations Plan.

How might Delaware be involved in this project?

Formal negotiations between the State of Delaware and US Wind began in December 2023[14] regarding a potential agreement for the cable landfall at 3R's Beach from the Maryland Offshore Wind project: The State of Delaware has signed a Term Sheet[15] with developer US Wind that describes the lease terms and community benefits:

- A lease ($350,000 per year plus annual increases) to US Wind at 3R's Beach for an underground cable landing to deliver power from the Maryland Offshore Wind project to the regional electric grid
- 150,000 renewable energy credits (RECs) to Delaware for each year the project generates power (see below for an explanation of RECs)
- Funding for dredging, workforce development, environmental education scholarships, and more in Delaware

[13] Skipjack Wind to be repositioned for future offtake opportunities (orsted.com)
[14] Delaware to Negotiate with US Wind Over Benefits for State - State of Delaware News
[15] US-Wind-Term-Sheet_001.pdf (delaware.gov)

This agreement has not yet been finalized. The Delaware Department of Natural Resources and Environmental Control (DNREC) Division of Parks and Recreation hosted an informational event[16] on March 12, 2024 in Bethany Beach regarding the proposed cable landfall at 3R's Beach. The information presented at the open house can be found here. DNREC held a public survey related to this proposed action, which closed on March 26, 2024. See upcoming opportunities for public engagement below.

[16] Planning, Preservation and Development - DNREC (delaware.gov)

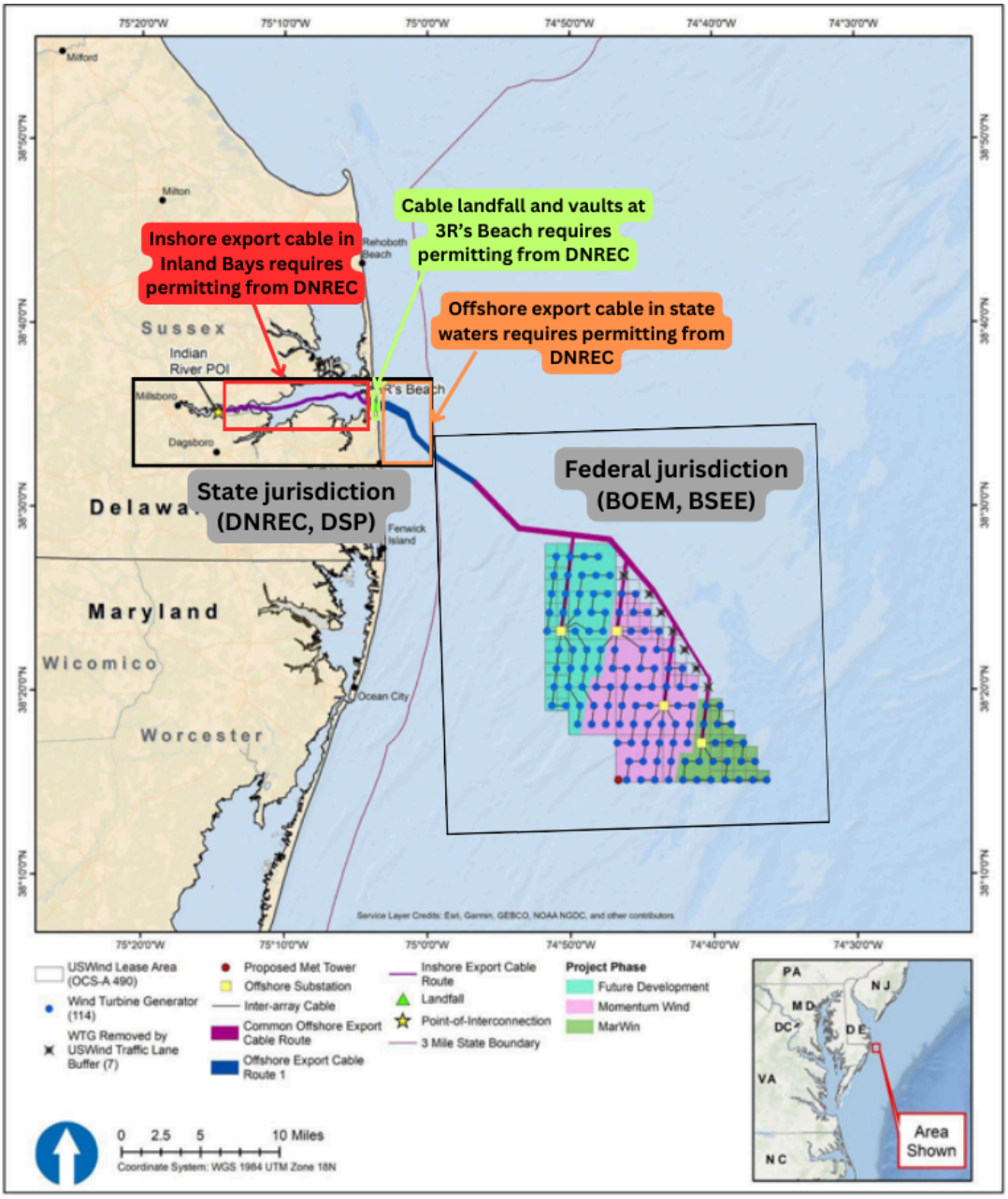


Figure ES-1. Maryland offshore wind project area

Opportunity for Public Engagement

State-level

US Wind Project Federal Consistency Certification Comment Period

Federal Consistency Certifications for the US Wind Maryland Offshore Project have been submitted to the DNREC Coastal Management Program. Comments were accepted through June 5, 2024. Federal consistency reviews help ensure that state and federal actions in Delaware's Coastal Zone are consistent and coordinated. Find more information on these Federal Consistency Certifications, and information on how to submit comments, at de.gov/dnrecnotices.

Proposed Offshore Cable Landfall

US Wind, Inc., proposes to develop an offshore wind energy project offshore of Maryland with power lines from the project proposed to come ashore at 3R's Beach in Delaware Seashore State Park and interconnect into a proposed substation to be built adjacent to the Indian River Power Plant.

June 5, 2024 at 4:00 p.m., Beacon Middle School

A public information session was held focused on a proposal to develop an offshore wind energy project offshore of Maryland, with power lines from the project proposed to come ashore at 3R's Beach in Delaware Seashore State Park. More info on DNREC's website here.

July 9, 2024 at 6:00 p.m., virtual

DNREC's Division of Water and Division of Watershed Stewardship will conduct a joint public hearing to consider comments on permit requests related to the US Wind project.

Public comments will be accepted through September 9, 2024. Visit the link here to learn more about the hearing and how you can provide a public comment.

Visit https://dnrec.delaware.gov/us-wind/ for more information about DNREC's actions and notices related to offshore wind.

Federal-level

Central Atlantic Wind Energy Areas

Information gathering and area identification were conducted from 2022-2023 for the Central Atlantic Wind Energy Areas. A Proposed Sale Notice (PSN OCS-A 0557) was published by BOEM in November, 2023 for the lease areas. This initiated a 60-day public comment period which concluded on February 12, 2024. BOEM hosted a public auction seminar on January 17, 2024 to describe their new auction procedure and provide information about the Proposed Central Atlantic Lease Areas. The Final Sale notice was announced in June 2024, with the auction planned for August 14, 2024.

A final Environmental Assessment was published in the Federal Register on June 7, 2024 with the determination that leasing, site assessment, and site characterization activities for the area will not significantly impact the human environment (FONSI). The next opportunity for public comment will occur when the lease is sold and BOEM assesses the potential environmental impacts of the developer's proposed project.

Additional Resources

In the U.S., federal agencies, academics, and nonprofit institutions are working to identify best practices for OWE development. Explore the organizations below for more information on research, development, and collaborations related to offshore wind.

The listing of an individual, organization, or agency does not signify endorsement by Delaware Sea Grant.

Marine life

- Atlantic Marine Assessment Program for Protected Species (AMAPPS): a joint effort by NOAA, BOEM, U.S. Fish and Wildlife Service, and the Navy which allows researchers to put all the information about abundance, distribution, ecology and behavior of protected species into an ecosystem context so resource managers can use it for conservation measures and decision-making
- Discovery of Sound in the Sea (DOSITS): a website produced by the University of Rhode Island's Graduate School of Oceanography which shares information on the science and uses of sound in the sea. FAQs address common questions about sound in the ocean and DOSITS hosts webinar series on various topics.
- Regional Wildlife Science Collaborative (RWSC): a collaboration between federal, state, offshore wind developer, and non-governmental organizations (NGO) representatives with a mission to collaboratively and effectively conduct and coordinate relevant, credible, and efficient regional monitoring and research of wildlife and marine ecosystems that supports the advancement of environmentally responsible and cost-efficient offshore wind power development activities in U.S. Atlantic waters
- Wildlife and Offshore Wind (WOW): a trans-disciplinary, highly integrated collaboration of diverse experts for the comprehensive evaluation of the potential effects of offshore wind energy development on marine wildlife. WOW's goal is to provide a long-term, adaptive roadmap for efficient and effective assessment of the potential effects of offshore wind energy development on marine life, from siting through operation

Fisheries

- Responsible Offshore Development Alliance (RODA): a broad membership-based coalition of fishing industry associations and fishing companies committed to improving the compatibility of new offshore development with their businesses
- Responsible Offshore Science Alliance (ROSA): a nonprofit organization leading a collaborative effort to advance research and monitoring on the potential effects of offshore wind on fisheries

Federal government

- National Oceanic and Atmospheric Administration (NOAA): offices of NOAA work together and with other agencies to share scientific information and support the regulatory processes involved in offshore wind planning

- National Renewable Energy Laboratory (NREL): a laboratory of the U.S. Department of Energy (DOE) which conducts research, development, and validation activities for wind energy technologies
- Tethys: an online database dedicated to advancing the wind energy industry by providing access to environmental information and research findings that can support development while minimizing environmental risks. Tethys hosts the Knowledge Base, a database of documents and information about the environmental effects of wind energy
    - U.S. Offshore Wind Synthesis of Environmental Effects Research (SEER): a joint effort between the U.S. DOE, Pacific Northwest National Laboratory (PNNL), and the National Renewable Energy Laboratory (NREL) to facilitate knowledge transfer for offshore wind research around the world
    - Working Together to Resolve Environmental Effects of Wind Energy (WREN): established by the International Energy Agency (IEA) Wind Committee, now led by the U.S. and collaborating with NREL, PNNL, U.S. DOE, and WETO.
    - Enabling Coexistence Options for Wind Energy and Wildlife (ECO Wind): an NREL and PNNL initiative that supports efforts to reduce wildlife impacts at land-based wind energy facilities with monitoring and minimization technology solutions
- Wind Energy Technologies Office (WETO): an office of the U.S. Department of Energy (DOE) which invests in energy science research and development activities to improve performance, lower costs, and reduce market barriers for U.S. wind energy
    - WINDExchange: a program of the U.S DOE WETO which provides resources to help communities weight the benefits and impacts of wind energy

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Have questions, comments, or want to learn more? Please contact Kathryn Lienhard at lienhard@udel.edu.

Our goal is to provide objective information from the best-available science. The resources and information provided on this site are non-exhaustive. If there is any additional information or resources you would like for us to consider for the site, please contact us.