
Maine Offshore Wind
Roadmap
February 2023
maineoffshorewind.org

Letter from Co-Chairs

Offshore wind presents a generational economic and energy opportunity for Maine. As an abundant source of clean and renewable energy, offshore wind has the potential to help free Maine from its over-reliance on fossil fuels to lower energy costs and volatility, and to curb climate-altering emissions to protect our state's environment for future generations.

As an industry, offshore wind is poised to grow significantly in the coming years. This growth will support existing and emerging Maine companies, create new jobs and career opportunities for Maine people, attract new workers and families to Maine, and deliver infrastructure investments in communities across the state.

As co-chairs of the *Maine Offshore Wind Roadmap* Advisory Committee, we are proud to bring forward this unprecedented and extensive analysis of how Maine can realize the immense opportunities presented by offshore wind in a responsible manner: *The Maine Offshore Wind Roadmap*.

The *Roadmap* is the product of 18 months of work, led by our expert Advisory Committee and dedicated Working Groups. Their work explored how Maine should approach energy markets, ports and infrastructure, manufacturing and supply chains, workforce development, socioeconomic impacts, and equity, while at the time preserving the Gulf of Maine ecosystem and supporting our vibrant and thriving seafood industries and coastal communities.

This work was paired with robust public outreach and stakeholder engagement with data and research-driven insights to make clear, timely, and thorough recommendations about economic, climate, human, and environmental impacts associated with the transition to offshore wind.

In the years ahead, offshore wind will be an essential tool in efforts to accomplish Maine's ambitious statutory climate and clean energy targets: Using 80 percent renewable energy by 2030 with an intention of 100 percent by 2040, cutting emissions by 45 percent by 2030 and 80 percent by 2050, achieving carbon neutrality as a state by 2045, and doubling our clean energy jobs to 30,000 by 2030.

Meeting these targets requires care, accountability, and engagement at every level to ensure positive impacts, and to avoid and mitigate those with adverse potential. In developing this document, we worked with fishermen, scientists, and others to address head-on important questions about how offshore wind can be compatible with the Gulf of Maine's remarkable ecosystem and existing users. By collaborating and coordinating with diverse stakeholders to share knowledge and understand shared ecosystems, this *Roadmap* is an informed path for advancing offshore wind in manners that protect people, communities, and the environment.

What became clear from our work is that offshore wind energy offers a powerful response to a preeminent challenge of our time: addressing climate change and energy volatility driven by global events. Rising ocean and land temperatures threaten our heritage industries of fishing, farming, and forestry. Higher sea levels endanger coastal communities, and more frequent and powerful storms damage infrastructure and public health. At the same time, Maine people are experiencing unprecedented energy price increases driven by unstable global energy markets and our over-reliance on fossil fuels to power our economy.

International events, most notably Russia's invasion of Ukraine, have triggered major disruptions in global energy markets, which have resulted in expensive and volatile energy prices. Maine, with nearly 60 percent of homes reliant on heating oil, and a regional electricity grid that is over-reliant on natural gas for electricity generation, is distinctly vulnerable to these global energy market forces. Furthering Maine's energy independence will also mitigate the negative environmental impacts from fossil fuel emissions.

The technical analysis conducted for this *Roadmap* paints a clear picture: Maine and the surrounding regions will need offshore wind as part of a diverse portfolio of clean energy to decarbonize our current energy supply and replace expensive, imported fossil fuels. Offshore wind is an essential component of our path toward a stronger, healthier, and cleaner energy future.

Offshore wind also offers the opportunity to establish Maine as a global technology and manufacturing leader. Following a decade of research and development into floating offshore wind technology at the University of Maine, our state is on the vanguard of innovation for offshore wind in deeper ocean waters—which is an area of great focus given the abundant capacity for clean energy in these areas, particularly the Gulf of Maine. This leadership is also viewed as essential for Maine's economy, by growing an industry with prospects for widespread investment across the state.

Benefits from offshore wind will include new opportunities to leverage traditional maritime-based industries and provide new generations of workers with opportunities for sustainable, well-paid careers. The offshore wind economy can also provide new investments in manufacturing, engineering, and technology, spurred by Maine's community colleges and universities integrating offshore wind as research, development, and job training priorities.

These unique economic, energy, climate, and innovation opportunities are coalescing at a critical time for Maine, the nation, and the world.

Maine's inherent strengths for offshore wind, established relationships between Maine industry and offshore wind, and the unique characteristics of the Gulf of Maine all put Maine in the running to set the global standard for responsible development of floating offshore wind.

With the *Maine Offshore Wind Roadmap*, Maine now has an outline on how to lead on responsible development of offshore wind that delivers on its vast potential to secure our energy independence, fight climate change, and strengthen Maine's economy.

Dan Burgess, Director, Governor's Energy Office (GEO)

Admiral Gregory G. Johnson, USN-Ret.

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Executive Summary

The *Maine Offshore Wind Roadmap* is the product of more than 18 months of work, under the leadership of the Governor's Energy Office (GEO). Development of the *Roadmap* was funded by a $2.166 million grant from the U.S. Economic Development Administration in 2020 and was guided by a diverse 24-member Advisory Committee, shaped by four expert Working Groups, and informed by technical studies commissioned specially for the *Roadmap*.

During their deliberations, the *Roadmap* working groups pursued their objectives with broad public input —turning to community members, researchers, established businesses, entrepreneurs, fisheries participants, and policymakers throughout Maine, New England, and the world to help chart the best course for Maine's offshore wind future.

The *Roadmap* describes how Maine is uniquely positioned to benefit from the responsible advancement of offshore wind. As one of the nation's most fossil fuel-dependent states—with nearly 60% of all homes reliant on heating fuels, and Maine and New England's energy grid over-reliant on natural gas for electricity—Maine is distinctly vulnerable to price and supply volatility of imported fossil fuels, such as the soaring costs caused by Russia's invasion of Ukraine in early 2022.

The *Roadmap*'s technical reports show that Maine will need offshore wind, together with other renewable sources, to make a transition to cleaner, less volatile, and more affordable energy sources in the coming decades. At the same time, the *Roadmap* describes the steps needed to act responsibly, support coastal communities and industries, and protect the unique Gulf of Maine ecosystem during this transition.

University of Maine's VolturnUS floating concrete hull technology

An Opportunity for Maine

Create Jobs and Economic Growth

With its record of pioneering offshore wind innovation, proximity to the abundant wind resource of the Gulf of Maine, and a growing demand for clean energy across the region, Maine is poised to take a leadership role in a fast-growing offshore wind industry expected to generate as much as $1 trillion in worldwide investment by 2040.[1] Offshore wind can spur economic growth throughout the state, including rural communities, communities undergoing economic transitions, and regions with limited economic development options. In addition, University of Maine researchers have worked closely with commercial enterprises to pioneer patented floating offshore wind technology and demonstrate the viability of floating offshore wind as a Maine-based industry of the future. Offshore wind offers Maine a chance to grow and diversify our economy, create and sustain family-supporting jobs, improve economic resilience, expand economic opportunity, and create a culture of innovation that serves as a foundation for national and global leadership in this growing industry.

The *Roadmap* offers specific strategies to expand Maine's role as a hub of innovation and to assist Maine firms to tap into supply chain opportunities. Strategic investment in port infrastructure is an essential Roadmap step, along with proactive workforce development.

Harness Renewable Energy and Fight Climate Change

The Gulf of Maine's wind resource stands to play a critical role in meeting Maine's current and future energy needs, allowing the state to reduce its dependence on costly imported fossil fuels and meet its clean energy targets. Maine, other New England states, and the federal government are looking to offshore wind in the Gulf of Maine to reduce long-term energy costs, build price stability, and make significant progress to decarbonize our state and region's energy sector.

The impact of climate change is already affecting Maine's environment and economy along the coast and across the state. Clean, renewable energy from multiple sources—including offshore wind—will help to slow the effects of climate change, mitigate harmful long-term climate impacts in Maine and beyond, and support the State's goals of achieving carbon-neutrality by 2045 and reducing greenhouse gas emissions by 80 percent by 2050.

The *Roadmap's* near-term next steps include establishing a state procurement plan for offshore wind that will be coordinated regionally to achieve cost-effective deployment. The document also offers steps to pursue regional transmission strategies, to ensure a stable and predictable investment environment, and to advocate for federal leasing mechanisms that support Maine's goals, such as revenue-sharing and other considerations.

Maine's Commitment to Responsible Offshore Wind

The *Roadmap* expresses the State's commitment to responsible offshore wind with specific strategies and actions aimed at:

Preserving Maine's Thriving Marine Economy

The *Roadmap* calls for Maine to vigorously represent all Maine interests before regional and federal authorities responsible for permitting and siting, for instance by emphasizing the importance of prioritizing commercial wind development outside of areas that represent the majority of the fishing effort. The *Roadmap* also calls on the State and federal government to undertake active and direct engagement with Maine's fishing industry, and to promote open, transparent, and comprehensive research and data gathering.

Protect the Environment, Wildlife & Fisheries Ecosystem of the Gulf of Maine

The *Roadmap* identifies the urgency of collecting high quality, relevant data to guide future decisions, and offers specific actions to proactively reduce wildlife conflicts and minimize ecosystem impacts. The *Roadmap* also recommends strengthening Maine's state policy framework, pursuing multiple funding opportunities, and coordinating efforts with other states.

Preserving Maine's Traditions & Culture

The *Roadmap* acknowledges the critical importance of offshore wind's compatibility with Maine's traditional culture—and calls for continued communication and cooperation with the communities, industries, and Native American people inextricably tied to the Gulf's resources, landscapes, and traditions.

Cross-Cutting Themes

Four cross-cutting themes guided development of the *Roadmap's* objectives and strategies:

Stakeholder Engagement & Communications: The State of Maine is committed to fostering open and transparent communication among stakeholders and will continue to seek input from the people of Maine to address their interests and concerns and mitigate any potentially adverse impacts.

Equity: The State of Maine is committed to ongoing engagement about offshore wind from all stakeholders—paying particular attention to those who may be most impacted and those who often lack access to or input on new opportunities for economic growth.

Transparency & Data-Driven Decision Making: The state of Maine will continue to work in partnership with all stakeholders to collect, vet, and effectively communicate the data on which decisions are based.

Regional Collaboration & Coordination: Through the implementation of the *Roadmap,* Maine will continue to work closely with New England states, Atlantic Canada, and the regional grid operator to ensure the benefits of cooperation.

Roadmap Overview

A visual guide to the roadmap's development and objectives.

Objectives

Pursue Offshore Wind Supply Chain, Infrastructure, and Workforce Investments to Support Economic Growth and Resiliency

Harness Abundant Renewable Energy to Reduce Long-Term Costs, Reliance on Fossil Fuels, and Fight Climate Change

Advance Maine-Based Innovation to Compete in Emerging National and Global Offshore Wind Industry

Supporting recommendations and technical reports from experts
Working Group Recommendations and Technical Reports

Working Groups:

- Energy Markets and Strategy
- Environment and Wildlife
- Supply Chain, Workforce, Ports, and Marine Transportation
- Fisheries

Maine's Offshore Wind *Roadmap* identifies five key objectives to responsibly advance offshore wind in Maine. Each objective contains a set of specific strategies recommended by the expert members of the Roadmap's Working Groups and endorsed by the Roadmap Advisory Committee.

Support Maine's Vital and Thriving Seafood Industries and Coastal Communities

Protect the Environment, Wildlife, & Fisheries Ecosystem in the Gulf of Maine

Cross-Cutting Themes

At the inception of and throughout the *Roadmap* development, four cross-cutting themes were deemed essential to the process of creating a *Roadmap* purpose-built for Maine.

- Stakeholder Engagement & Communications
- Equity
- Transparency & Data-Driven Decision Making
- Regional Collaboration & Coordination

Technical Reports:

- The State of the Offshore Wind Industry Through 2050
- Offshore Wind Transmission Review
- Maine Offshore Wind Talent Analysis
- Maine Offshore Wind Supply Chain Assessment
- Offshore Wind Supply Chain Diversification and Attraction
- Offshore Wind Supply Chain Partnership Building
- Market Deployment Strategies for Offshore Wind in Maine
- Socioeconomic Analysis of Offshore Wind in the Gulf of Maine
- Offshore Wind Energy Needs Assessment

Maine Offshore Wind Roadmap Proposed Milestones

2023-2024

OSW Procurement	Port Investment	Supply Chain and Workforce Support	Engage with Federal Agencies
Establish a responsible OSW procurement target and phased solicitation addressing a meaningful percentage of Maine's electricity needs by 2050	Port strategy identified with investment & environmental assessments underway	Businesses educated & assisted; workforce training begun	National OSW policy and Gulf of Maine scheduled federal lease sale informed by Maine priorities

2025-2030

OSW Procurement	Port Investment	Supply Chain and Workforce Support	Engage with Federal Agencies
Studies informed by public input to inform solicitations	Funding secured; environmental assessments completed; construction underway for first floating offshore wind port on the East Coast	Maine companies networked into East Coast projects; pre-market companies prepared; workforce trained	Site Assessment Plans, NEPA studies, and Construction and Operations Plans for proposed projects informed by state priorities

2030 and beyond

OSW Procurement	Port Investment	Supply Chain and Workforce Support	Engage with Federal Agencies
Commercial procurements approved	Construction complete; operations begin supporting floating offshore wind projects in the Gulf of Maine and beyond	Maine companies and workforce expanded and recognized for advanced knowledge and experience in floating offshore wind	Commercial Construction and Operations Plans informed by State priorities

Ongoing Stakeholder Engagement and Communication

As envisioned by the Advisory Committee, the objectives, strategies, and actions of the *Maine Offshore Wind Roadmap* are expected to progress in phases over the coming years. This proposed timeline offers a baseline estimate of when key actions in offshore wind are expected, based on a current evaluation of industry, federal and state schedules. This timeline will be updated as needed to reflect new information.

Regional Coordination	Floating OSW Demonstration Projects	Ecosystem Monitoring and Research	ME OSW Research Consortium
Discussions advanced on regional coordination opportunities for transmission, procurement, supply chain, workforce, or other topics	Advanced responsibly with stakeholder input and local companies and workforce engaged	New baseline data collected on Gulf of Maine fishes, wildlife, and ecosystem, including human dimensions	Advisory Board and initial priorities established

Regional Coordination	Floating OSW Demonstration Projects	Ecosystem Monitoring and Research	ME OSW Research Consortium
Regional transmission planning and investments advanced	Advanced responsibly with preliminary monitoring	Baseline data collection continued, new monitoring data available, and research initiated; additional guidance developed to mitigate impacts	Initial projects underway and new funding secured

Regional Coordination	Floating OSW Demonstration Projects	Ecosystem Monitoring and Research	ME OSW Research Consortium
Implementation of regional agreements and partnerships	Findings shared to inform and integrate in ongoing commercial activities	Data analysis performed; best management practices and guidelines improved to reduce impacts	Projects ongoing and findings inform OSW projects

Ongoing Stakeholder Engagement and Communication

About the Roadmap

The *Maine Offshore Wind Roadmap* identifies how the State of Maine—working alongside Maine people, private sector companies, municipal officials, neighboring states, and the federal government—can embrace the opportunities presented by offshore wind and responsibly build on the state's decade-long record of offshore wind planning, research and development, and innovation.

The purpose of this *Roadmap* is to serve as a strategic economic development plan for the offshore wind industry in Maine that maximizes benefits to Maine people, ensures compatibility with our Maine coastal heritage, and minimizes the impacts on our ocean-based industries and environment.

This *Roadmap* is the result of an extensive 18-month planning process led by the Governor's Energy Office (GEO). To support the *Roadmap*, the GEO successfully pursued and is grateful to have been awarded a $2.166 million grant from the U.S. Economic Development Administration, enabling substantial engagement and technical analyses.[2]

The planning process relied on a 24-member Advisory Committee—a high-level strategic body comprised of the state's leading public and private voices on climate, energy, economic development, natural resource management, fisheries, and more—and Working Groups focusing on energy markets, ports and infrastructure, socioeconomic impacts, equity, manufacturing and supply chains, workforce development, and fisheries and environmental compatibility.

During the planning process, the Advisory Committee and Working Groups used the substantive expertise of its members, together with state and technical consultant support, engagement with diverse communities from across Maine, input from offshore wind experts, experiences, and studies from around the world, new cutting-edge studies and data analysis on offshore wind's effects on Maine, and a transparent, public process to inform this *Roadmap*.

To complement the Advisory Committee and Working Groups, GEO also hired globally experienced technical consultants to provide the additional information necessary to make data-driven recommendations.

These technical consultant reports included supply chain, education and workforce, socioeconomic assessments of offshore wind, transmission analyses, deployment strategies to optimize benefits for Maine, and the development of renewable energy demand scenarios.

Throughout the plan development process, all *Roadmap* meetings and targeted community seminars were open to the public. GEO will maintain that practice as it transitions from plan to action.

What Went Into the *Roadmap*

96 Working Group and Advisory Committee Members

78 Meetings to Date

9 Technical Studies Produced

50 Experts brought in to share lessons learned elsewhere

50+ Other Technical Studies Consulted

1,372
Unique Participants

Photo: Karoline Rivero Bernacki © Equinor

The Maine Offshore Wind Initiative

Launched in June 2019 by Governor Janet Mills, the Maine Offshore Wind Initiative aims to explore thoughtful development of floating offshore wind energy in the Gulf of Maine while ensuring balance with our state's maritime industries and environment. The Initiative builds on Maine's existing assets for offshore wind in a thoughtful, responsible manner. These assets include:

- **A world-class offshore wind resource** in the Gulf of Maine.
- **Proximity to East Coast population centers and high-demand markets** that are conducive to efficient, low-cost transmission through new, co-located, and existing infrastructure.
- **A decade of offshore wind industry expertise** in engineering and design, permitting and surveying, maritime operations, and marine composites.
- **World-leading R&D and educational institutions,** serving as major assets to attract investment, support workforce development, and create exportable expertise and technology.
- An established and growing **gateway for international trade.**
- **Access to existing deepwater ports,** with room for additional port development.
- **Robust maritime and fisheries industry tradition** and corresponding expertise.
- **An established and growing workforce** in key occupations.
- **A strong manufacturing industry,** including composites.
- An enterprising and **engaged citizenry.**

Key Components

Policy & Legislation	Planning & Engagement	Research & Innovation
Advancing the Research Array	Developing the Maine OSW Roadmap	Engaging with the UMaine Demonstration Project
Establishing the Research Consortium	Funding Ports Studies & convening Stakeholder Group	Advancing the Gulf of Maine Research Array
Prioritizing federal waters for commercial projects	Participation in BOEM Gulf of Maine Task Force	Implementing the Maine Offshore Wind Research Consortium

Regional, National & International Partnerships

Business Network for Offshore Wind, National OSW R&D Consortium, BOEM Gulf of Maine Task Force, Regional Wildlife Science Entity, Government of the United Kingdom, University of Maine and other academic institutions, Pine Tree OSW, Regional Wildlife Science Consortium

The Maine Offshore Wind Initiative is overseen by the Governor's Energy Office (GEO), in close coordination with the Governor's Office of Policy Innovation and the Future, the Department of Marine Resources, the Department of Inland Fish and Wildlife, the Department of Economic and Community Development, the Maine International Trade Center, the Department of Transportation, the Department of Environmental Protection, the Department of Marine Resources, and the Maine Technology Institute.

Advisory Committee & Working Group Members

Advisory Committee

Dan Burgess, Director, Governor's Energy Office (GEO)

Admiral Gregory G. Johnson, USN-Ret.

Working Group Co-Chairs

Energy Markets and Strategies

Celina Cunningham, Governor's Energy Office (GEO)

Jeremy Payne, Maine Renewable Energy Association

Supply Chain, Workforce, Ports and Marine Transportation

Matt Burns, Department of Transportation

Jonathan Poole, Department of Economic and Community Development

Steve von Vogt, Maine Composites Alliance

Fisheries

Meredith Mendelson, Department of Marine Resources

Terry Alexander, F/V Jocka

Environment and Wildlife

John Perry, Maine Department of Inland Fisheries and Wildlife

Wing Goodale, Biodiversity Research Institute

Members At-Large

Habib Dagher, University of Maine

James Gillway, Searsport Town Manager

Ben Lucas, Maine Chamber of Commerce

Neal Goldberg, Maine Municipal Association

Matt Marks, Associated General Contractors of Maine

Patrice McCarron, Maine Lobstermen's Association

Suzanne MacDonald, Island Institute

Don Perkins, Gulf of Maine Research Institute

Hannah Pingree, Governor's Office of Policy Innovation and the Future

Grant Provost, Ironworkers Local 7

Will Sedlack, Maine Conservation Voters

Tom Welch, Chair Emeritus Maine Public Utilities Commission

Isaac St. John, Houlton Band of Maliseet Indians

Working Groups

Energy Markets and Strategy

Celina Cunningham, Governor's Energy Office, Co-chair

Jeremy Payne, Maine Renewable Energy Association, Co-Chair

Francis Pullaro, Renew Northeast

Marty Grohman, E2Tech

Alison Bates, Colby College

Patrick Scully, Public Utilities Commission

Jason Rauch, Central Maine Power

Arielle Silverkarsh, Versant Power

Steve Clemmer, Union of Concerned Scientists

Jeremy McDiarmid, Northeast Clean Energy Council

Will Sedlack, Maine Conservation Voters

Michael Peters, Messer Energy Services, Inc.

Tom Murley, Two Lights

Sharon Klein, University of Maine

Tom Welch, Chair Emeritus Maine Public Utilities Commission

Andrew (Drew) Landry, Office of the Public Advocate

Sean Mahoney, Conservation Law Foundation

Environment and Wildlife

Wing Goodale, Biodiversity Research Institute, Co-Chair

John Perry, Maine Department of Inland Fisheries and Wildlife, Co-Chair

Catherine Bowes/Zach Cockrum, National Wildlife Federation

Damian Brady, University of Maine

Amanda Cross, US Fish and Wildlife Service

Sarah Haggerty, Maine Audubon

Dawn Hallowell, Maine Department of Environmental Protection

Shilo Felton, National Audubon Society

Ivy Frignoca, Friends of Casco Bay

Erik Blomberg, University of Maine

Don Lyons, National Audubon Society

Doug Rasher, Bigelow Laboratory for Ocean Sciences

Jocelyn Runnebaum, The Nature Conservancy

Graham Sherwood, Gulf of Maine Research Institute

Erin Summers, Maine Department of Marine Resources

Sean Todd, College of the Atlantic

Sofie Van Parijs, NOAA Fisheries

Linda Welch, US Fish and Wildlife Service

Carl Wilson, Maine Department of Marine Resources

Gayle Zydlewski, Maine Sea Grant

Nicolas Record, Bigelow Laboratory for Ocean Sciences

Supply Chain, Workforce Development, Ports, and Marine Transportation

Matt Burns, Maine Department of Transportation, Co-chair

Jonathan Poole, Maine Department of Economic and Community Development, Co-chair

Steve Von Vogt, Maine Composites Alliance, Co-Chair

Jake Ward, University of Maine

Parker Hadlock, Cianbro

Dan Belyea, Maine Community College System

Kirk Langford, Maine Maritime Academy

Wade Merritt, Maine International Trade Center

Larry Robinson, Maine Manufacturing Extension Partnership

Bill Needleman, City of Portland

Ben Brown, Business Network for Offshore Wind

Bill Follett, Mayflower Wind

Greg Nadeau, former DOT Commissioner and Federal Highway Administrator

Kim Fitzgibbons, Kleinschmidt Associates

Chris Gardner, Eastport Port Authority

Jim Nelligan, Sprague Portland

Amanda Rector, State economist

Ruth Kermish-Allen, Maine Mathematics and Science Alliance

Mike Williams, Center for American Progress

Fisheries

Meredith Mendelson, Maine Department of Marine Resources, Co-Chair

Terry Alexander, F/V Jocka, Groundfish Fishery, Co-Chair

Craig Durant, F/V Marie Ann, Groundfish Fishery

Bob Humphrey, Sport-Ventures, Recreational Charter Operator

Eben Wilson, F/V Lettie Elise, Lobster Zone E

Dustin Delano, F/V Knotty Lady, Lobster Zone D

Mike Murphy, F/V Greyhound, Scallop Fishery

Sebastian Belle, Maine Aquaculture Association

Paul Anderson, Maine Center for Coastal Fisheries

Sheila Dassett, Downeast Lobstermen's Association

Virgina Olsen, Maine Lobstering Union Local 207

Jack Cunningham, Maine Lobstering Union Local 207 (Alternatte for V. Olsen)

John Bisnette, F/V Patty B,Maine Lobstering Union Local 207 (Alternatte for V. Olsen)

Patrice McCaron, Maine Lobstermen's Association

Ben Martens, Maine Coast Fishermen's Association

Bryan Holden, Luke's Lobster

Andy Dorr, Vinalhaven Town Manager

Chris Weiner, F/V Elizabeth Ames, American Bluefin Tuna Association

Mary Beth Tooley, O'Hara Corporation, Herring/Mackerel Fisheries

An Opportunity for Maine

Offshore wind offers Maine the unprecedented opportunity to grow and diversify our economy, bring additional family-supporting jobs to the state, and expand opportunities for those who need them most. The world-class offshore wind resource off our coast, when combined with other renewable sources, can meet clean energy demands for Maine and the region. By replacing energy generated by fossil fuels, offshore wind can reduce harmful emissions and slow climate effects, such as warming of the Gulf of Maine, more frequent and severe storms, and coastal erosion from rising sea levels.

Create Jobs and Economic Growth

- Maine's 10-year Economic Development Strategy identified offshore wind for its significant potential to grow and diversify the state's economy and create good-paying jobs.[3]
- The U.S. offshore wind industry has so far realized $13.5 billion in investment and is expected to become a $70 billion industry over the next decade.[4]
- Nearly 80 Maine firms are now engaged or positioned to engage in the offshore wind industry to provide permitting, products, surveying, engineering, maritime operations, and more.[5]

Maine's proximity to the abundant offshore wind resources in the Gulf of Maine promises new jobs in manufacturing, research and development, support services, ports and shipping, and more, and gives Maine the opportunity to become a global leader in the emerging offshore wind industry.

While rapidly growing in the U.S. in the past few years, offshore wind is a mature industry in Europe.[6] In 2019, offshore wind energy provided 75,000 jobs across 248 factories in Europe. In 2020, the industry generated $2.2 billion for each new gigawatt of offshore wind, with the global industry projected to generate nearly $1 trillion in investment by 2040.[7] With these models as a rough guide, the economics of offshore wind offer a promising opportunity for Maine's future.

The U.S. offshore wind industry has so far realized $13.5 billion in investment and is expected to become a $70 billion industry over the next decade.[8] There are 40 GW of U.S. offshore wind projects currently in development,[9] mostly situated along the eastern coast of the U.S., primarily in Massachusetts, New Jersey, New York, Virginia, and North Carolina. Early 2021 through May 2022, more than $1.2 billion was invested in manufacturing and port facilities to support offshore wind in these states.[10] An independent analysis estimates the U.S. will receive $109 billion in private offshore wind supply chain investment by 2030,[11] which will require significant and sought-after infrastructure, supply chain, and workforce enhancements.[12]

In Maine, a study of the state's offshore wind supply chain and workforce conducted for the *Roadmap* found that about 80 Maine firms are either engaging or positioned to engage in the international offshore wind industry. These companies are providing permitting, surveying, engineering, maritime operations, and other critical skills to support offshore wind projects around the world—ultimately contributing to the Maine economy while bringing extensive knowledge back to Maine.

At the same time, the University of Maine is pioneering research and development into floating offshore wind, and numerous Maine engineering, construction, and manufacturing firms are engaged in the national and global offshore wind industry.

This effort aligns with Maine's commitment to the clean energy economy, led by Governor Janet Mills' goal to create 30,000 clean energy jobs in Maine by 2030. This goal is supported by $4 million in funding from the Maine Jobs & Recovery Plan to begin a Clean Energy Workforce Program, which aims to prepare Maine residents for careers in clean energy, including offshore wind.

Offshore wind also offers an opportunity to improve job prospects and deliver economic development in disadvantaged areas of Maine. Nine of Maine's 16 counties—Androscoggin, Aroostook, Franklin, Oxford, Penobscot, Piscataquis, Somerset, Waldo, and Washington—meet the federal economic distress criteria, with per capita incomes 80 percent lower than the national per capita income as of 2020.

In addition, many counties in Maine experience high degrees of seasonality in their unemployment rates, including Washington and Hancock in the coastal region. These regions, communities, and residents would stand to benefit from the enhanced employment opportunities, including stability of increased annual employment opportunities, that offshore wind could offer.

Photo: Vineyard Wind

Offshore wind presents a wide variety of job opportunities for Maine, in services ranging from surveying and permitting to manufacturing, construction, and installation. Developing a world-class workforce is essential to ensure that Mainers get the maximum benefit from the advancement of offshore wind.

Offshore wind offers Maine a chance to grow and diversify its economy, create and sustain family-supporting jobs, improve economic resilience, expand economic opportunity, and create a culture of innovation that serves as a foundation for national and global leadership in this growing industry.

Harness Renewable Energy

- The Gulf of Maine has some of the highest sustained wind speeds in the world.
- Offshore wind energy potential is highest in winter and strong in the evenings when the sun isn't shining, offering an abundant source of clean energy when Maine's energy needs will be greatest.
- Offshore wind costs are projected to decline over the coming years, providing greater benefits and lower energy costs for communities, consumers, and the economy than fossil fuels.
- As offshore wind advances, a greater percentage will be floating. Maine has an opportunity to set the global standard for responsible development of floating offshore wind.

With Maine's extreme reliance on fuel oil and kerosene for home heating, and Maine and New England's overall over-reliance on natural gas to generate electricity, Maine faces unique challenges and opportunities that can be addressed by clean energy. Offshore wind is one of multiple renewable sources needed to meet Maine's clean energy goals and energy needs going forward.

- New England is overly reliant on natural gas to generate electricity, and, particularly in densely populated areas, to heat buildings (Figure 1 below). New England's dependence on natural gas is currently causing electricity rates to increase across the region, including in Maine.
- Maine is the most heating fuel-dependent state in the nation, with nearly 6 in 10 homes heated by oil or kerosene, which contributes to residents spending more than $4 billion a year to import polluting fossil fuels. Electrifying home heating with heat pumps will reduce our reliance on oil and is a cost-effective strategy for consumers.

Maine and neighboring states in the region have the chance to reduce fossil fuel reliance, provide price stability, add new generation sources, and embrace renewable energy's economic and environmental opportunities for our future. The New England states are moving to substantially reduce carbon emissions from the electric, heating, and transportation sectors, setting aggressive targets to increase clean energy resources and reduce greenhouse gas emissions 2050.

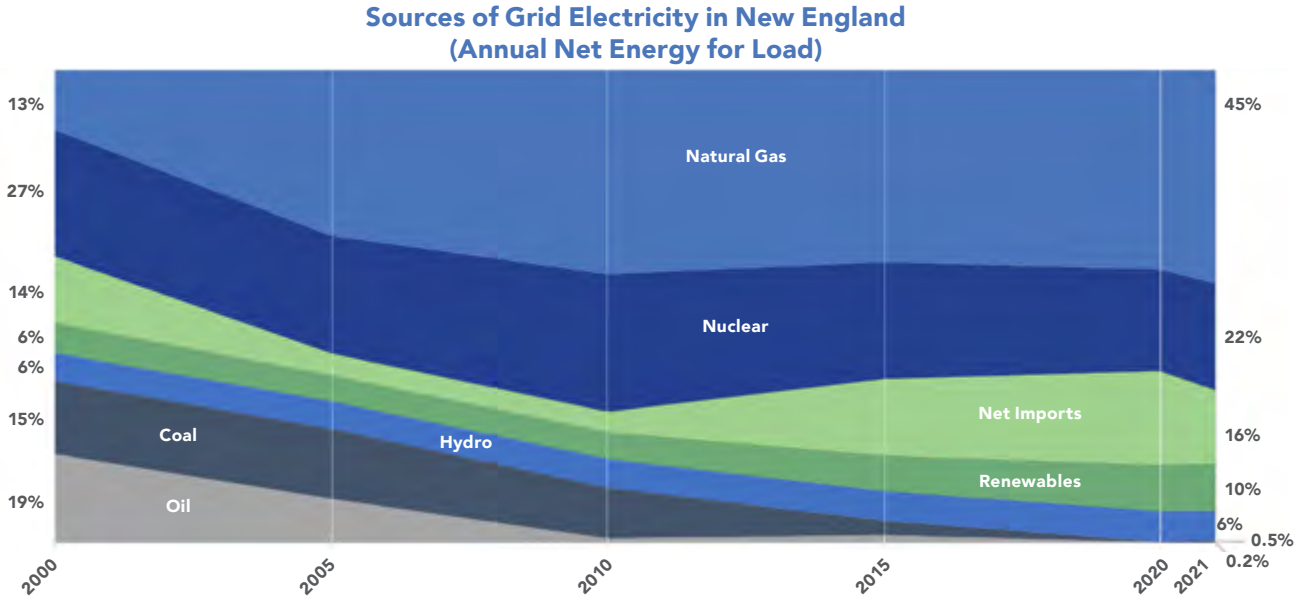


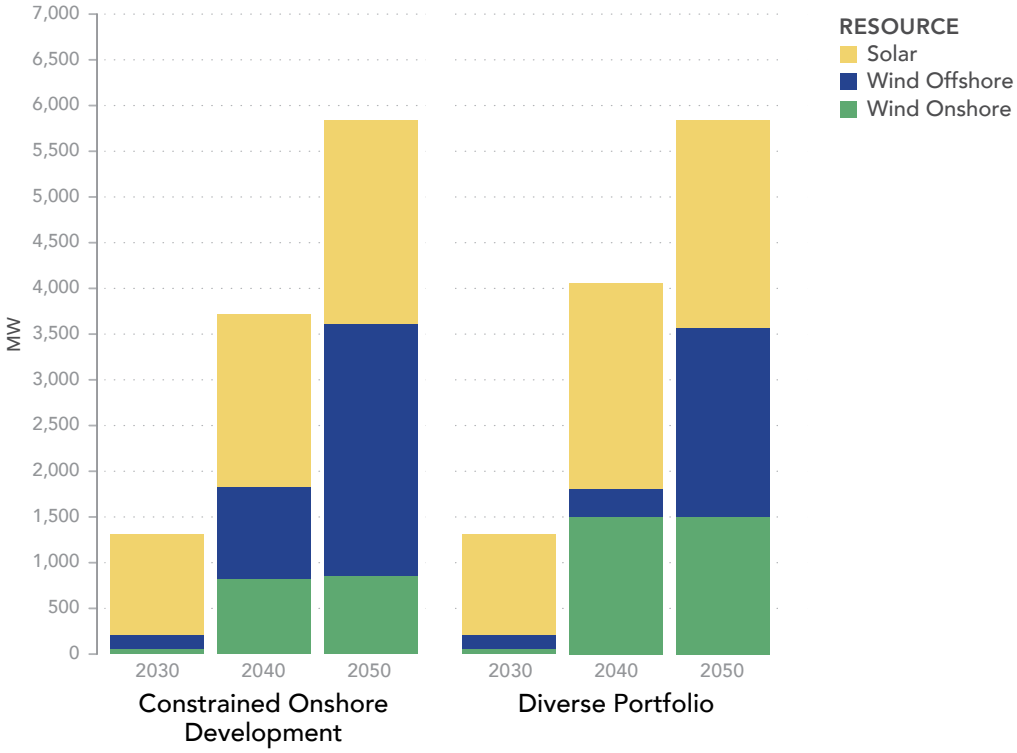
Figure 1: New England: Percentage of Total Energy by Resource Type (ISO-New England)

To achieve those ends, Maine will need to:

- Reduce our reliance on fossil fuels, primarily through the electrification of heating and transportation.
- Expand a diverse mix of clean energy resources, including offshore wind, to meet growing electricity needs and provide stability, independence, and resilience in our energy systems.
- Advance innovative energy storage solutions to balance the grid, decarbonize sectors that are difficult to electrify, and cost-effectively achieve clean energy targets.

Offshore wind is a critical part of Maine and New England's long-term energy needs. Maine's requirements, passed with bipartisan support by the legislature, will necessitate substantial new renewable energy resources in the coming decades, both onshore and offshore in the Gulf of Maine. DNV, a global consultancy, conducted an energy needs assessment for the state and the region for the *Roadmap*, looking at various energy demand projections and varying constraints of onshore resources to meet the increased demand. Based on this assessment, it is highly implausible that Maine will be able to achieve its future energy requirements using solely onshore renewable energy sources. DNV projects that Maine will need 2.1 to 2.8 GWs of offshore wind by 2050.

DNV conducted similar analysis of new renewable energy resources needed for the New England region. The results range from needing 3.4 GW to 11.9 GW of new offshore wind from the Gulf of Maine to support the region's goals, depending on energy needs projections and the constraints put on developing resources onshore. Under a diverse portfolio scenario with onshore renewable development constrained to 3 GW,



Maine Renewable Energy Needs (in MW) in Two Scenarios from DNV Technical Analysis

Figure 2: Under a Constrained Onshore Development scenario, the broad range of projects currently under development are completed, after which the volume of new onshore resources is constrained. Under a diverse scenario, the state continues rapid deployment of onshore resources, including moderate additional onshore transmission and associated land use in Maine. A scenario in which Maine meets its energy needs without the development of offshore wind was considered, and ultimately found to be implausible.[13]

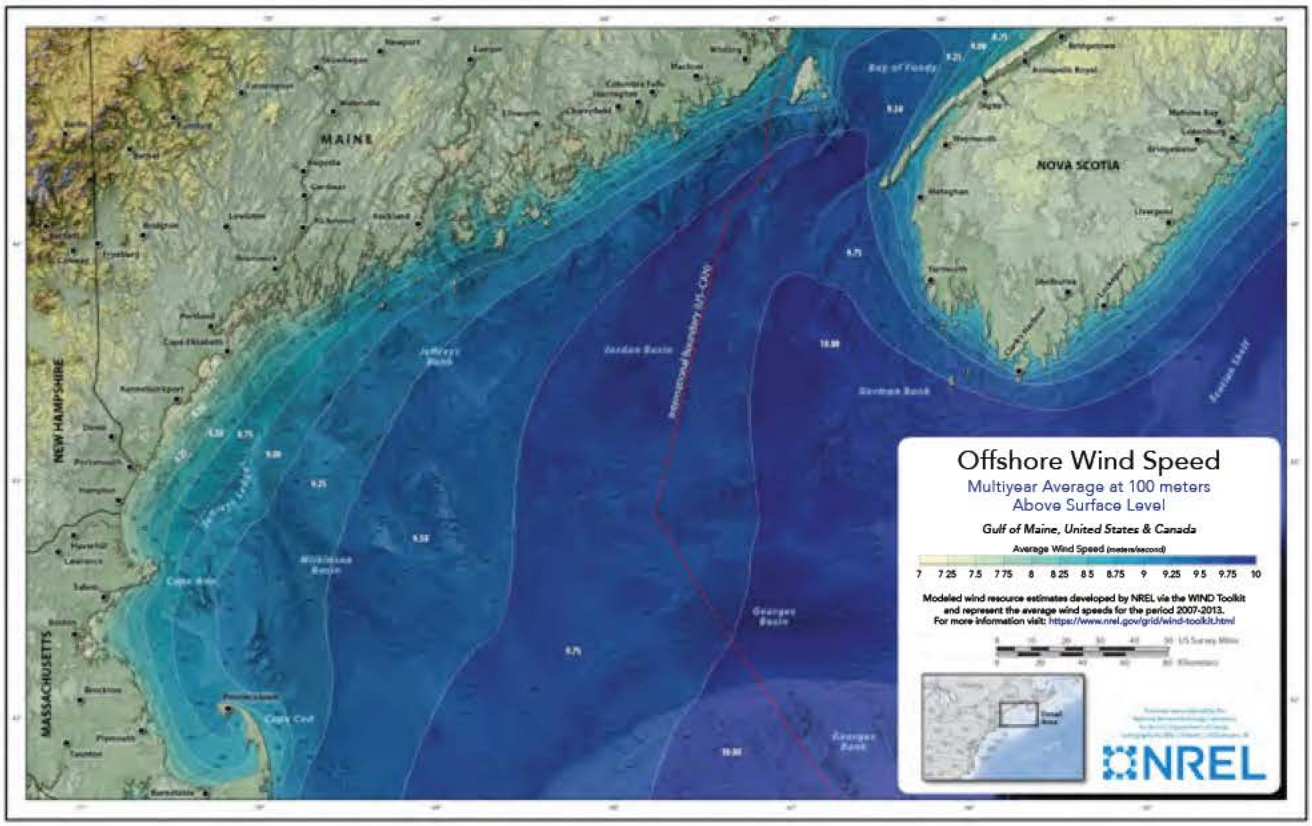


Figure 3: Offshore Wind Speeds in the Gulf of Maine at 100 m

New England will need an estimated 3 GW to 11 GW of offshore wind capacity by 2050 in the Gulf of Maine to meet both climate goals and projected demand for clean energy.

The Gulf of Maine has the highest, most consistent wind speeds of any area along the U.S. East Coast, representing the largest potential source of renewable energy for Maine and New England. In addition to this robust volume of available energy, offshore wind promises to deliver significantly higher production during winter months, which is when New England needs the energy most for heating. This transition can help insulate consumers from volatile fossil fuel costs. Offshore wind also complements other clean energy sources like solar, which decline at night.

Globally, offshore wind deployment continues at a rapid pace, with more than 50 GW installed worldwide, and the project pipeline—which more than doubled in 2021 alone—is over 360 GW. As fixed-foundation technology advances worldwide, the cost of energy also continues to decline.

Given the water depths of the Gulf of Maine, offshore wind development is best served by floating platform and turbine technology.

Although few offshore wind projects currently use floating turbines, and none yet at commercial scale, the volume of floating offshore wind planned worldwide has more than doubled over the last 12 months, from 91 gigawatts to 185 gigawatts (from 120-230 projects). This pipeline is likely to grow as countries around the world look to increase renewable energy and improve energy security.

Like other renewable energy resources, as the technology advances and economies of scale grow, costs will decline rapidly. According to DNV, while floating offshore wind is presently more expensive than fixed-foundation offshore wind developments, the cost of energy from floating offshore wind is projected to become as low as $0.039/kWh by 2050, a decline of nearly 80 percent.

Three new demonstration and pre-commercial floating offshore wind farms came online globally in 2021 bringing the global total to nearly 125 MW. There are currently several other pre-commercial floating offshore wind projects under development in the U.S., including the 1-turbine New England Aqua Ventus demonstration project in Maine, and the proposed 10-12 turbine research array—a 10 MW development proposed in Massachusetts as part of the Mayflower Wind project. Commercial floating offshore wind leases have been awarded off California and are likely to be developed in the coming years.

By 2050, offshore wind costs will be half of what had been predicted earlier in 2015. Over time, the cost difference between fixed bottom and floating wind is anticipated to narrow.

Strategic public policy and investment leadership can help accelerate cost reductions and maximize domestic and local economic potential. States along both coasts have set ambitious offshore wind targets, which are creating greater market certainty and driving investment. At the federal level, the Inflation Reduction Act provides $369 billion toward energy security, carbon emissions, and climate resiliencies, including investments in offshore wind and transmission. The Bipartisan Infrastructure Law provides $58 billion towards clean energy generation, manufacturing, and workforce, as well as efficiency and weatherization, and an additional $450 million for port infrastructure development programs. In September 2022, the federal government announced a Floating Offshore Wind Earthshot initiative, which includes a floating deployment goal of 15 GW by 2035 and significant investments in R&D, engineering, and manufacturing to reduce costs by 70%.

Maine has a long history of actively engaging in the development of offshore wind as a viable alternative to fossil fuel generation and in addition to supporting onshore renewable resources. Maine has done this through its demonstration projects, investments in R&D, and commitment to research that will ensure floating offshore wind is advanced responsibly.

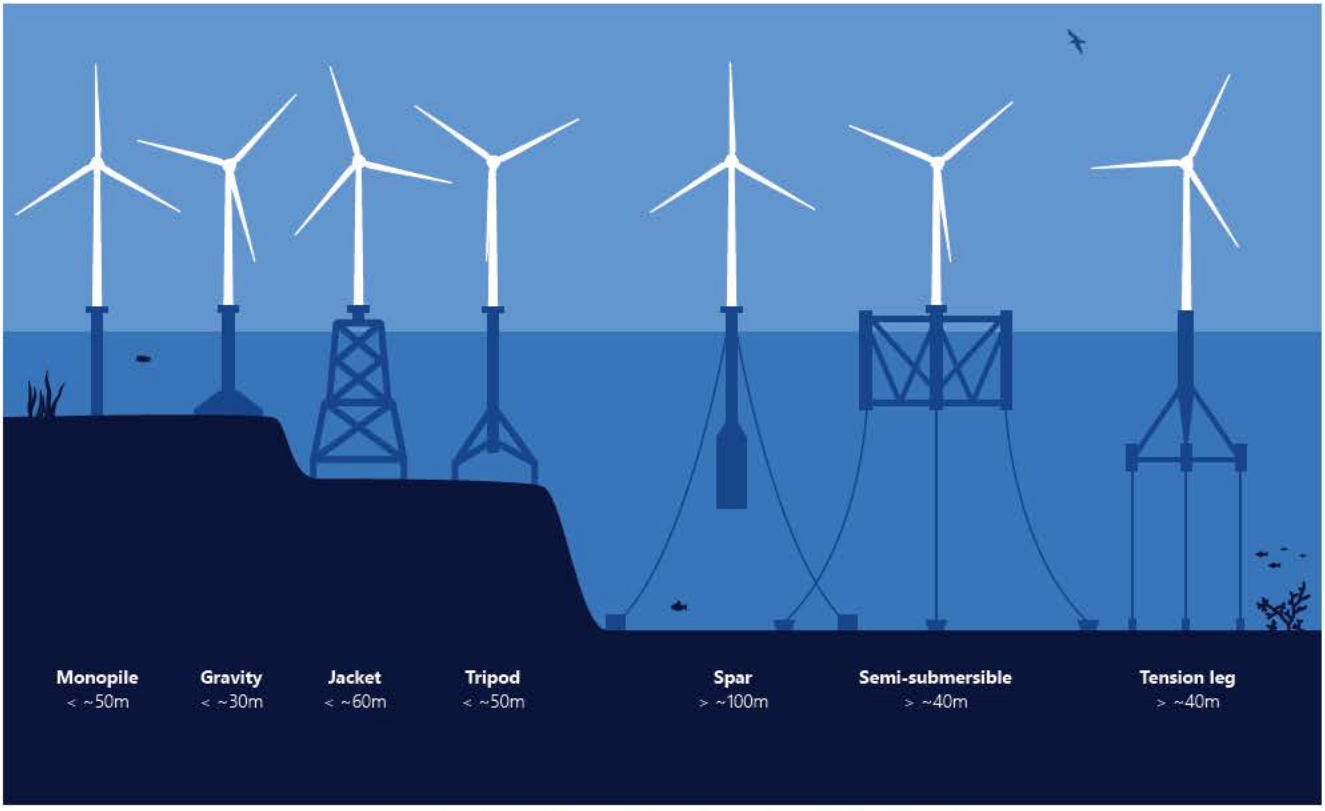


Figure 4: Offshore Wind Foundation Types. Credit: DHI

Portland Pier, Portland, ME, inundated with water during a King Tide event in July of 2022
Photo Courtesy Gulf of Maine Research Institute

Fight Climate Change

The effects of climate change are being felt throughout Maine, including more frequent severe storms, altered seasons, increased public health concerns, and damage to vital ecosystems and infrastructure. In February 2022, the Gulf of Maine has its second-warmest year on record—next only to 2021—and remains one of the fastest-warming ocean areas in the world. Rising sea levels and increasing storm events associated with climate change are threatening the future of Maine's coastal communities and maritime industries, with studies estimating that rising sea levels could cause billions in damage to Maine's coastal infrastructure in the coming years. Maine's inland communities are seeing warmer winters, drier summers, and an increased incidence of powerful storms that cause damage to vital infrastructure and the economy.

Increasing renewable energy is part of Maine's strategy to reduce fossil fuel emissions (a leading cause of harmful greenhouse gases that cause climate change) and the primary objective of *Maine Won't Wait*, the state's four-year-plan for climate action released by the Maine Climate Council in December 2020.

Offshore wind is one of multiple sources of renewable energy that are needed to reduce emissions to meet the state's climate goals and help slow the pace of warming. With bipartisan support of the Maine Legislature, in 2019 Governor Mills enacted legislation to require 80% of electricity consumed in Maine to come from renewable sources by 2030, with a goal of 100% by 2050. In February 2023, Governor Mills announced her intention to accelerate meeting Maine's goal of 100% to 2040, joining just six other states with goals of 2040 or earlier. This acceleration was proposed, in part, to contribute to the state's efforts to reduce fossil fuel use.

Governor Mills has also enacted, again with bipartisan support, greenhouse gas emission reduction requirements of 45% below 1990 levels by 2030 and 80% by 2050. To meet these ambitious goals, Maine must find ways to further decarbonize its energy grid, maintain its nation-leading pace of electrifying home heating and cooling—as signified by more than 82,000 new heat pumps installed since 2019—and make strides to reduce emissions from transportation by expanding the use of electric vehicles, public transit, and more.

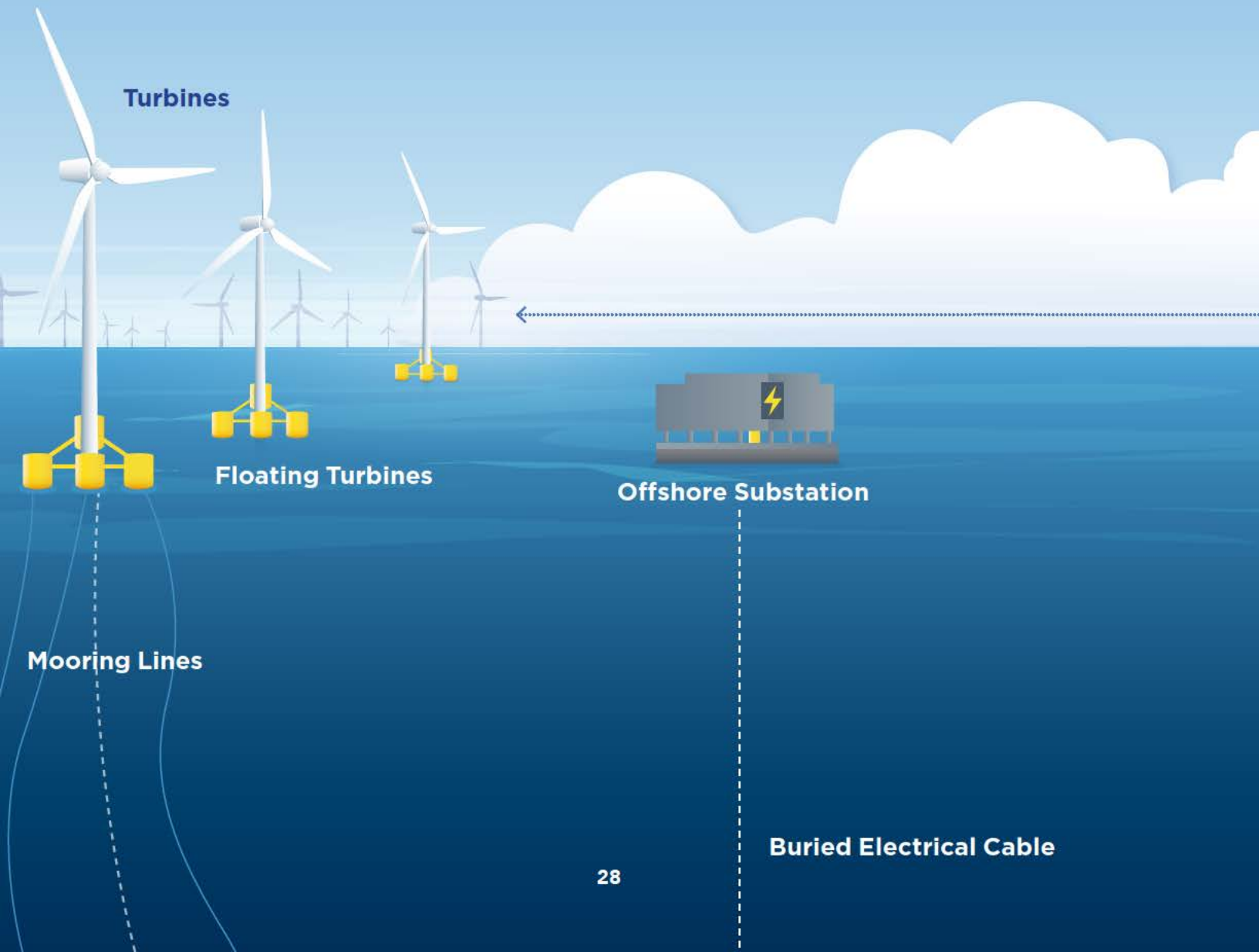
Increasing Maine's supply of renewable energy—from multiple sources, including offshore wind—also aligns with studies from Maine Won't Wait that forecast electricity demand in Maine to approximately double by 2050, as the transition to electric heating, cooling, and transportation advances. This transition to clean technology—known as beneficial electrification—will depend on the availability of abundant renewable energy.

According to studies conducted for the GEO, clean energy will be needed to power those electrified sectors to reduce our reliance on the fossil fuels that determine regional energy prices, and to help our region reduce greenhouse gases to contribute to the global fight against climate change.

How Commercial Floating Wind Farms Would Work

Floating wind turbines are configured in an array to optimize the capture of wind energy and other requirements.

Energy captured by the turbines is conveyed through a transmission line to likely a floating platform substation for commercial projects.



A buried transmission cable transmits the power from the floating substation to the shore, where it is connected to the existing onshore electrical grid.

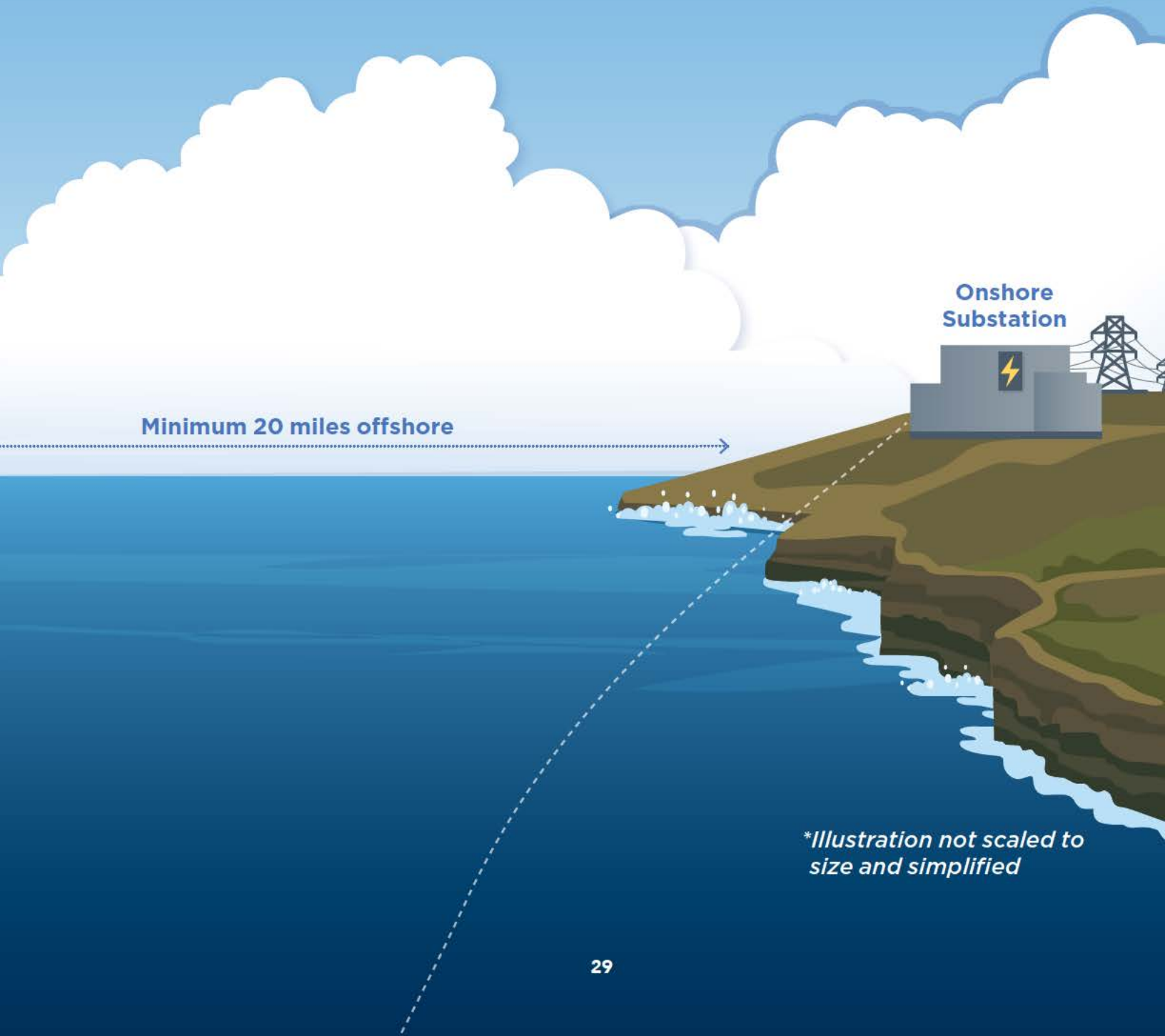


*Illustration not scaled to size and simplified

Maine's Commitment to Responsible Offshore Wind

Responsible development requires avoiding or mitigating potential impacts on communities, maritime industries, seafood harvesters, and the abundant wildlife that share this body of water that is at the heart of Maine's identity. In developing the *Roadmap*, the Advisory Council and Working Groups worked with fishermen, scientists, and others to address important questions about how offshore wind can be compatible with the Gulf of Maine's remarkable ecosystem and its existing users.

The *Roadmap* expresses the State's commitment to responsible offshore wind with specific strategies and actions aimed at:

Preserving Maine's thriving marine economy.

The *Roadmap* calls for continued diligence in preserving and supporting our coastal economy and the thriving fisheries, working waterfronts, and tourism pursuits that define and sustain our coastal communities.

The *Roadmap* calls on the State to vigorously represent all Maine interests before regional and federal authorities responsible for permitting and siting, for instance by emphasizing the importance of prioritizing commercial wind development outside of areas that represent the majority of the fishing effort.

The *Roadmap* provides specific ways for the State and federal government to undertake active and direct engagement with Maine's fishing industry, and promote open, transparent, and comprehensive research and data gathering.

Protect the environment, wildlife & fisheries ecosystem of the Gulf of Maine.

Recognized as one of the world's richest ecosystems, the Gulf of Maine is home to more than 3,000 marine species and birds. This count includes more than 30 at-risk species, among them the roseate tern and the endangered North Atlantic right whale. Responsible offshore wind prioritizes the protection of sensitive marine habitats and endangered and threatened species. It maintains a healthy ocean environment for all ocean uses and users that depend on a highly productive Gulf of Maine ecosystem.

The *Roadmap* identifies the urgency of collecting high-quality, relevant data to guide future decisions, and offers specific actions to proactively reduce wildlife conflicts and minimize ecosystem impacts.

The *Roadmap* also recommends strengthening Maine's state policy framework, pursuing multiple funding opportunities and coordinating efforts with other states and regional and federal entities.

Preserving Maine's traditions & culture.

The *Roadmap* acknowledges the critical importance of offshore wind's compatibility with Maine's traditional culture—and calls for continued communication and cooperation with the communities, industries, and Native American people inextricably tied to the Gulf's resources, landscapes, and traditions.

Further, Maine is committed to working with Tribal communities to identify any submerged paleo-cultural landscapes in the Gulf of Maine as part of offshore wind planning.

The Federal Offshore Wind Leasing and Development Process

In federal waters, which start three miles offshore, the Bureau of Ocean Energy Management (BOEM) in the Department of Interior retains exclusive jurisdiction to lease energy developments, including offshore wind. This process takes several years and includes multiple decision gates and opportunities for stakeholder engagement. BOEM plans to hold a Gulf of Maine lease sale by the end of 2024 and has started the process of determining the appropriate areas.

The Gulf of Maine Intergovernmental Renewable Energy Task Force, convened by BOEM, serves as a forum to collect and share relevant information that would be useful during BOEM's decision-making process. The Task Force consists of state and local officials from Maine, New Hampshire, and Massachusetts, along with federally recognized Tribes and federal agencies.

The BOEM leasing process takes place in four main stages that stretch out over nearly a decade: planning and analysis to identify lease areas, leasing, site assessment, and construction and operations.

Commercial offshore wind leasing process announced for the Gulf of Maine:

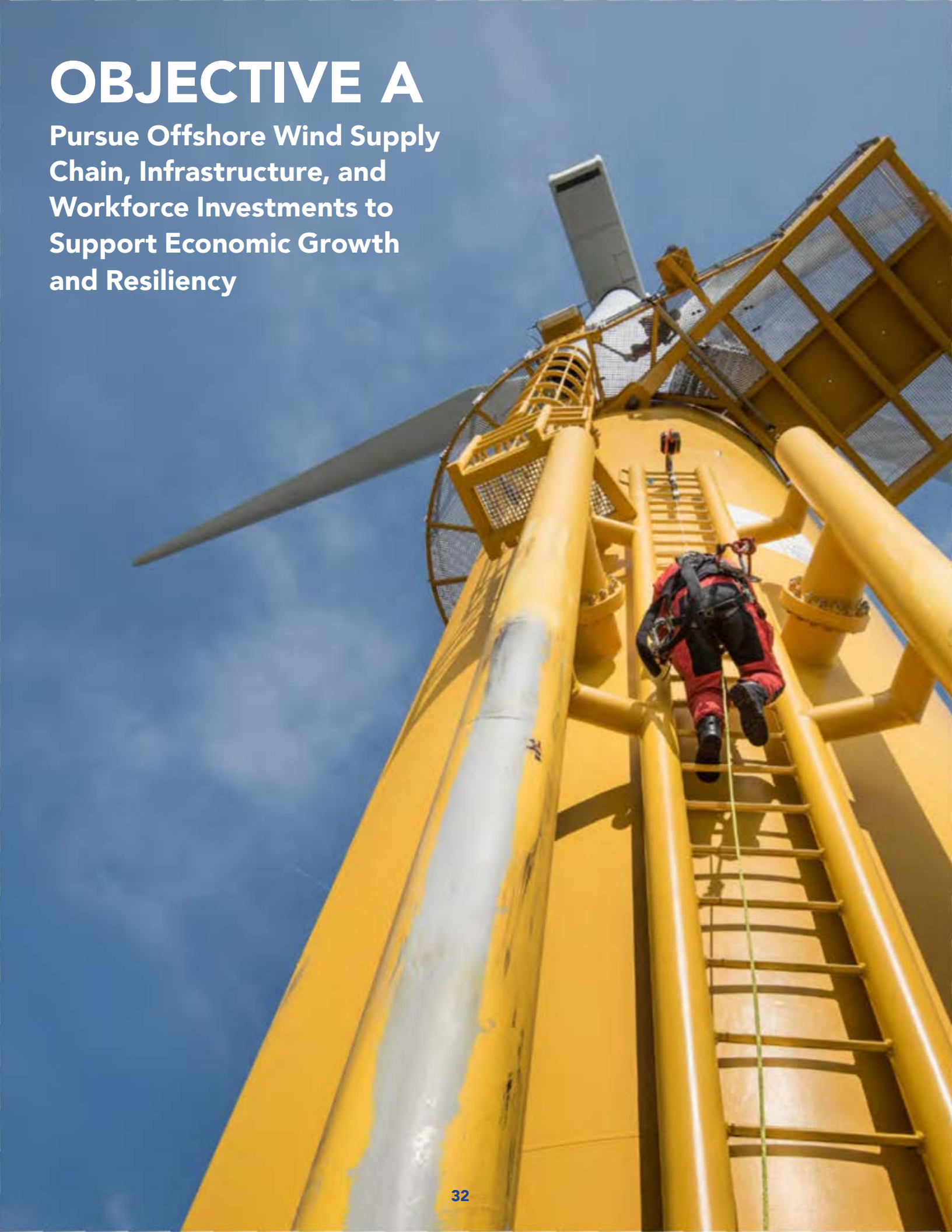
1. Planning and Analysis to Identify Lease Areas—Started with a large Request for Interest Area (Q3 2022), and currently winnowing to a smaller Call Area (Q1 2023), then reducing further to Wind Energy Areas (Q3 2023) and final identification of lease areas.
2. Leasing—BOEM aims to complete a lease sale in the Gulf of Maine in 2024. Recent BOEM leases have included new stipulations around engagement, local workforce and supply chain development, as well as community benefits agreements.
3. Site Assessment—After leases are issued, BOEM reviews and approves the developer's environmental site assessment, including scientific studies and monitoring studies.
4. Construction and Operations—Review of the developer's Construction and Operations Plan (COP), including an Environmental Impact Statement (EIS). Construction and operations of wind projects is not anticipated to begin in the GOM before 2030. *note that BOEM has recently proposed regulatory changes to its offshore wind program, which are not reflected here.

All of these steps present opportunities for Maine stakeholders to provide input and influence outcomes.

Visit boem.gov/renewable-energy/state-activities/maine-history to find current information about Gulf of Maine federal offshore wind activities.

OBJECTIVE A

Pursue Offshore Wind Supply Chain, Infrastructure, and Workforce Investments to Support Economic Growth and Resiliency



With its record of pioneering offshore wind innovation, proximity to the abundant wind resource of the Gulf of Maine, and a growing demand for clean energy across the region, Maine is poised to take a leadership role in a fast-growing offshore wind industry expected to generate as much as $1 trillion in worldwide investment by 2040. Offshore wind can spur economic growth throughout the State, including rural communities, communities undergoing economic transitions, and regions with limited economic development options.

With unique strengths to support the development of offshore wind in the United States, (such as innovation, workforce, wind resource, and deep-water ports), Maine stands to play a leading role in meeting the national offshore wind energy target of 30 GW by 2030 and the goal to deploy 15 GW of floating offshore wind capacity by 2035. This will allow Maine to secure some of the anticipated $109 billion in private supply chain investment, an additional catalyst that will be necessary to spur domestic port, vessel, supply chain, and workforce development (Figure 5). Furthermore, Maine has the opportunity to develop the nation's first purpose-built floating offshore wind port. Port capacity will be a crucial component of supporting projects throughout the Gulf of Maine as the industry expands, in addition to supply chain and component readiness.

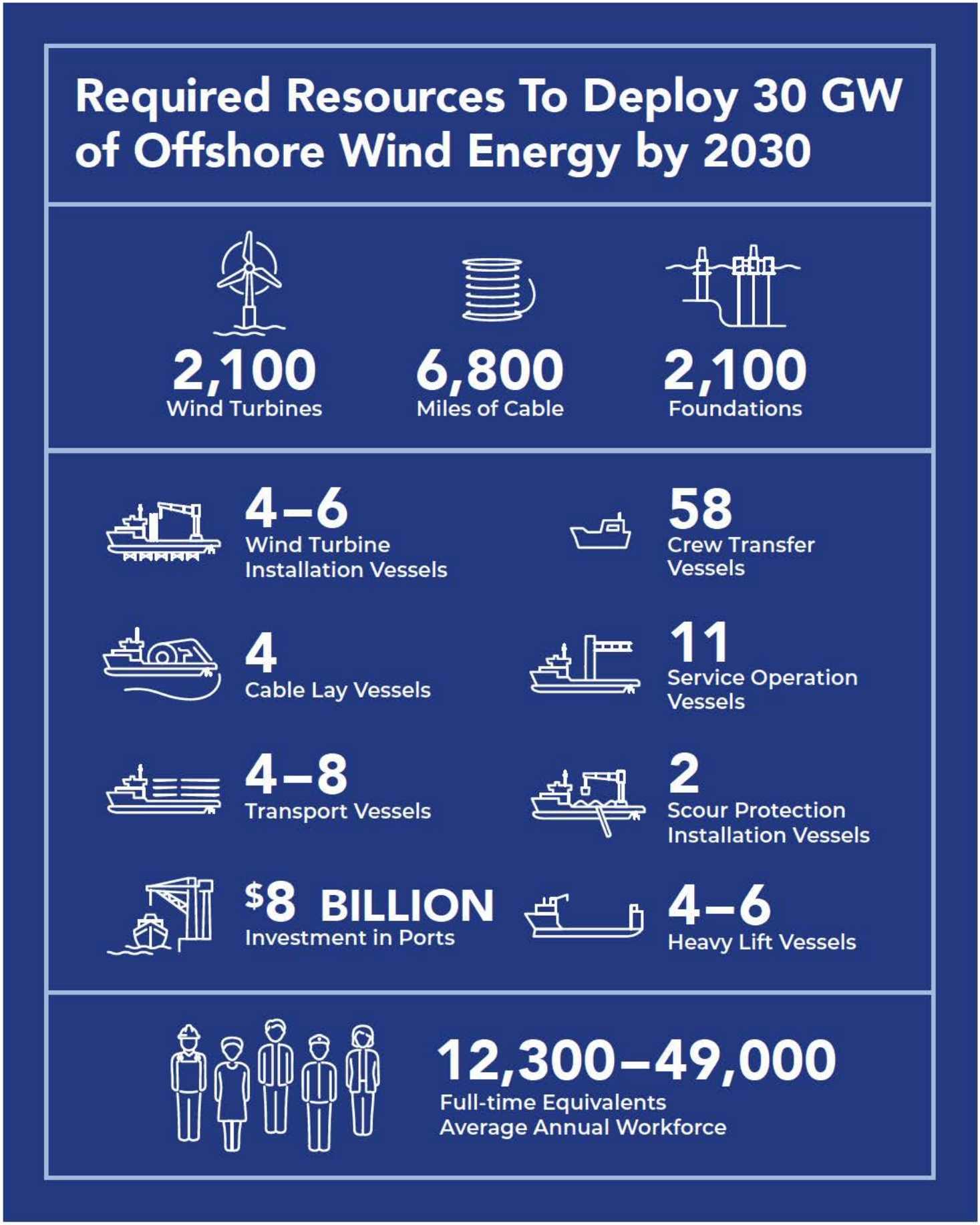


Figure 5. Supply Chain requirements for Deploying 30 GW of Offshore Wind Energy in the U.S. by 2030[14]

This investment also stands to the innovation occurring at the University of Maine. Over the course of the past decade, the University of Maine's Advanced Structures and Composites Center has completed in-depth, collaborative research and development in floating offshore wind Volturn-US hull technology, establishing a high level of technical readiness for commercial deployment.

The University, alongside private sector partners, the U.S. Department of Energy, the National Science Foundation, and the Maine Technology Institute, has successfully deployed the first floating wind turbine in U.S. waters at 1/8 scale, providing power for 18 months, and is currently planning a full-scale turbine for deployment in 2024. The State is also planning a small-scale floating Research Array to advance the University of Maine's technology and conduct important research to examine offshore wind's effects on Gulf of Maine fishing, wildlife, and ecosystems.

Along with the University of Maine's work, approximately 80 Maine companies and individuals are now engaging, or preparing to engage, in permitting, surveying, engineering, maritime operations, and other critical services to offshore wind projects around the world and growing this knowledge base in Maine. These projects will provide valuable experience to inform port, supply chain, and workforce development for future commercial offshore wind projects, while promoting adaptability to emerging technologies.

Figure 6: 80+ Businesses Across Maine Are Engaged or Interested in Offshore Wind

Unlocking the future potential of the offshore wind sector for Maine people will require leadership, support, and advocacy to fully advance regional, national, and global opportunities. A vibrant Maine offshore wind industry will also require workforce investments designed for the new occupations needed to support the industry's growing supply chain and infrastructure demands. To ensure long-term success, Maine must work diligently to ensure that those opportunities are available to all Maine people.

Supply Chain

Readiness for the offshore wind industry takes years. Significant lead time is necessary to plan and develop ports, help firms prepare to participate in the industry, and train a varied and essential workforce. With 12-13 commercial offshore wind projects expected to be under construction off the U.S. East Coast in 2025/2026—and a finite pool of supply chain, workforce, and infrastructure resources available—preparations for those projects must accelerate, and Maine can play an important role in this existing pipeline.

The offshore wind supply chain will involve a range of companies of all sizes to deliver products and services for offshore wind projects during every phase of project development. These project phases generally include siting and development, manufacturing, construction and installation, and operations and maintenance.

Key supply chain opportunities for Maine have been identified through opportunity analysis. They include environmental permitting and surveying, engineering and design, project management, onshore infrastructure construction, floating offshore wind components, secondary steelwork, moorings and anchors, cable protection systems and buoyancy, synthetic lines, Crew Transfer Vessels, and other professional services (Figure 7).

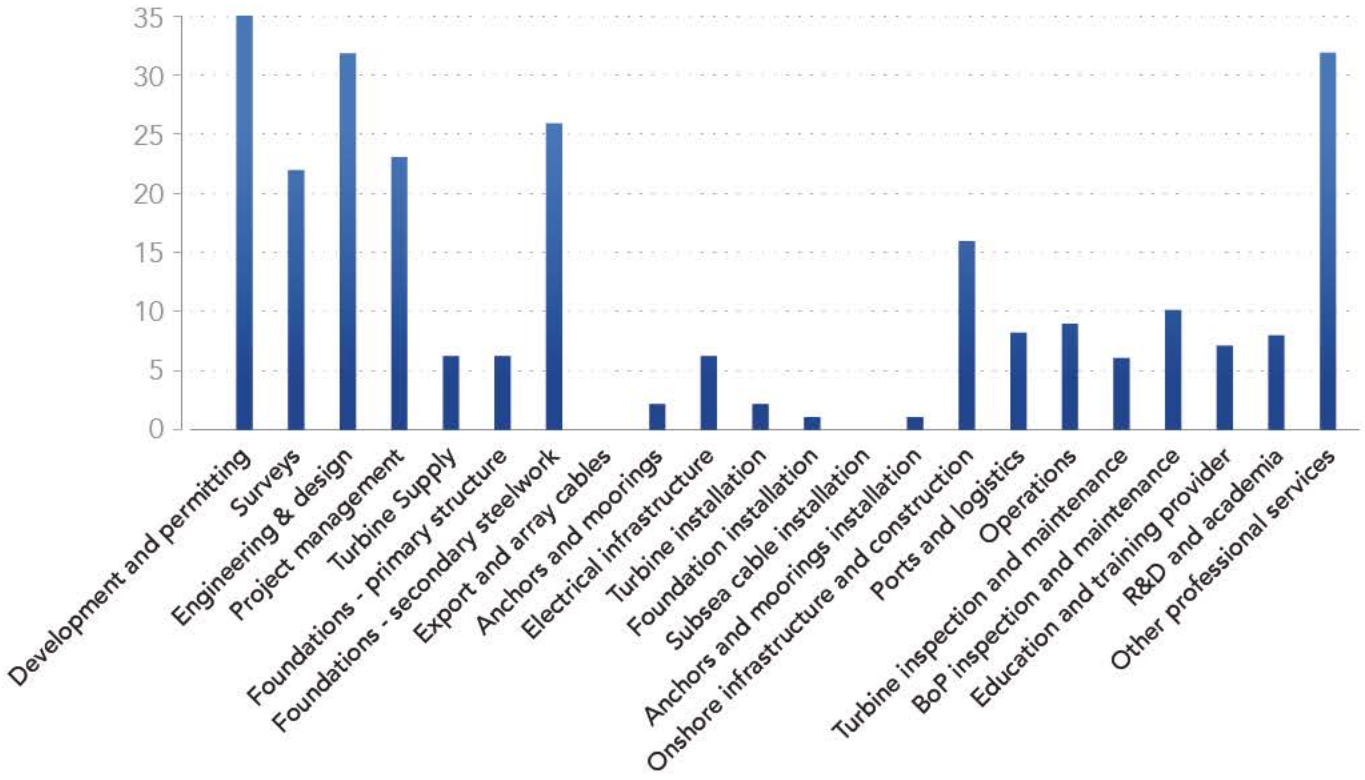


Figure 7: An Overview of Maine's Supply Chain and Workforce[48]

Workforce

Governor Mills has set a goal of 30,000 clean energy jobs in Maine by the year 2030—and the growth and development of offshore wind plays an essential role in attaining that goal. Through funding from the Maine Jobs & Recovery Plan and the Clean Energy Partnership program, Maine is supporting clean energy workforce development—and offshore wind can support these efforts by bringing clean energy career training opportunities to workers throughout the State, including in regions where job growth historically lags behind State averages.

Based in part on our abundance of marine-related industries, Maine's workforce already offers deep experience in surveying, permitting, marine monitoring, naval architecture, marine architecture, and benefits from the knowledge gained with floating offshore wind pilot projects over the last decade. As offshore wind development ramps up, workforce capacity in all those areas will face the need to grow—creating new, high-paying opportunities for interested workers throughout the State.

These opportunities will require increased commitment to job-specific training—an area where Maine also has deep experience. Throughout the State, training and registered apprenticeship[15] programs have helped to ensure the availability of qualified workers to accommodate growth and compensate for regular worker attrition (Figure 8). These programs may serve as models for new workforce training efforts. Relationships with regional training programs in neighboring states and Atlantic Canada can provide additional training opportunities.

From initial planning through commercial operation, industry estimates suggest that nearly 120 unique occupations play a role in the offshore wind development process across different phases.[16] The phases include:

Planning and Development. This phase of the offshore wind process typically requires two or more years, and based on U.S. averages is estimated to represent approximately 15% of the workforce required for a project. More than 75 occupations are involved, including engineers, financial analysts, lawyers, surveyors, and many more professions.

Manufacturing and Assembly. A multi-year stage of the offshore wind development process, this phase accounts for more than 40% of additional workforce demand. More than 70 careers are involved, including engineers, equipment operators, metal workers, assemblers, and administrative staff.

Construction and Installation. Spanning approximately five years and accounting for as much as 41% of the additional workforce needed, this phase requires the services of approximately 70 occupations, including mechanical engineers, welders, electricians, line workers, crane operators, and more.

Operations and Maintenance. A phase that spans 20+ years, this phase accounts for an average of 17% of increased workforce demand, and calls on more than 60 occupations, including administrative staff, wind turbine techs, marine operators, and plant managers.

Support Services. This phase involves approximately 20% of the additional workforce necessary for offshore wind project completion and support, calling on occupations including meteorologists, vessel mechanics, lawyers, policy experts, and more.

Utilizing the benefits of offshore wind for Maine requires an "all hands on deck" approach and represents a significant opportunity to create long-term, family-supporting jobs in the State, including for disadvantaged populations and communities. The Biden Administration has supported the role of labor unions in the burgeoning offshore wind industry in the United States, using mechanisms such as bidding credits or

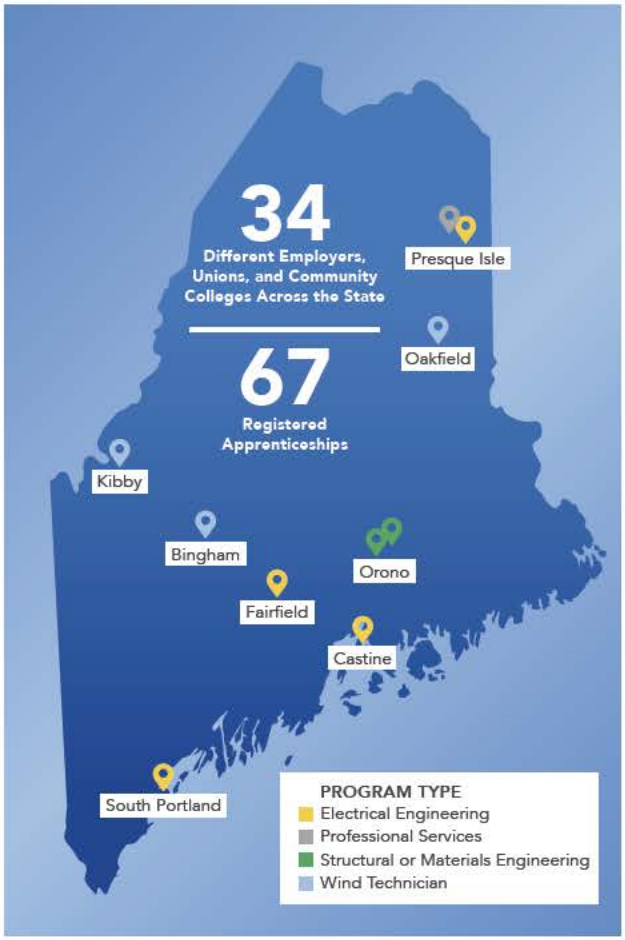


Figure 8

lease stipulations in federal offshore wind lease sales to encourage the development of a domestic workforce. The private sector and policymakers are working together to provide pathways to sustainable, well-paying careers. Some mechanisms used in other States include ongoing training, prevailing wage and benefits requirements, bidding credits to developers in exchange for substantive commitments to domestic workforce development and safety, and Project Labor Agreements (PLAs) for the construction phase. PLAs have been established for offshore wind projects in other states, and in Maine there are PLA provisions to be used to build Maine's proposed research array. However, Maine is a small business state, with limited workers represented by unions—particularly in the construction field. Broad and open discussion among many parties on the best approaches to provide long-term opportunities for Maine workers across the board is needed, with essential consideration of multiple mechanisms to develop and support talent in Maine. These conversations will continue in the coming months and beyond in Maine.

Training Tomorrow's Workforce: The Vital Role of Maine Maritime Academy

Maine Maritime Academy (MMA) and their Bucksport-based Professional Marine Development Center recognize the potential from offshore wind and are responding with essential training to prepare the next generation of skilled Maine workers to participate in this growing industry.

"We need to create the talents and skills to fulfill roles in offshore wind," says Dr. Kirk Langford, an Assistant Professor of International Business and Logistics at MMA. "Offshore wind will bring jobs and more general commerce to Maine. This is a huge opportunity for companies and workers in Maine to participate in the economy globally."

Langford's colleague, MMA Chief Operating Officer Craig Johnson agrees. "We see a strong long-term job market for people supporting and maintaining wind infrastructure once it's built. We're positioned to support the wind industry with everything from career training to certifications and licenses."

For Maine workers, offshore wind presents the opportunity to grow an industry-leading workforce—and to grow an economy that supports local communities by retaining critical talent and exporting both expertise and mission-critical products. "Offshore wind is not just about the Gulf of Maine," says Langford. We have the expertise to ship things out all around the world."

Infrastructure

Maine's deepwater port infrastructure gives it a strategic advantage for offshore wind. The predominant opportunity in Maine to support the installation of offshore wind projects is in developing port facilities for manufacturing, marshalling, assembly, and integration of components—particularly for floating offshore wind. As of this writing, there is no floating offshore wind port in the United States, despite 66% of deepwater U.S. offshore wind resources requiring floating turbines.[17] The unique characteristics of a floating project include the need for deep draft, large and level upland and quayside areas, no air draft restrictions, heavy loading capability, heavy lift land-based cranes, and proximity to installation sites.

Recognizing Maine's unique potential to become an offshore wind industry leader, the State has engaged in a series of studies to evaluate a carefully selected group of existing ports for their suitability to support offshore wind. The first of these studies, commissioned in 2020 with Moffat & Nichol, sought to evaluate the feasibility of using the Port of Searsport to service the offshore wind industry. The evaluation considered multiple terminal sites for either wind turbine generator marshalling or fabrication, for both fixed and floating foundation offshore wind turbines. The study's goal was to identify the best use for this port in servicing the wind generation industry, and to arrive at an estimated cost to adapt the port to service large-scale offshore wind farms.

Moffatt & Nichol then prepared infrastructure assessments that included conceptual layouts, preliminary concept designs, construction schedules, and estimates of probable cost. In addition, they completed a thorough economic analysis of selected sites using a model that incorporated potential revenue streams, terminal activity (staging or fabrication), and the required capital expenditure to generate a return on investment.

The State of Maine has assembled an Offshore Wind Port Advisory Group (OSWPAG) to serve as an advisory to the Maine Department of Transportation, the Governor's Energy Office, and other State officials regarding the development of a wind port that will allow Maine to realize the environmental and economic benefits of the rapidly developing offshore wind market in a way that reflects community values and minimizes adverse impacts. This OSWPAG process will provide the structure for a robust stakeholder and public communication process with respect to wind port development.

In addition to the Searsport study, a companion study on broader wind port needs in Maine is currently underway to analyze how other Maine ports, including the ports of Portland and Eastport, can play important roles supporting the offshore wind industry.

In addition to their direct impacts on the success of offshore wind development and operation, these specialized ports also act as economic engines for the communities and regions where they're located. At every level, global studies have demonstrated that local businesses benefit from offshore wind-related job growth, giving local and regional economies a boost—often in traditionally disadvantaged areas. These wind-related jobs could provide diversity and resiliency to fragile economies in rural communities that are heavily reliant on fishing or other natural resource-based economies.

Phases of Offshore Wind Port Development

How early investments in ports can create and expand economic opportunities for Maine communities and businesses

1. **Phase 1 – Planning:** Early investment in planning level activities will be necessary for government (municipal, state, and federal) commitment to a port development. Planning data and State energy policy will develop a need for an OSW port facility in this phase. In Maine, R&D work at the UMaine ASCC is included in this phase, which gives Maine a competitive advantage for floating OSW.
2. **Phase 2 – Development:** Determine the best ports suited for development of an OSW port facility and begin an analysis of these preliminary alternatives. Preliminary design, early environmental (NEPA) work, and public involvement occur in this phase. The State should also begin identifying potential federal fund sources.
3. **Phase 3 – Implementation:** A site is selected, and the project moves to final design and permitting. During this phase, local suppliers can also start to leverage local knowledge in new international markets/sectors and prepare for projects in the Maine OSW pipeline.
4. **Phase 4 – Operations:** Operations Plan (COP), including an Environmental Impact Statement (EIS). The OSW port facility is constructed and operational. As the OSW industry matures, multiple port facilities in various roles will be necessary to support projects in the Gulf of Maine and planning on those facilities should begin.

Supply chain, infrastructure, and workforce investment strategies

The following strategies reflect a recommended approach to accelerate pursuit of the supply chain, workforce, and infrastructure development necessary to seize offshore wind opportunity—and to realize its full potential. Informed by detailed research reports authored by globally experienced technical consultants, the strategies and their associated actions will position the people of Maine to share in the estimated $109 billion U.S. opportunity in private investment offshore wind development capital.[18]

Strategies

Strategy 1: Create abundant and accessible opportunities for Maine businesses

Strategy 2: Strategically invest in ports and manufacturing infrastructure

Strategy 3: Attract investment and workforce to Maine necessary to support the industry

Strategy 4: Ensure opportunity and inclusivity in Maine's offshore wind workforce

Strategy 5: Develop export opportunities and industry readiness for Maine businesses and research institutions

Strategy 1

Create Abundant and Accessible Opportunities for Maine Businesses

Maine businesses and research institutions must start preparing today to engage with the offshore wind industry in order to access current and emerging commercial export opportunities and support current demonstration and future commercial opportunities in the Gulf of Maine and beyond.

The Bipartisan Infrastructure Law, the Inflation Reduction Act, and the CHIPS and Science Act collectively provide unprecedented opportunities to support Maine businesses and workforce, particularly through developer and manufacturing tax credits, workforce development funding, and the cascading effects of adding new family-supporting jobs throughout the industry.

Supply chain readiness is essential to continued development of the offshore wind industry in Maine and beyond—and a growing list of Maine firms and individuals have been participating in the global offshore wind industry and adjacent industries for over a decade. When combining these firms with other businesses that are near-ready to engage, there are more than 80 Maine firms poised to take part in the offshore wind industry.[5] Bolstering their capacity and increasing that number will require significant support, which is achievable by leveraging existing programs, supporting growth in the broader clean energy economy sector, and developing new offshore wind initiatives. Such support for supply chain readiness can be in the form of public and private sector leadership, education and training, networking, financing, technical assistance, and promotion. This work will help to maximize the benefits of offshore wind throughout Maine, including firms and disadvantaged communities. Additionally, floating offshore wind should be prioritized as an emerging opportunity for Maine's supply chain and talent pool.

Offshore wind Crew Transfer Vessel (CTV) design [Image: SouthCoast Wind]

Offshore wind Service Operations Vessel (SOV) design [Image: Ørsted]

Maine's goal should be to support innovative companies in expanding into offshore wind, which in turn will enable those companies to offer sustainable, well-paying careers.

Photo: Sonya Legg, Princeton University

Biddeford's DeepWater Buoyancy: Local Expertise with Global Potential

David Capotosto founded DeepWater Buoyancy in 2013. Since then, the Biddeford company has built a global reputation for the design, engineering, and manufacture of sub-sea buoyancy solutions and employs a team of nearly 30 Maine-based professionals, many of whom have been on board since its earliest days.

As a longtime contractor for the offshore research, defense, and oil and gas industry, DeepWater's expertise has found a natural fit in the growing offshore wind industry, particularly as floating wind technology emerges. DeepWater developed specialized flotation technology to support conduits that carry everything from fluid conduits to comm and power lines between floating rigs and the seafloor—working in depths as great as 4,500 meters below sea level.

Today, Capotosto—who serves as not only president of DeepWater, but also its director of businesses development and director of quality—says the potential for offshore wind represents significant promise for many new, highly specialized job opportunities at DeepWater and continued growth for the Maine company.

"We're located in Biddeford, Maine and that's where we will continue to grow," he says.

Action: Establish public and private sector leads to shepherd and coordinate economic development programs for offshore wind over the long-term. This should involve a senior level State official or body to coordinate across State agencies and implement State-wide economic development programs for offshore wind. This should also be complemented by a private sector lead outside of State government that focuses on offshore wind business development, either through an existing or new initiative.

Action: Identify market opportunities in fixed and floating offshore wind through relationships, business intelligence, and market analysis building off existing work, the Maine Offshore Wind Supply Chain Opportunity Assessment, and associated technical reports.

Action: Continue identifying firms with existing and potential offshore wind market-readiness to fit those opportunities identified in the action above, including aviation support, vessel building, vessel retrofitting and maritime operations. Leverage Maine firms with deep maritime and defense-related industry experience and manufacturing to provide components for fixed and floating projects. Track and communicate with those firms via the existing Maine Offshore Wind Supply Chain Registry.

Action: With private sector partners, prepare offshore wind industry programming and services by identifying financial resources, creating resources for Maine firms that provide companies a line of sight into their future in the offshore wind industry, developing formal engagement pathways such as networking events, tailoring targeted services based on market readiness levels, developing capability audits, and identifying industry training resources to upskill Maine firms.

Action: Leverage Maine's two floating offshore wind demonstration projects (the New England Aqua Ventus single turbine in State waters and the proposed Research Array in federal waters) and apply supply chain lessons learned and relationships developed. Create business opportunities to provide knowledge and services developed during the demonstration projects.

Ironhouse: Taking Lewiston Talent Worldwide

Ironhouse Consulting is a study in entrepreneurship—and living proof that homegrown talent holds the key to Maine's prospects as a critical resource hub for offshore wind development. Founded by Brian Langlais in 2017, Ironhouse has become a recognized leader in utility engineering, field management, design, and regulatory compliance. Given the firm's commitment to careful, sustainable growth, it was only logical for Langlais and his team to gravitate toward the rich potential of offshore wind.

Working in partnership with Avangrid, Vineyard Wind is currently developing Vineyard Wind 1, the first phase of the nation's first commercial-scale offshore wind project. Vineyard Wind has retained Ironhouse to provide commissioning oversight for the offshore substation, wind turbine foundations, inter-array cables, wind turbine generators, and SCADA system.

"We're proud to be able to support this project and provide unique and exciting career opportunities here in the Northeastern part of the U.S," said Langlais. The Vineyard project highlights the importance of regional collaboration—and the opportunities offshore wind can bring to Maine workers.

Action: Provide financial assistance and tailored services to early-stage companies through offshore supply chain education and re-assessing early-stage companies for interest in the industry. Work with Maine's existing small business support network to assess small business needs and provide business technical assistance and training.

Action: Provide assistance and tailored services to market-ready and in-market firms such as raising industry awareness, assisting with business plans and gap analyses, and facilitating inclusion of Maine businesses in supply chain registries including, but not limited to, the Maine Offshore Wind Supply Chain Registry.

Photo: Vineyard Wind

Strategy 2

Strategically Invest in Ports and Manufacturing Infrastructure

Maine can secure offshore wind opportunities for the State, region, and nation by strategically investing in infrastructure, such as deepwater ports, manufacturing infrastructure for floating offshore wind and for major equipment for Wind Turbine Installation Vessels (WTIV), and a floating offshore wind innovation hub. Maine's port development efforts in particular have taken on pre-planning work in stakeholder engagement and thorough site selection review. Future work will involve lengthy processes such as coordinating efforts to secure federal funding and comply with associated requirements, State and federal permitting, and negotiations for potential land acquisition. Given the long lead time of infrastructure development, newly available federal funding, and new opportunities offered by the Bipartisan Infrastructure Law, the Inflation Reduction Act, and the CHIPS and Science Act, Maine's strategic infrastructure investments should begin now.

Action: Invest in a purpose-built deepwater port project in Maine to attract additional investment from the offshore wind industry sector and to drive local supply chain and workforce development. The Offshore Wind Port Advisory Group, which represents broad stakeholder interests, will advise the State of Maine on site selection and OSW port development. The State of Maine has also undertaken several studies, such as Maine Department of Transportation's Feasibility Study of the Port of Searsport, and has ongoing work related to opportunities for OSW port development coastwide.[19]

Action: Continue to collaborate with other States, jurisdictions, and developers to complete a coastwide port development plan and investment strategy, including Portland, Searsport, and Eastport, to meet the needs of the offshore wind industry.

Action: Ensure a stable and predictable investment environment for offshore wind projects by starting early permitting, environmental assessments, and robust engagement with fishing business, ocean users, and community stakeholders in potentially developable port sites along the Maine coast. (See Objective 2, Strategy 4).

Action: Pursue federal and private sector funding to establish a floating offshore wind fund to support additional infrastructure investment in Maine manufacturing and ports.

Action: Help secure additional resources to scale up manufacturing and supply chain infrastructure for floating offshore wind. Work with developers, OEMs, and higher tier supply chain companies to make investments in Maine.

Action: Foster partnerships with local governments and communicate directly about potential opportunities and impacts with inland and coastal communities through an ongoing engagement process to provide clarity, build capacity for engagement, identify local concerns and needs, and identify solutions. (See Objective 4).

Strategy 3

Attract Investment and Workforce to Maine to Contribute to the Infrastructure, Domestic Supply Chain, and Workforce Necessary to Support the Industry

Maine needs infrastructure investment and another 75,000 talented workers to realize the opportunities of emerging industries like offshore wind.[20] Maine can prepare for international offshore wind investments in infrastructure, supply chain, and workforce development by promoting Maine's considerable offshore wind assets as part of the larger regional context.

Action: Coordinate and collaborate with other New England states to catalyze efficient offshore wind investments and supply chain development, and to train and attract skilled workers.

Action: Attract international offshore wind investments in Maine through a communications and promotion strategy and an informational marketing portal for offshore wind development. The portal should highlight the Maine Offshore Wind Supply Chain Registry.

Action: Promote partnerships between Maine firms and international firms with complementary products and services to encourage investments in Maine.

Action: Explore the use of Opportunity Zones and Foreign Trade Zones to attract investments. Opportunity Zones are economically distressed communities, defined by individual census tracts, nominated by State Governors, and certified by the U.S. Secretary of the Treasury via his delegation of that authority to the Internal Revenue Service. Under certain conditions, new investments in Opportunity Zones may be eligible for preferential tax treatment.[21] Foreign Trade Zones (FTZs) are designated geographical areas where foreign and domestic goods are treated, for tax and tariff purposes, as if they had never entered the United States. FTZs are normally located near U.S. ports of entry.[22]

Action: Continue to implement existing Memorandums of Understanding with other nations, such as the United Kingdom, to expand relationships and information exchange on offshore wind and other renewable energies. Consider pursuing complementary strategic MOUs with other nations.

Action: Partner with State leaders to promote Maine's assets by identifying speaking opportunities for State officials and Maine companies with national and international audiences and meetings with international developers and all supply chain companies to develop networks and attract investments.

Strategy 4

Ensure Opportunity and Inclusivity in Maine's Offshore Wind Workforce

To meet the target of 30 GW of U.S. installed offshore wind capacity by 2030, average annual U.S. employment levels (full-time equivalent [FTE]/year) are estimated at between 15,000 (with a low level of domestic supply chain) and 58,000 (with a robust domestic supply chain). This estimate only includes the direct and indirect offshore wind jobs associated with offshore wind projects, excluding additional jobs in communities supported by offshore wind activity, also known as induced impact jobs.[23] The growing offshore wind industry is complex and requires talent from many different fields and backgrounds to successfully develop projects. Offshore wind provides family-supporting career opportunities in 117 different key occupations throughout the different phases of an offshore wind project.[24] Occupations fall into five general categories: development, manufacturing and supply chain, ports and staging, construction and maritime, and operations and maintenance. These occupations require talent with strong and diverse educational backgrounds—ranging from technical training to post-graduate degrees. Training and educational institutions, governments, labor organizations, private industry, and others are working to understand the workforce requirements of the industry and are expanding or developing programs to meet industry needs and provide opportunities for all.

Maine's current and future talent pools deserve long-term high quality career opportunities that can support families. Developing Maine's offshore wind workforce is an opportunity to put shared goals into action—goals such as safety, wellness, career advancement opportunities, continuing education, competitive pay and benefits. Maine's existing wind-related workforce is already strong due to Maine's decade of regional leadership in installed wind capacity, accounting for more than 1,300 jobs in 2020, or about 10% of Maine's clean energy workforce.[25] There are several key occupations and industries in Maine that are well-positioned to

provide services in and outside of the State for both fixed and floating activities. Maine also has existing talent advantages in surveying, permitting, marine monitoring, floating offshore wind engineering and design, and maritime training and engineering.[26] Maine's training providers are well-equipped in many regards, although specialized training in offshore wind-specific skills (like working at height at sea) will be needed. Floating offshore wind provides an opportunity to attract new talent and families to Maine, by expanding training programs and attracting companies to the State. Maine and partners can work to ensure disadvantaged populations and communities have access to career exploration programs, training and apprenticeship programs, post-secondary education, and career opportunities in the industry. Attracting new people to the State and engaging the underemployed Maine talent in education and training can also benefit other Maine industries with workforce shortages.

Action: Strengthen and communicate offshore wind career exploration opportunities for K-12 and Career and Technical Education (CTE) students, focusing on the advantages and gaps in Maine's current workforce. Ensure disadvantaged populations and communities have access to these career exploration programs.

Action: Increase offshore wind opportunities in Maine's postsecondary education by providing scholarships, supporting Maine post-secondary R&D to benefit the offshore wind industry in and beyond Maine, supporting and leveraging existing training programs—particularly for high-demand occupations, and for disadvantaged communities and populations —and attracting students/educators/and researchers to Maine (Maine Talent Analysis).

Action: Enhance, expand, and communicate offshore wind training and registered apprenticeship opportunities through public and private sector partnerships that involve trusted community partners, including small businesses, coordinating to ensure additive workforce development to benefit multiple industries, building

on U.S approved training standards that already exist (e.g., US Department of Labor), and ensuring Maine people can find and engage in workforce opportunities.

Action: Encourage family-supporting, high-quality careers for Maine workers and align with Federal workforce policy, including BOEM's recent lease stipulations, through efforts such as enhanced partnerships and ongoing trainings; prevailing wage and benefits requirements; union agreements (examples include,

> "The industry for offshore wind is so expansive. It is inclusive of categories from labor jobs to consultants to manufacturing to engineers."
>
> —Kim Fitzgibbons, Principal Consultant for NEPA & Permitting at Kleinschmidt Associates

but are not limited to, Project Labor Agreements, labor peace agreements or Memorandums of Understanding); health and safety protections; leveraging opportunities for Maine companies in cutting edge technologies such as robotics; and/or supporting Maine's engineering and professional services clusters.

Action: Promote equity in workforce development by addressing barriers to participation and supporting training opportunities by trusted community partners. Focus on communities meeting EDA's economic distress criteria, the Climate and Economic Justice Screening Tool criteria, or criteria identified by related tools, such as the Maine Social Vulnerability Index.

Offshore Wind: A New Direction for Maritime Education

After graduating Maine Maritime Academy and climbing the ranks of a company devoted to onshore wind development, Juergen Pilot brought his expertise back to the East Coast. Today, he's a Deputy Construction Manager for Avangrid Renewables in New England, where he's actively involved in planning and resource management for the company's planned eastern seaboard offshore wind arrays.

Juergen highlighted the industry's growing demand for skilled offshore wind staff—from engineers to maintenance technicians, and everything in between. "We hire contractors, who in turn hire more contractors, and so on," he says. "There are unique staffing needs at each tier. Our goal is to hire or contract local talent where available, and that is why industry-tailored education is so important."

Juergen acknowledged offshore wind's unique fit for Maine people—and the Maine economy. "Given the State's maritime legacy and related resources, Mainers have a unique opportunity to be successful in the offshore wind ecosystem, and to help expand it across the United States. The student body at Maine Maritime Academy is definitely open to the opportunity offered by this up-and-coming field." Accordingly, Juergen sees enormous potential for Maine's future.

The growing demand for skilled OSW talent highlights Maine's need to prioritize collaboration with schools like Maine Maritime Academy and the University of Maine to offer specialized curricula—so that today's offshore wind workforce training leads to tomorrow's local job growth. "Maine Maritime Academy offers a great education, but after graduation many of us have to leave Maine to find jobs in the industry. Offshore wind provides the opportunity to not only train talent in Maine but to keep that talent here through the creation of specialized industry support roles," Juergen says. "When offshore wind expands to the west coast and the Gulf of Mexico, I'd love to see them turning to Maine for services and expertise."

Strategy 5

Develop Export Opportunities and Industry Readiness for Maine Businesses and Research Institutions

The International Renewable Energy Association (IRENA) projects that 1,000 GW of global offshore wind installations will come online by 2050.[27] While the US-based offshore wind industry is poised for significant growth in the coming decades, offshore wind is a truly international industry. Efforts to identify domestic and global relationships and export opportunities for market-ready Maine businesses and research institutions should be pursued, while expanding the prominence of Maine as a global partner in the offshore wind industry.

Action: Identify export leads for market-ready or in-market firms through relationship building, training, and identification of market access opportunities.

Action: Promote partnerships between Maine firms and developers with expertise and global opportunities, such as the international companies and developers currently working in Maine and individuals working in the global industry from Maine, and with international companies with complementary products and services to expand export opportunities.

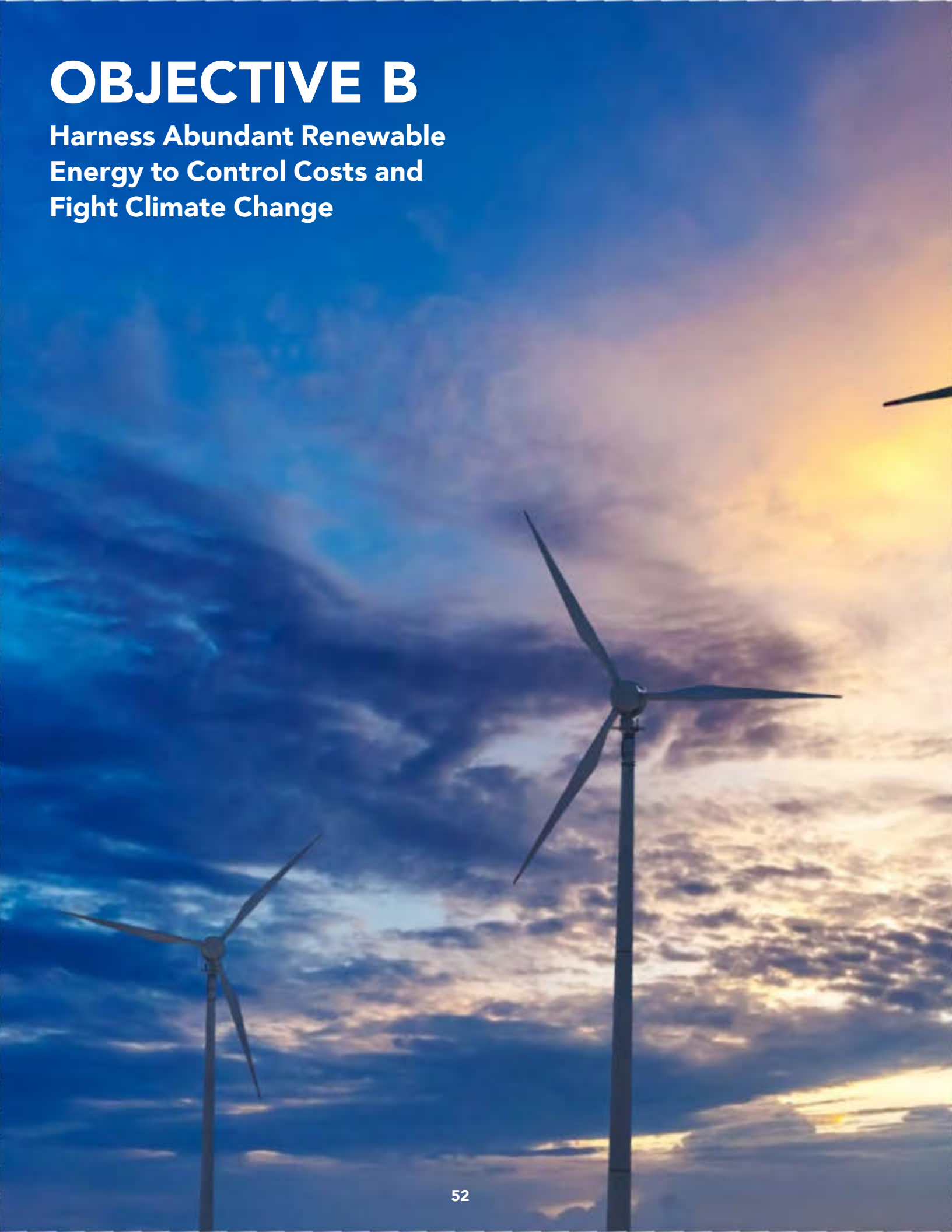
Action: Expand Maine's prominence in the international offshore wind industry, particularly with floating offshore wind, by exploring partnerships with international firms and industry associations, fostering relationships within industry innovation hubs, engaging with other State or national trade organizations, and identifying opportunities for new exports.

WILL SEDLACK
Political Director, Maine Conservation Voters

"Offshore wind will help Maine end its reliance on costly foreign fossil fuels while helping us protect a place that we love so much. This is a real opportunity to develop a thriving new industry that will bring benefits to the entire state—not just coastal Maine."

OBJECTIVE B

Harness Abundant Renewable Energy to Control Costs and Fight Climate Change



The Gulf of Maine's wind resource stands to play a critical role in meeting Maine's energy needs, allowing the State to reduce its dependence on costly, imported fossil fuels and meet its clean energy targets. The State of Maine has enacted one of the most ambitious renewable portfolio standards in the country, which calls for 80 percent of electricity used in the State to be from renewable sources by 2030, with an intention of 100 percent by 2040.[28]

Maine, other New England States, and the federal government are looking to offshore wind in the Gulf of Maine to reduce long-term energy costs, build price stability, and make significant progress to decarbonize our State and region's energy sector.

New England relies heavily on natural gas for power generation. In the winter, natural gas is also required to heat buildings, particularly in other New England States. The limited volume of natural gas available for delivery through existing infrastructure—which must be prioritized for heating needs—forces the region's electricity grid operator, ISO-New England, to deploy expensive and high-emissions oil- and coal-fired power plants and rely on imported liquified natural gas (LNG) to maintain the electricity supply.[29] Global events—such as Russia's invasion of Ukraine—upset world energy markets and cause significant price volatility. The effects in Maine are severe.

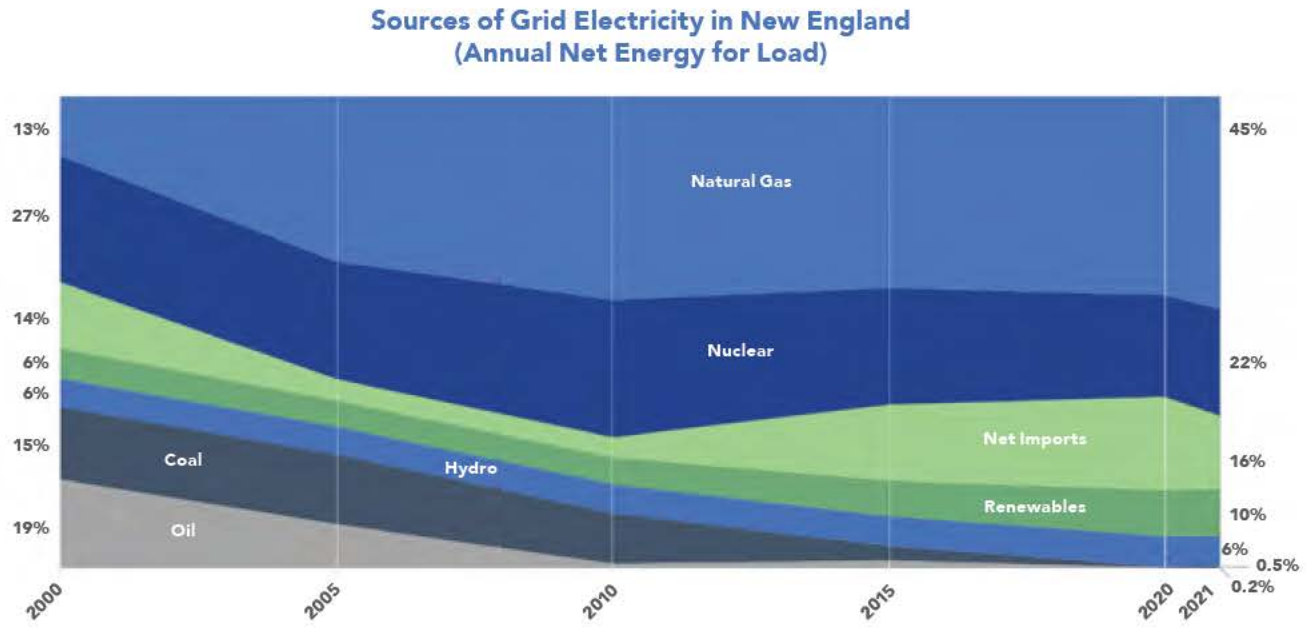


Figure 9: New England Percentage of Total Energy by Resource Type (ISO-New England)

By unlocking the robust volume of available energy in the Gulf of Maine, offshore wind can diversify and strengthen Maine's sources of clean energy. In contrast to other renewables, offshore wind offers much higher energy potential at night and during winter months, when regional electricity demand for heating peaks, because the strongest and most consistent offshore winds occur in winter.[30]

Demand for electricity in Maine is expected to double by 2050, as electrified technology for heating, cooling and transportation—such as highly efficient heat pumps, heat pump water heaters, and electric vehicles —continues to advance.[31] Deploying these innovative technologies – combined with a transition to renewable energy generation—is the key strategy reducing Maine's reliance on volatile energy markets and reducing greenhouse gas emissions, of which 91% are attributed to the combustion of fossil fuels.[32] Given increasing energy demands and the state of our energy infrastructure, Maine must plan for long-term energy needs by ensuring a diverse renewable portfolio that ensures electricity supply can meet demand.

A range of analyses for the *Roadmap* assessing the cost-effectiveness and feasibility of various high renewable-energy scenarios have repeatedly shown that offshore wind must be included for Maine to have a viable pathway to achieving its long-term renewable energy goal. To reduce our reliance on fossil fuels and meet growing energy needs with new renewable energy, Maine—with modest limitations to the amount of onshore renewable energy available—will need 2.1 to 2.8 gigawatts of offshore wind by 2050.[33] New England States will need even greater resources from the Gulf of Maine to meet their renewable energy requirements.

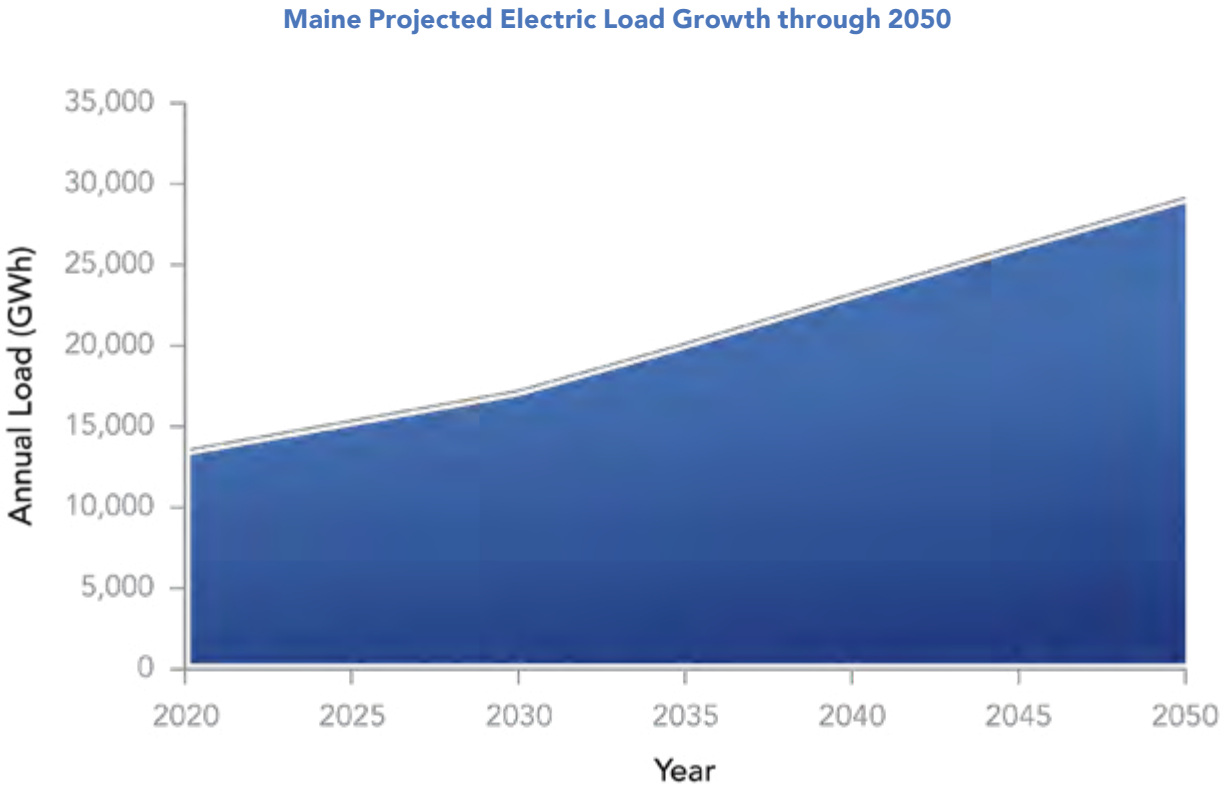


Figure 10: Electric sector load forecast developed for the Maine Climate Council's Electric Sector study. This study incorporates aggressive levels of transportation and heating electrification to meet Maine's climate goals. (Synapse Energy Economics)

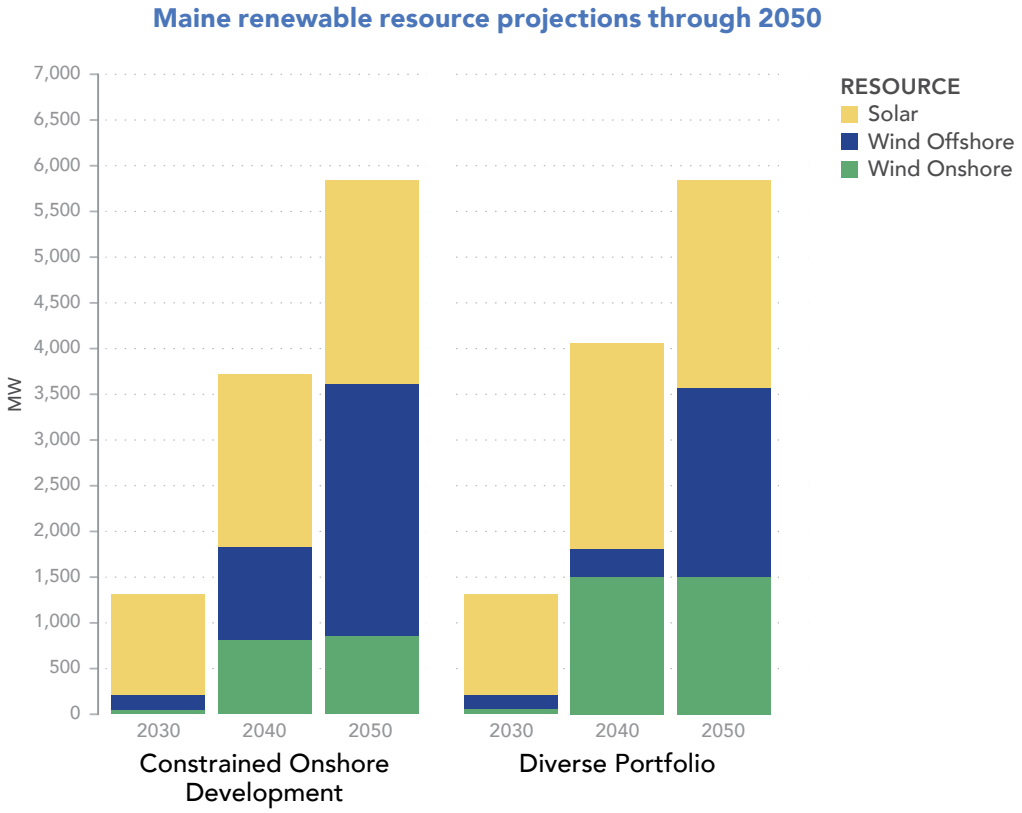


Figure 11: Maine Renewable Energy Needs (in MW) in Two Scenarios from DNV Technical Analysis [34]

Further, these analyses show that as offshore wind technology matures and is deployed at a commercial scale, its costs are projected to decline significantly—ultimately dropping well below comparable costs of fossil fuel-generated electricity.[35] Early testing and demonstration scale projects have confirmed this trend. Hywind Scotland, a 30-megawatt floating project located in the North Sea east of Aberdeen, Scotland, offers compelling evidence of this decline in cost. Since the full-scale project has come online, costs have dropped by 70% when compared to the reduced-scale Hywind Pilot project.[36] This trend has remained consistent as new offshore wind projects have come online, with floating offshore wind showing the greatest potential for significant cost reduction. Current studies predict that global floating technology costs will decline an estimated 37-49% with continued investments in research and development from the public and private sectors and commercially scaling the technology.[37]

Lastly, expanding transmission capacity is a component of advancing offshore wind and other renewable energy in Maine. The State is now working proactively at the regional and national level to pursue transmission planning and infrastructure solutions that leverage federal dollars, minimize impacts, and allow Maine to effectively unlock its available renewable energy resources.

Transmission Planning

As Maine and the region advance offshore wind, the infrastructure required to efficiently deliver power generated offshore to end users onshore is key to the success of future projects. The region is well positioned to proactively plan for optimal transmission siting and configuration for future offshore projects that would avoid individual radial cables for each project.

Studies are ongoing to assess various aspects of transmission infrastructure to deliver offshore wind energy to Maine and the region, including policy options such as coordinated onshore and offshore transmission infrastructure. Regional coordination is key in ensuring development is cost-effective and minimally impactful, and the State continues to pursue Maine's interests with regional partners. Coordinated transmission planning is complex but can provide an opportunity to strategically develop offshore wind in the Gulf of Maine. These efforts will take place over the coming decades, leveraging long-term planning strategies to identify best practices to reduce costs and impacts.

Transmission Planning

Interconnection

Identifying preferred sites, or points of interconnection (POI), where cables carrying energy from offshore wind generation connect to the power grid should consider multiple factors, including existing capacity, distance to future offshore wind leases, existing users, and environmental impacts. Typically, individual projects land their own cables ashore, leading to competition for ideal POIs and numerous radial connections, though not necessarily leading to the most efficient use of available connections. While it is acknowledged that first generation projects may be developed in this manner, proactive planning and coordination is needed to ensure that future development is done so efficiently while appropriately balancing the multiple factors at play.

Performance

An important goal of transmission planning is to minimize congestion from sudden injection of offshore wind power, and to avoid unnecessary onshore upgrades from inefficient siting. Innovative solutions are also considering offshore grid configurations that merge the output of multiple projects through a centralized connection and deliver power using fewer onshore landings. The U.S. Department of Energy's Atlantic Offshore Wind Transmission Study will assess multiple offshore transmission configurations to maximize reliability and benefits of offshore wind, while minimizing costs and impacts on existing users. Innovative emerging technologies can provide additional value to the power system, such as helping to stabilize voltage or restore sections of the grid in the event of a blackout.

Coordination

The State has jurisdiction within three nautical miles of shore with existing permitting processes for undersea cables, while BOEM has oversight for transmission offshore through its authority to grant easements for offshore lease areas. Early coordination with State agencies and regional entities to gather accurate and up-to-date spatial data is key for the responsible siting of these landings. The State will continue to build on relationships with a wide range of partners to provide the information necessary to minimize disruptions to wildlife and fisheries wherever possible and encourage BOEM to apply similar best practices in federal waters. The State continues to advocate for Maine's priorities with federal agencies and as regional grid operators, including ISO-NE, to embark on long term resilience planning, and to monitor developments in multi-state action across the country. The State is also actively working with other coastal New England states to engage stakeholders to inform transmission infrastructure investment, including strategies for integrating offshore wind generation and opportunities to leverage federal funding.

Strategies

Strategy 1:
Establish State floating offshore wind procurement coordinated regionally to achieve cost-effective deployment

Strategy 2:
Pursue regional transmission strategies

Strategy 3:
Ensure stable and predictable investment environment

Strategy 4:
Advocate for federal leasing mechanisms that support Maine's goals

Photo: Principle Power

Strategy 1

Establish State Floating Offshore Wind Procurement Coordinated Regionally to Achieve Cost-Effective Deployment

The Governor's Energy Office will continue to work with stakeholders, and in coordination with other State entities, to determine Maine's optimal procurement target and strategy, including phased commitments that address a meaningful percentage of Maine's electricity needs by 2050 and advances Maine's renewable energy goals. This procurement authorization should be put in place in advance of BOEM's scheduled lease sale in the Gulf of Maine, currently expected in 2024, to effectively position Maine for future investment in the state. This effort should include the identification of best practices from other jurisdictions and consider joint efforts with neighboring States. In addition, regional efforts to enable clean energy deployment through regional market reforms have the potential to influence the pace and scale of deployment. In at least eight other East Coast States, an offshore wind electricity procurement has served as a primary driver of investment and led to cost-effective results. Predictable, established, and competitive procurement processes provide the certainty needed to attract cost-effective offshore wind development. The State's procurement process for energy can also provide a mechanism to shape the development of offshore wind energy to protect our natural resources, fishing industry, economic development, research, equity, and innovation.

Action: Develop a responsible procurement target and strategy, using methods such as Offshore Renewable Energy Credits (ORECs) or long-term Power Purchase Agreements (PPAs), that pursues phased offshore wind development commitments for a meaningful percentage of Maine's electricity needs by 2050.

Action: Explore additional mechanisms to deliver affordable and cost-effective floating offshore wind. This includes consideration of pursuing offshore wind through the Renewable Portfolio Standard (RPS) requirements as well as pursuing joint or coordinated procurements with other New England States or entities, including timelines and requirements to phase these coordinated procurements to drive competition and reduce costs. Additionally, to take advantage of substantial interest of business to procure clean energy, explore ways to facilitate power purchase arrangements with business, institutional, and governmental entities.

Action: Phase-in procurements for capacity incrementally to take advantage of the declining costs and lower the average cost to Maine's consumers and businesses.

Action: Include realistic local or domestic content requirements that promote supply chain development and high-quality career paths, as well as best practice requirements to avoid or minimize impacts on ocean users, wildlife, and the environment.

Action: Develop a plan to pursue additional studies and necessary funding to address key knowledge topics, such as additional socioeconomic studies, equity and environmental justice considerations, and energy analyses around seasonal and hourly dispatch of floating offshore wind and how it interacts with demand load profiles.

Above Photo: Principle Power

Strategy 2

Pursue Regional Transmission Strategies

Maine will continue to collaborate with other New England States to explore coordinated approaches to offshore wind transmission, seeking opportunities to leverage shared objectives, efficiencies, and benefits. Through the *Offshore Wind Roadmap* process, GEO has engaged consultants to conduct an offshore wind transmission technical review, which included initial injection analysis to identify potential offshore wind interconnection points using data from ISO-New England. The State is actively working with other coastal New England States (including Connecticut, Massachusetts, New Hampshire, and Rhode Island) soliciting comments from stakeholders as a part of the New England Regional Transmission Initiative to inform transmission infrastructure investment, including strategies for integrating offshore wind generation and opportunities to leverage federal funding.

A broad range of efforts should be pursued to achieve long-term, cost-effective, and responsible floating offshore wind deployment in the Gulf of Maine. The benefits of supporting offshore wind industry development are likely to be substantial; however, a proactive strategy to reduce the cost of procurements would be particularly beneficial during the initial phases. This strategy is particularly important given the region's recent high and volatile electricity prices driven by global energy markets and over-reliance on natural gas for generation.

Action: Identify approaches to plan for offshore transmission that allow for innovative, competitive, and regional action to satisfy transmission needs while meeting State policy goals. This could include approaches to allow developers to more easily secure project financing, increasing engagement in regional transmission planning with the goal of reducing costs and increasing renewable energy for Maine, supporting high-voltage direct current (HVDC) cable technology advancement, and engaging with FERC's ongoing long-term transmission planning initiatives and providing input to these processes on behalf of the State.

Action: Continue to engage regularly with ISO-New England to advance and incorporate the State's offshore wind and other interests in regional planning and market administration. This could be on a case-by-case basis for individual projects, as well as part of longer-term studies such as the 2050 Transmission Study.

Action: Pursue efforts to maximize the utility of priority points of interconnection, prioritizing sites with robust existing transmission infrastructure. Considerations should be taken for coordinated offshore transmission to take advantage of all available interconnection capacity, including consideration of long-term interconnection needs.

Action: Continue efforts such as the New England Regional Transmission Initiative to engage with other New England States in a regional process to solicit detailed information regarding the potential benefits and considerations related to a coordinated transmission approach.

Strategy 3

Ensure a Stable and Predictable Investment Environment

Stable and robust permitting requirements, and the processes for establishing such requirements, are fundamental to fostering a favorable environment for investment. As with other major infrastructure projects, offshore wind development takes significant time and financial private sector investment. To attract that capital requires a permitting process that balances (i) certainty and transparency, (ii) early and adequate public and stakeholder input, and (iii) confidence in the finality of duly made regulatory decisions consistent with all applicable standards. Efforts to proactively de-risk these projects can provide benefits for stakeholders and developers alike, promoting communication in early stages. Engagement with the State and federal regulatory agencies throughout is key to navigating the complexities of this process. Achieving the right balance is key to achieving the predictable conditions desirable for all stakeholders to secure responsible development of an offshore wind industry that works for Maine.

Action: Continue to work with stakeholders to refine Maine's approach, including pursuing opportunities to participate in joint efforts with other New England States. Other jurisdictions that have pursued offshore wind procurements have employed a variety of structures, with varying mechanisms designed to balance risk allocation, drive competition, and reduce costs.

Action: Develop and prioritize a clear and efficient process and rules for siting, permitting, and mitigating potential adverse impacts of offshore wind development and associated transmission. Work with communities to identify best practices for successful cable landing and interconnection.

Action: Set clear requirements and achievable expectations for developers, signal stable conditions for investment, and highlight the importance of proactively building and sustaining public support and mitigating areas of potential conflict.

ELIZA DONOGHUE
Director of Advocacy & Staff Attorney at Maine Audubon

"The impact of offshore wind on Maine cannot be understated—it stands to have a profoundly positive impact on Maine's environment and workforce, propelling us toward our carbon reduction goals and providing quality jobs that leverage the unique skills and resources of Maine people and businesses."

Strategy 4

Advocate for Federal Leasing Mechanisms that Support Maine's Goals

Action: Work to achieve State goals through leasing mechanisms by supporting federal legislation, such as the RISEE act, that shares leasing revenue that would provide targeted investment throughout the State, including economic development, equity, research and monitoring, innovation, and stakeholder engagement.

Action: Engage on the development of federal lease sale stipulations or multi-factor bidding components to advance the State's interests, including but not limited to engagement and consultation with Tribes and fisheries, other stakeholder engagement, economic and workforce development, regional transmission readiness, and research.

Action: Proactively support capacity within communities for the development of community investment initiatives and work with municipalities and others to establish best practices for Community Benefit Agreements (CBAs) in advance of commercial development.

"Offshore wind is a game changer for New England. With some of the strongest consistent winds off our coast than almost anywhere in the world, it has enough potential to power our grid nearly ten times over. Since offshore wind is strongest and most consistent in the wintertime, it will also have a critical role to play to increase the reliability of the grid and to decrease costs for consumers. Offshore wind is likely to be the workhorse of our decarbonization here in New England. Likely to provide nearly 50% of our power by 2050, it is a critical climate solution."

—Susannah Hatch, Director of Clean Energy Policy at ELM

OBJECTIVE C

Advance Maine-Based Innovation to Compete in the Emerging National and Global Offshore Wind Industry

Alfond W2 Wind-Wave Ocean Engineering Laboratory at the University of Maine

Photo: University of Maine

Innovation plays a significant role in the global transition to renewable energy. As this transition progresses and regional and national commitments to address climate grow, so does the need for public and private sector support to fuel the research and development efforts that drive innovation. In the State's 10-Year Economic Development Strategy and the Maine Job and Recovery Plan, Maine has recognized the essential value of innovation to support and modernize heritage industries and expand our economy.

Recent federal legislation—including the Bipartisan Infrastructure Law, Inflation Reduction Act, and the CHIPS and Science Act—also prioritizes innovation in catalyzing the shift to renewable energy. This suite of legislation expands innovation support by designating billions of federal dollars in tax credits, ongoing R&D funding, investment in regional innovation and technology hubs, and skilled workforce development to stimulate advances in renewable energy projects and technologies.[38]

Over the course of the past decade, the University of Maine, through its Advanced Structures and Composites Center, has pioneered patented semi-submersible floating offshore wind platform technology with the potential to: catalyze offshore wind technology development and deployment; create opportunities for the U.S. supply chain; and advance engineering and design, financing, manufacturing, installation, and O&M to reduce both costs and effects of offshore wind on fishing, ocean users, and the ecosystem.

In addition to the platforms, other University of Maine innovations over the past decade include:

1. Floating LIDAR technology, called DeepCLiDAR, to assess wind resources at height, synthetic mooring lines to reduce the seafloor footprint and impact of floating technology on other ocean users, and the largest polymer 3D printer that can be used in the production of composite components and tooling.
2. W2, the first Wind/Wave basin specifically designed to advance floating offshore wind technology, a state-of-the-art wind-wave testing facility, and facilities to test wind blades and structural materials. The floating offshore wind engineering team at UMaine now has grown to include more than 40 personnel.
3. UMaine has also developed graduate student concentrations in offshore wind engineering within the Dept. of Mechanical Engineering and is increasing these course/workshop development offerings under a grant from the State of Maine, and collaborations with European partners.

The University of Maine, in partnership with the State, is now emulating successful fixed offshore wind innovation approaches seen elsewhere in the world by employing a phased approach to offshore wind that emphasizes innovation, research, and shared learning as technology is developed and deployed over multiple years. This approach includes New England Aqua Ventus (a joint venture of UMaine, RWE Renewables, and Diamond Offshore Wind), a planned full-scale, 11-megawatt, grid-connected single floating turbine in a State-designated test site in State waters using the Volturn US semi-submersible foundation.

As planned, New England Aqua Ventus would be the first commercial-scale floating demonstration project to go online in the United States.

This demonstration project will be essential to maintain Maine's technical and non-technical leadership in responsible floating offshore wind development, while helping Maine to establish the *Roadmap's* proposed Innovation Hub for floating offshore wind. Over the course of the past 10 years, this project has already made significant progress—and produced abundant innovation. During that time:

- UMaine has won a $50 million grant for the project from the U.S. Department of Energy in a national competition.
- 70 patents have been awarded globally for the technology.
- The State of Maine has already awarded a 20-year PPA for the project.
- Private industry has committed to invest $100 million to realize the project.

In addition to these technical achievements, the project has gathered more than 8 years of non-technical environmental, ecological, and fisheries data gathered at the site to reduce impacts, and will continue to collect and share data during and after construction—all of which will help to streamline future development projects and protect Gulf of Maine ecosystems, communities, and economies. The project has also provided valuable lessons learned on topics such as permitting, energy procurement, and stakeholder engagement.

The demonstration project is also informing the proposed Gulf of Maine Floating Offshore Wind Research Array, a State-led proposal to deploy to 12 turbines on floating foundations in Federal waters of the Gulf of Maine approximately 30 miles from the mainland. The Research Array's purpose is to advance understanding into floating offshore wind's operations and effects on the Gulf of Maine, in order to inform responsible development of future commercial wind projects.

Beyond the University, Maine companies are also innovating to advance offshore wind. For example, Deepwater Buoyancy of Biddeford produces cable protection systems and floating cable buoyancy modules, in addition to buoys that host monitoring equipment; Maine Marine Composites of Portland develops innovative engineering approaches to analyze and enhance mooring and anchoring systems; and Lyman Morse Boatbuilders of Thomaston are augmenting traditional boatbuilding with advanced composites, modernized metal fabrication, and advanced fabrication techniques that improve safety and efficiency, while reducing waste, and can enhance vessel building for offshore wind.

To further advance innovation in floating offshore wind, the Maine Legislature in 2021 directed the Governor's Energy Office and the Department of Marine Resources to establish the Maine Offshore Wind Research Consortium to develop and execute a research strategy to better understand the impacts of floating offshore wind power projects in the Gulf of Maine, and inform improved, responsible offshore wind development.

- The Consortium, which launched in 2023, will include: Evaluation of opportunities and challenges to existing uses in the Gulf of Maine, including research on how to best support offshore wind's co-existence with the fishing industry;
- Development and refinement of methods to avoid and minimize impacts on ecosystems and existing uses; and
- Research to identify and implement cost efficiencies in commercialization

With more than a decade of offshore wind development—and a rich history of marine-based innovation to its credit—Maine has already earned competitive advantages in innovation for floating offshore wind. As appetites for State, regional, and global offshore wind development grow, Maine can leverage these advantages and expand public and private sector partnerships to move from research to improved commercial project design, development, operations, and best practices that address key challenges.

JACOB WARD
Senior Research Engineer, UMaine Advanced Structures and Composites Center

"The Offshore Wind Industry has allowed me to live in my home state, work in my home state, and work on something that is going to make a positive impact.

Start small with single turbines, but eventually build an Offshore Wind industry that will make enough renewable energy to power the state and create thousands of jobs in the process. Instead of spending thousands of dollars on importing electricity and fuel into the state, we can generate it here, keeping the money in the state. "

Imagining Maine's Future: The UMaine Advanced Structures & Composites Center

Founded in 1996, the University of Maine Advanced Structures & Composites Center has grown in both size and reputation as a distinguished innovation hub with hundreds of patents, 350 employees, and meaningful real-world impacts in areas as divergent as ocean engineering, structural thermoplastics, wood composites, and large-scale bio-based additive manufacturing. In 2013, the Center built the nation's first floating wind turbine—marking the first-time offshore wind-generated power would contribute to America's power grid.

The project was an unmitigated success—ultimately leading to a $50 million Department of Energy grant to build a full-scale version of the pilot turbine, now scheduled for deployment in the waters off Maine's coast. Staffed by a team of 45 engineers working on floating wind, many educated and credentialed at the University of Maine, the project's scope holds enormous significance to the future of both the Maine economy and the U.S. floating offshore wind industry. And every aspect of the project, from R&D to materials and component manufacturing, was designed at the Center's Orono-based W2 Ocean Engineering Lab.

"Currently, the State of Maine uses between $4 and $6 billion in fossil fuels in the form of heating oil and gas for our cars each year. The majority of that money leaves Maine because we do not produce fossil fuels," said Dr. Habib Dagher, founding executive director of the Center. "If we can keep some of that money in Maine, we can put it back into our economy."

Dr. Dagher, whose work at the Center already demonstrates Maine's potential as a global hub for innovation, isn't alone in his aspirations. "Today at UMaine, we have more than 45 people working on offshore wind," Dagher said. "It's the largest floating offshore wind research, engineering and development team in the U.S."

This commitment to leadership and innovation is part of a much larger vision for a Maine economy that not only relies on sustainable energy—but thrives on it. As Dr. Dagher sees it, the Center's work is the first step toward a future when Maine is a net exporter of not only power—but of the innovation and expertise behind its generation.

"What better than to bring green energy and materials together and educate the next generation to do that?" Says Dr. Dagher. "It's not a job. It's a mission. And we come every day excited to do it."

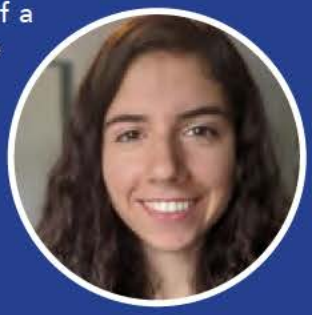
Maine Offshore Wind Projects

1/8 SCALE PROJECT
1 Turbine
(Umaine, Cinabro, MMA)

12 MW DEMONSTRATION PROJECT
1 Turbine
(NEAV LLC, UMaine)

RESEARCH ARRAY
12 Turbines or Less
(State of Maine, UMaine, NEAV LLC)

"Every day, I'm thankful and excited to be working at the epicenter of a burgeoning industry with the power to change the future. Floating offshore wind is integral to the energy transition, and Maine's expertise and abundant resources are key to the success of offshore wind in New England."



—Leah Sirkis

"I've been involved in floating offshore wind projects through the University of Maine Composites Center for the past two years, and plan to continue with this research in graduate school. I am excited by the potential environmental and economic benefits the State of Maine could see if we continue to play a leading role in this industry."

—Casey Bourque

"The UMaine ASCC is the perfect place to incubate inventive ideas and test different possibilities to lower costs and help the whole world transition into cleaner energy... it feels great to work on the frontier of such revolutionary technology."

—Yüksel Ruwad Alkarem (Rudy)

"With offshore wind, Maine can be an energy-independent state, relying only on the renewable wind resources right off our coast. I hope the floating offshore wind industry continues to grow in Maine as UMaine leads the nation with our innovative floating wind turbine technology.

—Mitchel Kelly

Strategies

Strategy 1:
Continue developing floating demonstration projects

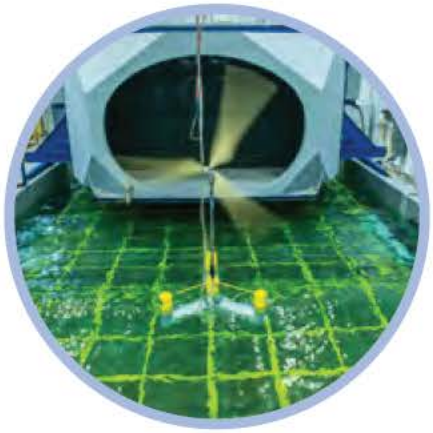
Strategy 2:
Leverage resources to commercialize Maine's R&D capabilities in floating offshore wind

Strategy 3:
Establish a floating offshore wind innovation hub in Maine

Strategy 4:
Leverage and expand Maine's capabilities in Artificial Intelligence, data science, and robotics

Strategy 5:
Collaboratively research complementary technologies such as energy storage and clean fuels

Photo: University of Maine



Strategy 1

Continue Developing Floating Demonstration Projects

The development of floating demonstration projects, including the single floating turbine project in State waters and the proposed floating offshore wind Research Array, can advance the development pipeline, where further cost and impact reductions can occur at scale. Maine has a unique but time-sensitive opportunity to set the global standard for responsible floating offshore wind development that mitigates impacts to ocean users and ecosystems.

Action: Continue to pursue floating offshore wind research through a phased approach to demonstration projects, including the single floating offshore wind turbine in State waters (UMaine and New England Aqua Ventus) and the State-led Research Array proposed in federal waters. Disseminate knowledge gained throughout the phases of the project in a timely manner to inform future projects.

Action: Implement the Maine Offshore Wind Research Consortium by leveraging Gulf of Maine expertise, regional and national partnerships, and public and private funding sources. Prioritize data and information sharing.

Photo: University of Maine

Strategy 2

Leverage Resources to Commercialize Maine's R&D Capabilities in Floating Offshore Wind

Maine's R&D capabilities are world-class and ripe for commercialization and industrialization. Additional financial and technical resources are necessary to ensure technology transfer from research to improved commercial project design, development, operations, and best practices.

Action: Identify specific funding opportunities from the three pieces of federal legislation (BIL, IRA, CHIPS and Science Act) that address key challenges associated with commercializing UMaine's R&D capabilities for floating offshore wind.

Action: Ensure public and private sector funding and technical assistance is available to address key challenges associated with commercializing Maine's R&D capabilities. (*See also*, Objective 1, Strategy 1).

Strategy 3

Establish a Floating Offshore Wind Innovation Hub in Maine

An innovation hub in Maine will focus additional R&D for responsible floating offshore wind, ports, supply chain, and workforce investments for this promising global market. The hub should bring together governments, continuing and higher education institutions, businesses, labor unions, and community-based regional organizations to create partnerships to develop technology, innovation, and manufacturing sectors. This hub should also be strategically linked to the floating offshore wind Research Array, Maine Offshore Wind Research Consortium, and other offshore wind R&D consortia and innovation centers around the world to maximize investments and expand collective knowledge.

Action: Conduct a feasibility study with broad input to scope a floating offshore wind innovation hub in Maine, including the potential for a floating offshore wind National Center of Excellence at the University of Maine.

Action: Secure funding and partnerships to support the innovation hub, including specific funding opportunities from the 3 pieces of federal legislation (BIL, IRA, CHIPS and Science Act) that address key challenges associated with floating offshore wind.

Action: Track investments in Maine floating offshore wind innovation to better measure and understand the various factors that impact progress and provide metrics of success.

Strategy 4

Leverage and Expand Maine's Capabilities in Artificial Intelligence, Data Science, and Robotics

Several higher education institutions in Maine have core competencies and tools to support the role of artificial intelligence (AI), data science, and robotics in offshore wind (estimated to reduce the LCOE by 3.5%).[39] However, engagement with offshore wind projects needs to be encouraged to help ensure industry applicability and advancement.

Action: Forge strategic partnerships and leverage funding to encourage more offshore wind-applied research projects in AI, data science, and robotics within higher education institutions in Maine.

Action: Support and expand entrepreneurship and incubator programs on AI, data science, and robotics toward offshore wind.

Action: Promote Maine-based technology companies to engage in active offshore wind projects.

Strategy 5

Collaboratively Research Complementary Technologies Such as Energy Storage and Clean Fuels

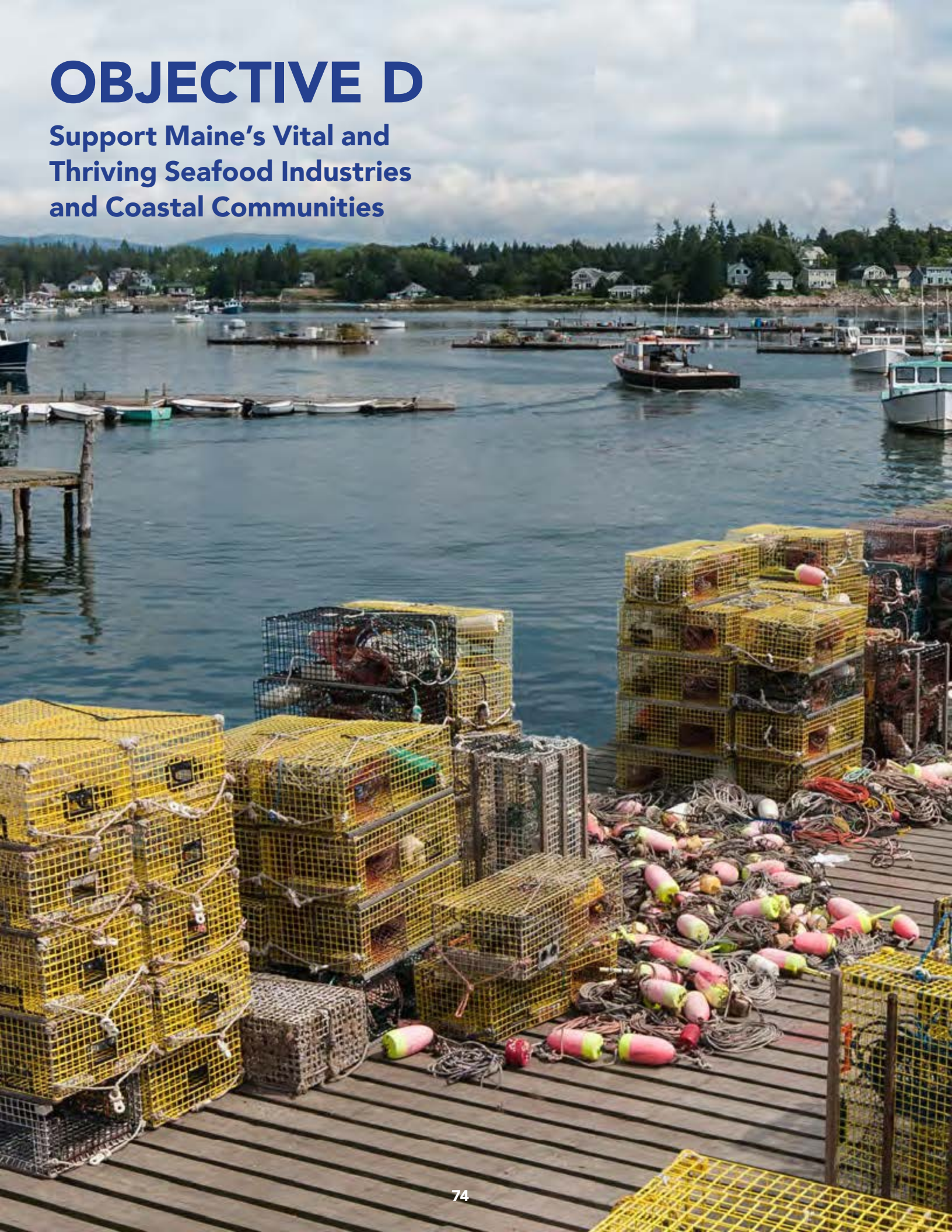
Collaborate with federal agencies, national laboratories, and other partners to pursue research into innovative technology options that could be deployed in concert with offshore wind, such as green hydrogen, other clean fuels, and energy storage to advance decarbonization and meet energy goals. Target solutions that can decarbonize hard-to-electrify sectors, such as aviation, long-haul transport, shipping, steel, and chemicals.

Action: Pursue regional partnerships focused on clean hydrogen research and development.

Action: Based on Maine's existing strengths in renewable energy and maritime industries, identify public and private partnerships and funding opportunities to advance technologies for offshore wind including storage and clean fuels to meet energy demands and deep decarbonization goals.

OBJECTIVE D

Support Maine's Vital and Thriving Seafood Industries and Coastal Communities



The abundant fisheries of the Gulf of Maine have supported Maine's thriving seafood industry and coastal communities for generations. According to the Maine Department of Marine Resources, with more than 16,000 licensed fishermen, Maine has twice as many annual seafood landings as any other East Coast State and is home to 30 percent of all commercial fishing trips on the entire eastern seaboard. Maine's fishing industry adds more than $3 billion annually in direct and indirect economic benefit to the State, which makes the industry—and the families and communities that rely on the health of the Gulf—critical to Maine's economy and identity.[40]

Lobster is the largest and most economically and culturally vital fishery in Maine. Many fishing families in Maine have 5th, 6th, or even 7th generation fishermen, for whom holding a lobster license is central to their livelihood and family heritage. On many islands, particularly in the Midcoast, between 15 to 40 percent of the year-round population holds a lobster license,[41] and a high percentage of the community is supported on the income from those license-holders.

While Maine is positioned for offshore wind, the development of this industry must deliver benefits to people and communities in coastal Maine by co-existing with the vital seafood industry and preserving social and historical characteristics that date back centuries. Further, with many counties in Midcoast and Down East Maine highly reliant on fishing, there exists limited capacity or economic diversification to absorb stress on this important industry.

Responsible planning, knowledge-sharing, and ongoing consultation with marine businesses, affected communities, and stakeholders are central for helping to understand, identify, avoid and, when necessary, mitigate any potential adverse effects from offshore wind and engage in co-creating solutions to local concerns. Affected communities, as well, will likely need additional capacity and technical assistance to engage effectively on offshore wind and evaluate potential impacts and opportunities.

As part of its responsible approach to offshore wind, the State will continue to pursue collection of critical data to better inform decision-making on State, regional, and national levels, and insist upon robust stakeholder engagement and smart, inclusive, and transparent planning. Maine will also seek to learn from the Just Transition movement around strategies to support impacted communities and sectors.

The phased approach to offshore wind in the Gulf of Maine now underway between the State and University of Maine, which is advancing a demonstration project in State waters and a small-scale Research Array in federal waters, is an example of this responsible approach.

The State is coordinating with the fishing industry to determine how offshore wind can co-exist in the Gulf of Maine prior to the proposal of any commercial scale projects. To help offshore wind, fishing, navigation, and other ocean users co-exist in the Gulf of Maine, the *Roadmap* calls for project planning to identify and avoid areas of high fishery value, guarantee safe navigation for all mariners, and ensure developers are accountable for sharing information about offshore activities and maintaining a safe and healthy marine environment.

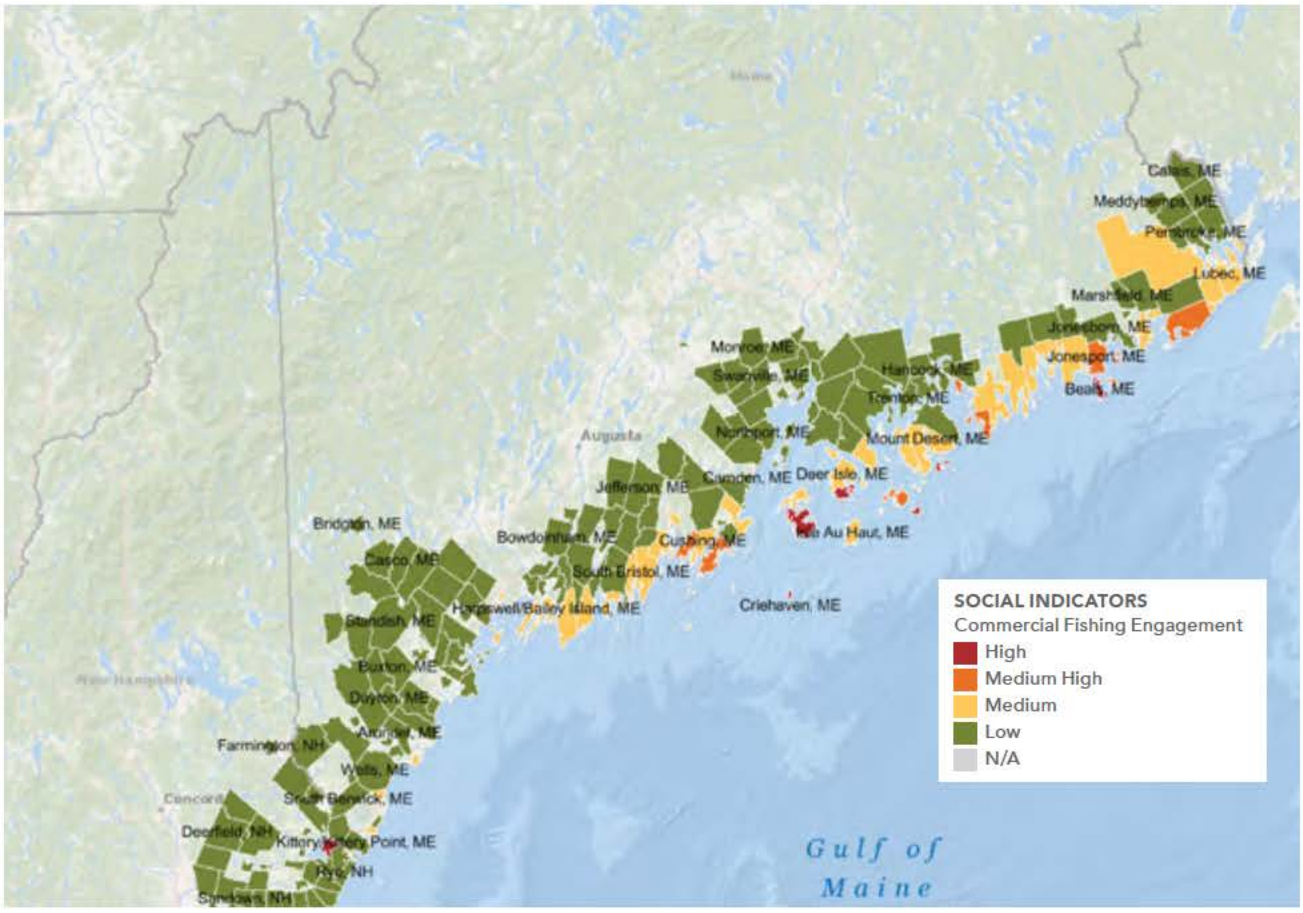
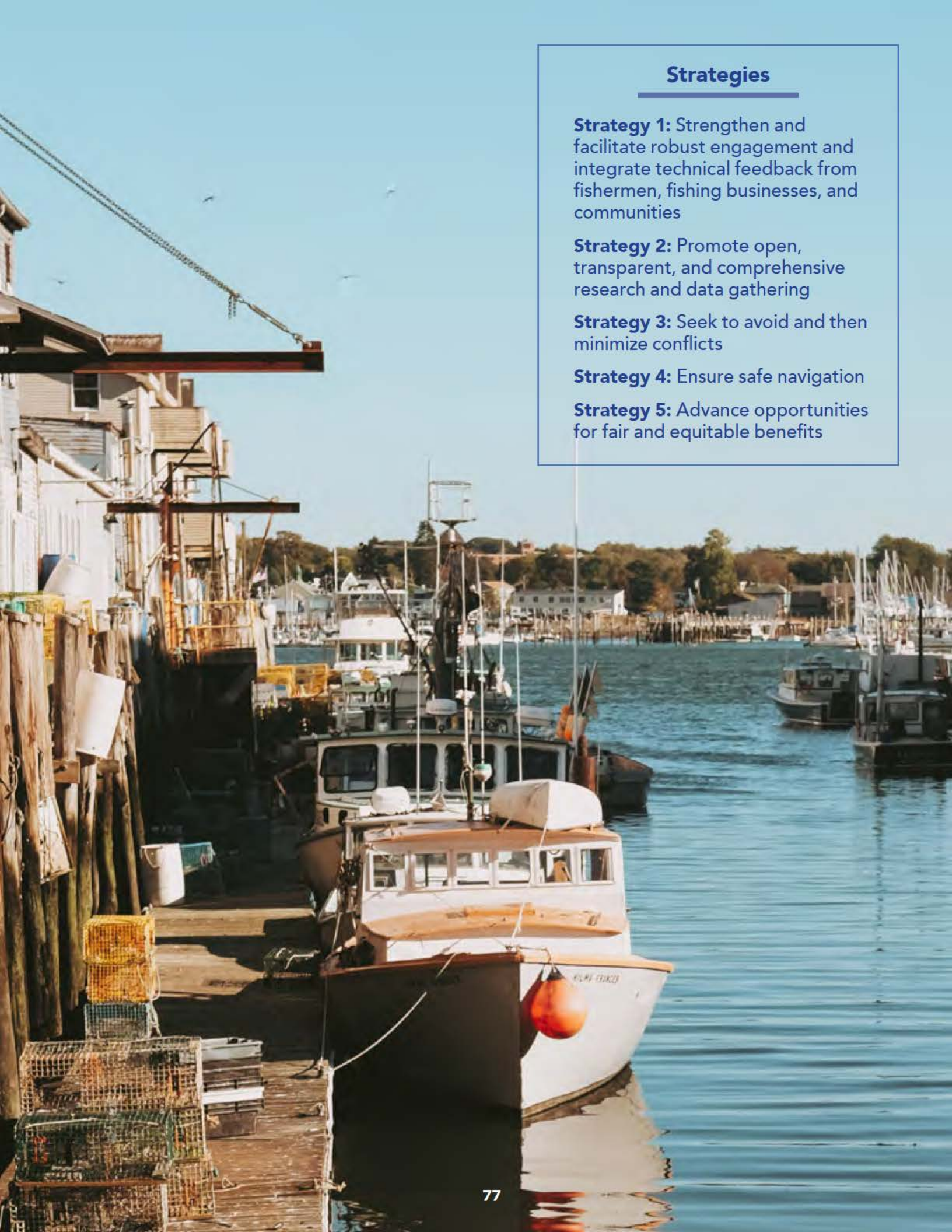


Figure 12: NOAA Fisheries Community Social Vulnerability Indicators - Commercial fishing reliance measures the presence of commercial fishing in relation to the population size of a community through fishing activity. A high rank indicates more reliance.[49]



Strategies

Strategy 1: Strengthen and facilitate robust engagement and integrate technical feedback from fishermen, fishing businesses, and communities

Strategy 2: Promote open, transparent, and comprehensive research and data gathering

Strategy 3: Seek to avoid and then minimize conflicts

Strategy 4: Ensure safe navigation

Strategy 5: Advance opportunities for fair and equitable benefits

Strategy 1

Strengthen and Facilitate Robust Engagement and Integrate Technical Feedback from Fishermen, Fishing Businesses, and Communities

The development of offshore wind is a complex and lengthy process. The State of Maine has an important role in facilitating and promoting open and transparent communication between Maine's existing businesses and stakeholders, Tribes, and the many actors involved in offshore wind development, particularly the federal government and developers. Most of the authority for offshore wind development lies with the federal Bureau of Ocean Energy Management (BOEM) and it is important for the State to continue to engage in open and transparent communication with Maine's stakeholders to share information, understand concerns and priorities, and develop recommendations to advance to BOEM. Maine can support clearer communication and provide guidance to developers working with Maine's fishing industry and coastal communities. Participation takes time, energy, and resources that are not equally accessible to all stakeholders.

Action: Encourage and assist BOEM in providing active and direct engagement with Maine's fishing industry in the development of wind energy areas and future federal decisions through workshops, meetings, dockside conversations, and other engagement, working closely with the Department of Marine Resources (DMR), the fishing industry, and community organizations to do so in a robust and meaningful way.

Action: Work with BOEM and other New England States to strongly encourage or require offshore wind developers to follow guidelines that stipulate full engagement with the fishing industry from Maine, New Hampshire, and Massachusetts during survey operations. Key elements are included in the Fisheries Working Group recommendation #1 found in the Appendix.

Action: Assess the ability and cost to participate effectively in State regulatory processes relevant to offshore wind impacts by fishing industry members and coastal communities and identify ways to expand equitable access and capacity to participate, including providing support or capacity for improved participation.

Action: Foster local government partnerships and engage in direct communications with affected communities through an ongoing consultation process to provide clarity, identify local concerns, and co-create solutions.

Action: Support efforts to build local capacity and provide technical support to communities in order to promote investments and development of community benefits.

Strategy 2

Promote Open, Transparent, and Comprehensive Research and Data Gathering.

Given the scale of fishing activity in the Gulf of Maine, specifically from Maine fishermen, the local economic impacts of that activity, and the uncertainties associated with large-scale floating offshore wind, it is critically important that Maine advocate with federal partners to better understand the impacts of both offshore and shoreside development with new floating offshore wind technology and that data from these monitoring and research efforts are made available publicly. A key component of this strategy is working with BOEM, the fishing industry, regional partners, and lease holders on monitoring requirements to adequately inform impact assessments for new floating offshore wind.

Action: Advance the Research Array and learn from the single turbine demonstration project to gather data and experience before commercial construction occurs in the Gulf of Maine so that potential impacts on fishing businesses, ocean users, marine environment, and wildlife can be better understood.

Action: Continue to advance a cooperative approach to research and monitoring, as is common practice within within Maine's Department of Marine Resources, that involves direct engagement with the fishing industry in development of protocols and utilization of fishing vessels as scientific platforms when practicable.

Action: Work with BOEM, other New England States and developers

to pursue monitoring for offshore wind leases that establish comprehensive baseline information for 3 years prior to construction and encourage developers to continue comparable monitoring during and after installation. Data should be made available in a timely manner for broader use and integrated with other information. Surveys and other studies should adhere to recognized standards and be informed by the detailed recommendations of the Fisheries Working Group and the Environment and Wildlife Working Group.

Action: Advocate for public availability of geophysical and geotechnical data gathered by offshore wind developers in accessible, centralized, and usable formats on a regular and timely basis as appropriate.

Action: Continue to contribute to the development of USCG's port access route study to inform understanding of formal and informal transit to fishing grounds and how such potential wind energy areas may adversely affect transit. If such impediments are identified, the State should work closely with BOEM to ensure wind energy areas are appropriately sited and designed to allow for safe transit.

Action: Request a port impact assessment by appropriate State or federal agenc(ies) to determine if the vessels fishing in those proposed wind energy areas would be concentrated in certain ports, identify any implications for the port's local economy and shoreside businesses (including jobs gains/losses where possible and considering relative impact of those gains/losses in the area), consider cumulative impact on fishing communities of multiple projects, and identify mitigation mechanisms. This assessment may require collection of new information and/or use of local ecological knowledge to supplement available data.

Strategy 3

Seek to Avoid and Then Minimize Conflicts

BOEM has announced its intention to lease commercial scale offshore wind areas in the Gulf of Maine by mid-2024. This will require the identification of wind energy areas (WEAs) by BOEM in consultation with the Gulf of Maine Intergovernmental Task Force. Maine's representatives on the Task Force need to be prepared to fully engage in these conversations and represent the interests of Maine's citizens in the appropriate siting of wind energy lease areas. Maine has already begun this work by seeking data and input from commercial fishermen, scientists, and other stakeholders with expertise in commercial fishing activity, wildlife and fisheries resources, and the offshore environment to identify areas of greatest concern for offshore wind development.

Action: Encourage BOEM to prioritize commercial development in areas outside of those which represent the majority of effort by the Northeast lobster industry and significant effort from the groundfish, monkfish, scallop, tuna, and herring fisheries and areas outside of designated Habitat Management Areas in approved fisheries management plans.

Siting of future commercial development is a significant concern for Maine's fishermen and is critical to do thoughtfully, with the best available data and through an open dialogue among a variety of interests. The FWG recommendation is an important starting place for these conversations. Environmental and wildlife high risk areas, transit from non-fishing mariners, and cost and logistical concerns to offshore development are also part of the considerations. Maine has been undertaking a mapping project, with coordination from other States and federal agencies, to fully understand the data available and position Maine to best advocate for the least impactful areas for commercial development (see below). The State will utilize the mapping effort and other stakeholder dialog to continue to advocate for the protection of areas most critical to the fishing industry and other stakeholders.

Action: Continue to work with fishermen, scientists, and others with relevant expertise to enhance the existing Northeast Data Portal and identify data gaps by collating Gulf of Maine data and mapping the areas of known concentration of priority species, habitats, and fishing activity to inform stakeholder engagement and future State and federal decision making.

Action: Strengthen engagement between offshore wind developers and the fishing industry in development of lease areas to minimize impact of grid orientation, layout, and micrositing on existing uses.

"Fishing is not just a job along our coast, it is a way of life that our ancestors passed on to us. It's up to us to hand it to the next generations of families in hopefully as good a shape as it was handed to us."

—Terry Alexander
F/V Jocka, Co-Chair Fisheries Working Group and Advisory Committee Member

Strategy 4
Ensure Safe Navigation

The installation of floating structures in the Gulf of Maine provides unique challenges to current users of the ocean. Maine is committed to designing strategies to foster a safe environment, reduce risks, and minimize disruptions to navigation.

Action: Encourage BOEM to require offshore wind developers to work with affected fishermen and mariners to design wind array layouts to ensure fishermen and other mariners may safely operate within and around active wind turbines once projects are constructed, with appropriate standards and protections to mitigate risk and liability.

Action: Ensure BOEM requires offshore wind developers to implement mitigation strategies to reduce wind turbine generator impacts on marine vessel radar, such as the use of reference buoys and advanced radar designs, and fund upgrades of fishermen's radar to provide technology that minimizes or eliminates radar impacts.

Action: Promote the adequate marking of windfarms through multiple means, including but not limited to AIS (whether that be at corners, along perimeters, or throughout the array at appropriate distances), visual markings, sound, charts, and other means.

Action: Work with BOEM to consider in detail the unique surface and subsurface features of floating technology and design appropriate protocols to clearly mark and light subsurface platforms, cabling, anchoring, and other features.

Action: Seek inclusion of a unique identifier along with a gridded numbering and lettering system, advanced seaward, such that each 1 x 1 nautical mile square could be uniquely referenced, and advocate for consistency between multiple developers.

Action: Advocate for transit lanes through wind farms that have specific marking and lighting characteristics.

Action: Encourage deployment of cellular towers within wind farm areas to facilitate emergency communication.

Strategy 5

Advance Opportunities for Fair and Equitable Benefits

Maine seeks to first avoid and then minimize the impacts of offshore wind to the greatest extent. Key to addressing impacts on the seafood industry and coastal communities is to collect the appropriate data to better quantify and then create mechanisms to mitigate these impacts. Maine's fishing industry is currently under immense strain and uncertainty caused by the evolving right whale regulations on the lobster industry, market shifts as a result of the pandemic, and current inflation pressures. Offshore wind offers an opportunity to seek investments in Maine's fishing industry and build important infrastructure to benefit coastal communities. Lessons can be gleaned from existing work through partners such as SEAMaine and other industry initiatives about the type of support that would be most beneficial to the seafood industry and foster dialogue with the community to advance meaningful investments.

Action: Continue to collaborate and open a dialogue with Maine's seafood industries to identify and implement pathways to help the industries thrive and explore ways development of the offshore wind industry could include investments that help support fisheries' priorities.

Action: If impacts to fisheries cannot be avoided, minimized, or mitigated, advocate for a plan to assess and quantify these impacts utilizing the best available fisheries, ecological, and socio-economic data, including the value of loss to the unique qualities of Maine fisheries, heritage, and communities. The plan should consider broad impacts to the industry and its communities before, during, and after construction and operation of OSW farms, and impacts on fishermen, associated businesses, and communities.

Action: Explore federal funding and other funding mechanisms to help mitigate any impacts incurred on fishing businesses, ocean users, and coastal communities, and to provide additional support to complement any developer or federal funding sources.

CARL WILSON

Director, Bureau of Marine Science

"Every place in the Gulf of Maine is either currently being used by fisheries or has the potential to be used in the future because these are dynamic resources responding to environmental conditions that are constantly changing. The Department of Marine Resources' goal is to avoid impact to the fishing community when possible and if cannot avoid impact, how can we minimize impact to this integral Maine industry."

Maine fishermen have a long history of adapting and responding to changing regulations, including those to strengthen the ecosystem and protect listed species. Over the past 25 years, the lobster industry has complied with increasingly more stringent regulations to protect the endangered North Atlantic right whale, including replacing all the groundline with sinking rope, adding weak links, reducing the number of traps per buoy, specific marking of gear, and a seasonal closure of nearly 1000 square miles to fishing. Despite these efforts, the right whale population remains at serious risk of extinction, requiring the federal government to take further actions in the coming years. Many of Maine's people are deeply concerned that future requirements will threaten the economic viability of this iconic fishery which has sustained our coastal communities for centuries. Maine's approach to offshore wind needs to acknowledge the reality of the current immense pressures facing fishermen.

In recognition of the importance of protecting and promoting the recovery of the North Atlantic right whale while responsibly advancing offshore wind development, the Bureau of Ocean Energy Management (BOEM) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) developed a joint Draft North Atlantic Right Whale and Offshore Wind Strategy. The State will strongly advocate for a strategy that recognizes the effort to the fishing industry and the importance of fully funding the strategy.

OBJECTIVE E

Protect the Environment, Wildlife, & Fisheries Ecosystem in the Gulf of Maine

Recognized as one of the world's richest ecosystems, the Gulf of Maine is home to more than 3,000 marine species and birds, including some 30 species considered endangered or threatened, such as the roseate tern and the North Atlantic right whale.

The Gulf of Maine is also one of the fastest warming oceans on the planet, which is having a measurable impact on long-standing circulation patterns, water salinity, and temperature, and altering marine productivity and the abundance and distribution of marine species. Important habitat areas are likely to shift, as water temperature and salinity cause a cascade of changes to species distribution through diverging habitat preferences, areas of primary and secondary productivity, and resulting areas of species foraging aggregations.

Climate-driven changes to the Gulf of Maine are likely to result in ecological shifts that call for ongoing monitoring and, where appropriate, human behavior modification. Maine is committed to protecting and preserving the Gulf's marine species, habitats, and wildlife, and to pursuing responsible development of offshore wind technology that advances renewable energy with as few adverse impacts as possible.

As part of this commitment, Maine has a leadership opportunity in designing environmentally responsible floating offshore wind development to avoid and, if necessary, mitigate negative impacts of offshore wind development on the environment and wildlife. This will be shaped by data-driven decisions that protect the Gulf's natural resources and support informed adaptation as new information becomes available.

The response of ecosystems to fixed bottom offshore wind – both single turbines and configured arrays – has been well studied in Europe. Research has found some bird species may collide with turbines, while others avoid turbines altogether.[42] Other species are attracted to turbines.[43] These effects are seen both above and below water with fish, marine mammals, birds, and bats.

New hard substrate from fixed bottom turbines has also been shown to change habitat and cause a "reef effect." Studies have also shown marine life may respond to electromagnetic fields (EMF), operational noise, increased vessel traffic in the area, elevating the risk of secondary entanglement in fixed bottom deployments. [44]

While much research has been conducted on fixed-bottom turbines (with more still needed), little research has yet been conducted on floating platform technology.[45,46] Additionally, cumulative impacts of multiple offshore wind projects on wildlife and the environment over time and space also needs to be assessed.

To this end, data collection is now underway to advise responsible offshore wind development and to create a baseline for evaluating effects of offshore wind through time. Projects such as the proposed single turbine demonstration project in State waters and the Gulf of Maine Floating Offshore Wind Research Array, also aim to help unlock further understanding of how floating wind will integrate with both the marine environment and existing ocean uses.

In addition, the Maine Offshore Wind Research Consortium established by the Legislature will develop and execute a research strategy to answer critical questions about floating offshore wind in the Gulf of Maine, and to oversee ongoing research efforts once the array is built. The Consortium will ensure research is conducted in an open, transparent, and inclusive manner, and includes contributions from regional and national scientific entities, Maine's fishing industry, State and federal agencies, and scientific experts. This work will place Maine in an ideal position to lead the nation in environmentally responsible floating offshore wind development.

The Gulf of Maine is a shared resource. While several current regional initiatives about science and offshore wind are underway, none are directly focused on coordination within the Gulf of Maine specifically on floating offshore wind. Maine has an opportunity to partner with Massachusetts and New Hampshire to identify key natural resources to avoid during offshore wind development and collaborate on funding for monitoring and research on questions unique to floating technology.

Maine also has a legacy of collaboration with ocean users to develop and execute research and monitoring in the Gulf of Maine. These partnerships should continue and expand to welcome participation by additional regional entities and developers, while also encouraging ongoing collaboration with ocean users of the Gulf of Maine to ensure mutually beneficial outcomes.

Strategies

Strategy 1: Collect high-quality, relevant data that is publicly available

Strategy 2: Proactively reduce conflicts, minimize ecosystem impacts, and facilitate timely permitting

Strategy 3: Strengthen Maine's State policy framework

Strategy 4: Enhance regional collaboration in the Gulf of Maine

Strategy 5: Pursue State and other funding opportunities

Strategy 6: Facilitate open and transparent engagement and integration of technical advice

Strategy 7: Promote and advance new technologies

Photo: Nate Butler

Strategy 1

Collect High Quality, Relevant Data that is Publicly Available

Although much is known about the GOM ecosystem, there remains a vast array of data needed to ensure informed siting and environmental review of areas in the GOM for potential offshore wind development. Broad-scale monitoring in the Gulf of Maine has been extremely limited to date, and collecting baseline information on wildlife species and the ocean environments has been identified as a pressing need. In addition, there is limited bathymetric data of complex habitats. Complex habitats drive above and below water species use and distribution in the Gulf of Maine and are also important for a number of vulnerable or important commercial species such as Atlantic cod and American lobster. Current information is needed on the distribution, abundance, and movement patterns of bird, bat, marine mammal, turtle, and fish species, as well as the underlying ecosystem.

Publicly available data can be used to assess broad-scale questions and potential cumulative impacts and other research questions, but the public data needs to be augmented by project-specific data to refine our understanding of impacts in the GOM. To the extent practical, data collection should be standardized, aggregated across regions and projects, and made publicly available in order to maximize learning, understand regional impacts, and create transparency.

Action: Continue to work with fishermen, scientists, and others with relevant expertise to enhance the existing Northeast Data Portal and identify data gaps by collating Gulf of Maine data and mapping the areas of known concentration of priority species, habitats, and fishing activity to inform stakeholder engagement and future State and federal decision making.

Action: Coordinate with regional and federal partners to improve seafloor habitat characterization in the Gulf of Maine through the collection of bathymetry and seafloor hardness information, sediment sampling, and benthic fauna characterization. This information should be used to create detailed sediment and habitat maps of the Gulf of Maine.

Action: Initiate a coordinated below and above water ecological baseline monitoring study in identified areas of the Gulf of Maine to provide for meaningful assessment of the impacts of offshore wind development on the ecosystem, wildlife, and fishes of the Gulf of Maine.

Action: Advocate for a preliminary assessment for potential submerged paleocultural resources in Gulf of Maine waters <200 feet depth to inform offshore wind development.

Action: Conduct tracking studies on high-risk species, including species listed under both the Maine and Federal Endangered Species Acts in the GOM, consisting of marine and non-marine birds, bats, marine mammals, and fish species especially vulnerable to impacts from offshore wind energy development, as detailed by the Environment and Wildlife Working Group.

Action: Work with BOEM, Regional Wildlife Science Collaborative, and other partners to ensure developers provide natural resource data as it pertains to potential impacts to wildlife, fisheries, and the ecosystem in a publicly available and usable format in a timely manner.[47]

Maine Offshore Wind Research Consortium Established

The advisory board of the Maine Offshore Wind Research Consortium, which will advise the State on research priorities in support of responsible offshore wind in the Gulf of Maine, held its first meeting in Feburary 2023. The expert advisory board includes members representing Maine's fishing industry, wildlife experts, scientists, the offshore wind industry, and State agencies.

The Consortium, directed by legislation signed by Governor Janet Mills in 2021 with bipartisan support of the Maine Legislature, will support Maine's research into the cost-effective operation of floating offshore wind, and how it interacts with the marine environment, wildlife, the fishing industry, shipping and navigation routes, and more. The Consortium will also help outline research strategies for the Gulf of Maine Floating Offshore Wind Research Array, an energy research project proposed to deploy 10-12 turbines on semi-submersible floating concrete platforms pioneered by the University of Maine.

The Consortium will also collaborate closely with other states and regional and national science and research partners, including the National Offshore Wind Research and Development Consortium, and the Regional Wildlife Science Consortium, of which the Governor's Energy Office is a member. For more about the consortium, visit maineoffshorewind.org.

Strategy 2

Proactively Reduce Conflicts, Minimize Ecosystem Impacts, and Facilitate Timely Permitting

Maine's coast has extensive underwater cables providing power to nearshore islands and transmitting data and information across the Atlantic. Properly siting the transmission cables and nearshore infrastructure needed to advance offshore wind should be a priority for the State and will require continued engagement with ocean users, environmental and wildlife experts, coastal communities, and landowners. Proactively identifying the potential areas of conflict and environmental impacts early in the siting process can expedite the permitting process for offshore wind developers.

The State has jurisdiction within three nautical miles of shore with existing permitting processes for transmission cables, while BOEM has oversight for transmission offshore. The State can build upon lessons learned elsewhere to develop best management practices for siting and installation that are complementary to the existing State permitting process and scaled to the risk. Taken as a whole, these best practices should minimize negative impacts on the most sensitive environment and wildlife while avoiding the areas of greatest potential conflict with commercial fisheries through time-of-year restrictions, co-location with existing development, and use of installation methods that reduce habitat disturbance. Proactive planning of transmission infrastructure can significantly reduce impacts to wildlife and the environment as well as costs, while minimizing potential user conflicts.

Action: Encourage BOEM to have developers conduct early consultations with State natural resources agencies to gather the most current spatial data that depict nearshore habitats, sensitive species distributions, and other areas of concern to facilitate informed planning for offshore wind transmission siting.

Action: Explore opportunities for development of transmission "backbones," corridors, or other co-location strategies to avoid or minimize adverse impacts to benthic habitat and fishing activity, where widening of corridors would not significantly increase adverse impacts to high value marine or wildlife habitat.

Action: Prioritize transmission siting in areas outside of complex habitats, including coral habitats and habitats protected through fisheries management plans in State waters, and encourage BOEM to guide siting outside of these areas.

Action: Guide offshore wind developers to target landfall to utilize already existing high-use areas so minimal habitat is disturbed, while requiring avoidance of sensitive wildlife habitat and fish species, particularly protected species

Action: Encourage offshore wind developers, to the extent practicable, to co-locate onshore transmission cables with linear development (i.e., existing roads and transmission lines) and utilize existing onshore substations to minimize disruption.

Action: Require developers to bury cables, whenever possible, at a minimum of 6 feet in State waters, and encourage BOEM to apply this standard in federal waters, thereby reducing exposure to EMF and gear conflicts with fishermen.

Action: Require offshore wind developers to avoid the greatest disruption to wildlife, marine fisheries, and habitats in State waters when laying transmission cables.

Action: Establish clear requirements for offshore wind developers to follow best management practices in State waters and encourage BOEM to apply this standard in federal waters, during installation and operation of the cable.

Action: Upon turbine decommissioning, require removal of transmission cables, unless assessment of impact indicates that removal would cause greater adverse impact to benthic habitat and marine resources in State waters, and encourage BOEM to apply this standard in federal waters.

Strategy 3

Strengthen Maine's State Policy Framework

Maine has opportunities through State policy to influence how offshore wind is developed through the federal consistency provisions of the Coastal Zone Management Act (CZMA) and establishment of specific criteria and contract provisions regarding coastal uses and resources as aspects of the energy procurement process.

The CZMA requires certain federal actions affecting Maine's coastal uses or resources to be consistent with standards of approval under State environmental laws which provide the "enforceable policies" of the Maine Coastal Program, which is administered by the Department of Marine Resources in cooperation with the Department of Environmental Protection and other State natural resource agencies. In accordance with P.L. 2021 c.407 (L.D. 1619), Maine is currently reviewing State laws and rules to determine whether the existing regulatory framework as applied to offshore wind energy development adequately protects Maine's coastal resources in a manner that avoids or minimizes adverse effects on coastal resources and users.

Action: Assess efficacy of existing State statutory and regulatory authorities related to the siting and development of offshore wind turbines and associated facilities, including transmission cabling and port development, to address potential impacts to fisheries, wildlife, and other coastal uses and resources and to take action to implement corrective actions identified in the assessment as appropriate.

Action: Investigate the potential benefits of, and process by which, the State of Maine may enhance and use its federal consistency review authority under the federal Coastal Zone Management Act (CZMA) to address issues of concern regarding offshore wind energy development in federal waters, including changes to State laws and rules which provide enforceable policies and establishment of a Geographic Location Description (GLD). The State should assess its ability to review monitoring and construction plans and develop a plan to do so that includes meaningful stakeholder engagement and may require additional resources.

Strategy 4

Enhance Regional Collaboration in the Gulf of Maine

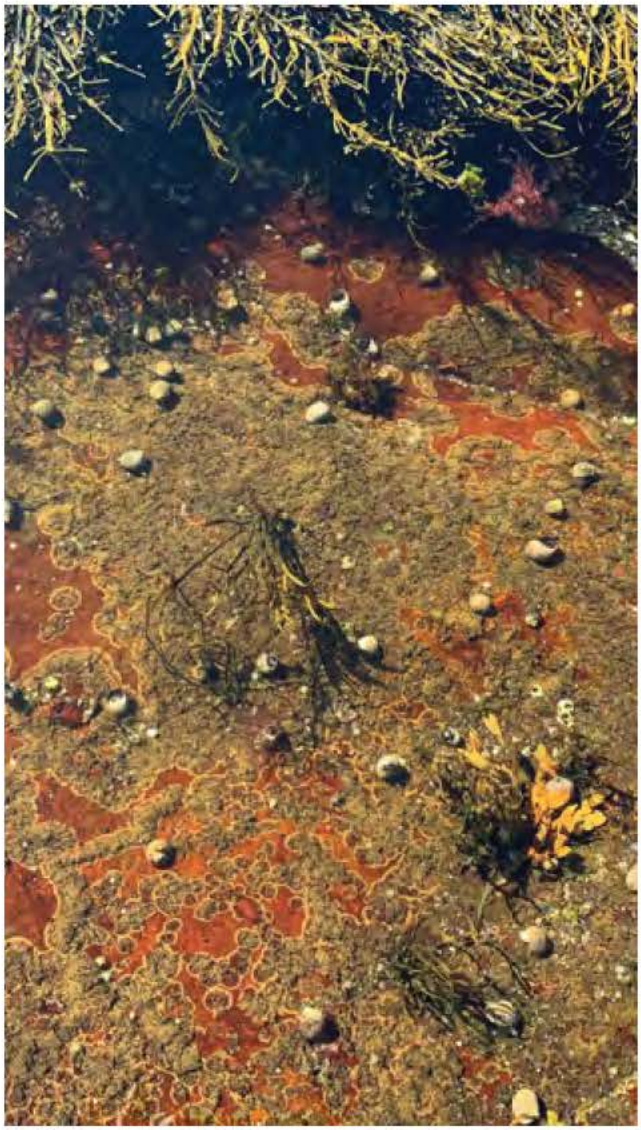
Maine can take several actions to ensure that there are coordinated efforts in the GOM, avoid duplication, and foster regional cooperation and joint learning as offshore wind continues to be developed along the East Coast. The New England States also have an opportunity to take the lead role in jointly identifying key resources that are important to avoid during the BOEM siting process and to identify and address cumulative impacts of multiple offshore wind energy developments on wildlife and the environment over time and space.

Action: Maintain active membership and support toward the Regional Wildlife Science Collaborative, National Offshore Wind Research and Development Consortium, Responsible Offshore Science Alliance, and other entities as resources allow.

Action: Encourage State-to-State regional approaches to inform BOEM siting process such as the newly initiated GOM portal work through the Northeast Ocean Data Portal.

Action: Consider a role for the Research Consortium to coordinate offshore wind ecological research and monitoring in the Gulf of Maine, including monitoring on projects, federal surveys, State surveys, and research at the University of Maine and other GOM institutions.

Action: Work with regional and national agencies and organizations to identify collaborative opportunities to identify and address cumulative impacts over time and across the U.S. Atlantic Coast.



Strategy 5

Pursue State and Other Funding Opportunities

Maine has already recognized through a $2 million appropriation to DMR that it is essential to invest in independent monitoring and research efforts, while collaborating and coordinating with federal and State efforts in the region as well as public and private research institutions and commercial research and monitoring. Commercial offshore wind site characterization surveys and post-construction monitoring efforts will necessarily be limited to specific project areas and will be limited in effort and duration. Additional funding will allow long-term research on questions that cannot be addressed within a standard development spatial scope or timeline, as well as provide key context for change within the ecosystem as a whole and communities that are dependent on them. Congress is exploring avenues to create a new dedicated stream of funding from future offshore wind development for coastal protection and resiliency, and these efforts should be encouraged.

Action: Support continued State funding for offshore monitoring and research. This includes funding for the Research Consortium as well as funding for fisheries and wildlife science, ecosystem monitoring, socioeconomics, community dynamics, and other fisheries and ecosystem-related topics.

Action: Pursue additional funding, both independently and in partnership with States whose fishing vessels use the Gulf of Maine to increase the available pool of funding for fisheries and ecosystem monitoring and research.

Action: Pursue funding from federal agencies such as BOEM and NOAA for pre-development monitoring, research, and characterization of designated Wind Energy Areas (WEAs) prior to lease auction.

Action: Encourage joint funding with New Hampshire, Massachusetts, and other regional States and stakeholders to support research efforts into identifying and addressing cumulative impacts of multiple offshore wind projects in the Gulf of Maine over space and time.

Action: Work with Maine's Congressional delegation to support legislation to fund efforts to protect impacted communities, including Tribes.

Action: Pursue State or other funding sources for the Research Consortium.

Action: Consider establishing a Coastal Fund, modeled after the Maine Department of Environmental Protection's (DEP) In Lieu Fee Compensation Program to support regional monitoring and environmentally responsible offshore wind development and mitigate impacts to wildlife, natural resources, and ecosystems.

Strategy 6

Facilitate Open and Transparent Engagement and Integration of Technical Advice

Maine will need an in-depth, coordinated, and cohesive assessment from a variety of disciplines along various stages of the development process to ensure environmentally-sound offshore wind projects. The timeline for development of offshore wind is long and complex. Neighboring States such as Massachusetts and New York have established both formal and informal advisory groups to help each State solicit input and broad technical expertise throughout the process. Maine is committed to building on the work of the Environment and Wildlife working group. Specific to the BOEM siting process for offshore wind development, the inter-governmental nature of the task force has made it difficult for non-governmental entities to have a voice in other regions. Maine will proactively solicit additional input to feed into the process to allow the input of Maine stakeholders to be understood and expressed through representatives of Maine.

Action: Utilize existing networks or establish an advisory body to further develop pre-and post-construction monitoring recommendations and environmentally responsible development methodology to avoid, minimize, or mitigate impacts, as outlined by the Environment and Wildlife Working Group.

Action: Develop a coordinated comment and engagement process for Maine's State agencies to effectively communicate with BOEM and other federal agencies during the NEPA Environmental Assessment and project-specific Environmental Impact Statement processes.

Action: Explore ways to provide an ongoing process for Maine stakeholders to engage in the broader siting process during the GOM Interagency Task Force Meeting with BOEM around potential wind energy areas, including holding Maine stakeholder meetings prior to GOM Interagency Task Force Meetings.

Strategy 7

Promote and Advance New Technologies

Technology is advancing rapidly, and new tools will be available to avoid, monitor, and minimize potential impacts over the next decade as commercial scale OSW projects are developed in the GOM. Maine should advocate for the continued use of the best available technology and encourage new research into technological advances. Because floating offshore wind is a relatively new industry in the U.S., planning and development must be dynamic and allow for the active integration of emerging research and guidelines for environmental impact reduction.

Action: Encourage BOEM to require all developers to utilize the latest, most effective technologies to avoid, minimize, and monitor impacts to wildlife and the GOM ecosystem to the extent practicable.

Action: Advocate for periodic review of the existing technology to avoid, minimize, and monitor impacts to wildlife, and encourage development of recommendations for new feasible technologies by the Regional Wildlife Science Collaborative (or some similar technical experts).

Cross-Cutting Themes

Through the development of the *Maine Offshore Wind Roadmap*, four foundational cross-cutting themes were deemed essential by the Advisory Committee for guiding Maine's overall approach to advancing responsible offshore wind.

Stakeholder Engagement & Communication

- **Collaborate closely and continuously with the fisheries industry.** The input and perspectives of Maine's fishing industry is crucial for offshore wind. The State, through DMR, will continue to advance these conversations through the existing Working Group framework, as needed. Engagement with the industry will occur early and often as offshore wind advances, to identify, avoid, and minimize impacts to the industry, harvesters, and communities. Fishermen possess significant and unique expertise and knowledge about the marine environment, the health and security of which is the essential to their livelihoods. This reliance, which exists within its own complex regulatory structure, must be recognized and respected when planning and developing offshore wind to avoid negative impacts and create opportunities for shared successes to support the industry's sustainability.
- **Stakeholder and fisheries engagement with Federal agencies.** Based on Maine's approach, the State will work to ensure the Bureau of Ocean Energy Management (BOEM) and other federal agencies employ effective and meaningful engagement and communication strategies and guidelines in its forthcoming process to determine commercial leasing and offshore wind development in the Gulf of Maine.
- **Collaboration with environmental and wildlife advocates and stakeholders.** The Gulf of Maine is a rare and highly productive ecosystem, providing an important habitat to many protected and commercially important species. Based on the models employed by the *Roadmap*, the State should continue to identify opportunities to engage with non-governmental organizations, natural resource agencies, and scientific and research entities to ensure their input is considered throughout upcoming offshore wind planning and development processes.
- **Engagement with communities directly involved or affected by offshore wind development.** While offshore wind's impact could affect—and benefit—the entire state of Maine, the *Roadmap* calls for ongoing efforts to solicit input and maintain strong two-way communications with those communities directly affected by offshore wind development. From shorefront communities where development of infrastructure, manufacturing, and support services are concentrated to municipalities on transmission corridors, these stakeholders will be provided with accessible information and encouraged to participate at critical points throughout offshore wind planning and development.

- **Utilization of existing communications tools and channels.** The *Roadmap* necessitated the creation of new communication tools and channels to raise awareness about offshore wind and encourage interested Maine audiences to follow and engage. These tools and channels—which include a dedicated website, e-mail newsletter, public meeting calendar, and more—are the foundation for ongoing communication efforts with stakeholders and the public.
- **Leverage trusted partnerships.** Maine will continue to partner with regional, state, local, community, and private entities about offshore wind to publicize information and opportunities for input, as well as allow for access to information and promote the offering of feedback.
- **Strive for continuous improvement.** Maine will continue to improve upon its approach to responsible offshore wind by seeking and incorporating stakeholder engagement and making every effort to expand public understanding of climate change and clean energy in Maine.

Equity

As offshore wind advances, Maine intends to support the talents of all Maine people, remove barriers to employment opportunities, avoid or mitigate negative impacts to vulnerable populations, and build a diverse in-state workforce. A commitment to equitable outcomes and process—integral to the *Roadmap*'s objectives and strategies—will continue throughout the *Roadmap*'s implementation of the recommendations contained within, and will benefit from new ways to involve groups and communities, particularly those who often may not have or cannot access a seat at the table.

During its development, the *Roadmap*'s Advisory Committee and Working Groups considered ways to create opportunities for historically disadvantaged communities and marginalized groups, particularly frontline communities experiencing disproportionate impacts from a changing climate. In Maine, those groups include lower-income rural communities, Tribes, refugees, and immigrants, among other populations.

The context for this *Roadmap* is Maine's transition to cost-effective renewable energy, a transformation in which offshore wind will play an important role. This transition will bring jobs, investment, new revenues, and clean energy to power our economy, as well as address inequities produced by the fossil fuel-based economy.

The volatility of energy costs from fossil fuels hits disadvantaged families hardest, particularly given Maine's reliance on home heating oil and an aging housing stock. Maine communities understand the problem of social vulnerability when fossil fuel prices rise, especially during winter months. Nine of Maine's 16 counties meet the federal economic distress criteria, including higher-than-average unemployment rates and/or lower-than-average income. A just transition to a renewable energy future would ensure costs and benefits of pursuing renewable energy are fairly distributed to enhance the lives of all Maine people.

This *Roadmap* urges coordination with rural, low-income, and other frontline communities, as well as with Tribes, given their intricate, cultural ties to natural resource uses and economic drivers. Going forward, the state will track *Roadmap* implementation across the equity factors represented in recommendations from the Maine Climate Council's Equity Subcommittee and nationally recognized tools and definitions, in particular the Justice 40 Initiative's Climate and Economic Justice Screening Tool (CEJST).

The *Roadmap* includes strategies and actions that commit to an equitable pathway for Maine's offshore wind industry, calling for studies and actions to understand and avoid disproportionate impacts on priority communities. This includes detailed recommendations to address potential impacts on fishing, which reflects repeated concerns from fishermen during the *Roadmap* process that offshore wind might jeopardize coastal communities that depend on fishing livelihoods. The *Roadmap*'s Fisheries Working Group, comprised of Maine fishermen, developed strategies to start addressing these concerns. The *Roadmap* also includes targeted workforce and supply chain strategies to provide opportunities for all Maine people, including historically disadvantaged communities and those with overwhelming dependence on a single economic sector. Further, the *Roadmap*'s strategies to promote cost-effective offshore wind energy speak to the importance of securing stable, affordable, renewable energy for all Maine people and businesses, particularly low-income residents.

While the work of hearing and incorporating the range of Maine's underrepresented voices is ongoing, this work is a long-term process. The State will continue to work to define key terms and develop a comprehensive economic transition approach for climate-impacted industries, as identified by the Maine Climate Council's Equity Subcommittee, working to ensure consistency across State entities. As this process unfolds, Maine remains committed to efforts to offset geographic and socioeconomic disadvantages to ensure the benefits of offshore wind are available statewide.

Transparency & Data-Driven Decision Making

The *Roadmap*'s objectives and strategies utilized a data-driven approach that sought to make informed decisions based on sound data and analysis. Throughout the process, several new rigorous technical studies (reference Appendix) guided the Working Groups and Advisory Committee.

An example of data-driven decision-making is the *Roadmap*'s approach in identifying and communicating priority considerations to BOEM regarding the siting of future commercial-scale projects in the Gulf of Maine, which has the potential to affect hundreds, if not thousands, of Maine's fishermen and fishing businesses. Maine has been proactive in driving the use of relevant geospatial data streams and critical analyses in the federal process for selecting lease areas.

Through the Gulf of Maine Mapping Portal, a project with the Northeast Regional Ocean Council's Northeast Ocean Data Portal, experts in fishing, fisheries, wildlife, and habitat share data to create Gulf of Maine-specific maps that depict where the greatest activity takes place—for fish, fishermen, and wildlife such as marine mammals and birds. These data layers are created using geospatial data that has been thoroughly vetted, made broadly available, and discussed through workshops among a variety of stakeholders and ocean users.

Through the forthcoming establishment of the Maine Offshore Wind Research Consortium, an Advisory Board that represents a cross-section of fishing industry representatives and other stakeholder interests will advise on the development and execution of a research strategy. This effort will produce relevant data in an open forum and improve understanding of the local and regional impacts of floating offshore wind power projects in the Gulf of Maine.

This comprehensive approach to research, data, and scientific analysis allows Maine to move ahead with confidence that key initiatives supporting the desired outcomes and objectives of the *Roadmap* are grounded by current data and analysis. It's critical that stakeholders also have access to data; the State is committed to continuing to work in partnership with stakeholders to collect, vet, and communicate data about offshore wind.

As the *Roadmap* transitions to implementation, Maine will continue to collect new, targeted data, conduct and support research and monitoring, and ensure additional data is collected in an open and transparent manner, and that the results of this work are made publicly available.

To that end, Maine's efforts will include:

- **Floating offshore wind research and demonstration projects.** The course of planning, development, and operations of floating offshore wind research and demonstration sites in the Gulf of Maine will provide important insight and data to inform commercial floating offshore wind projects in the Gulf that advance to permitting and operational planning.
- **Filling knowledge gaps in the Gulf of Maine.** BOEM's iterative stakeholder process regarding commercial-scale offshore wind leasing winnows large potential lease areas down to smaller areas to minimize potential impacts on the ecosystem, fisheries, and other ocean users.

There are known data gaps in the Gulf of Maine to inform this siting process; Maine and partner organizations are working to gather large-scale data on the Gulf of Maine to fill these gaps. As BOEM's commercial leasing process continues, and areas of interest are narrowed, Maine will pursue greater baseline data on those sites. Maine will also continue to work with partners to address other knowledge and research gaps, such as incorporating new spatial information on lobster landings in coming years, to inform BOEM's process.

- **Ensuring public availability of environmental and other non-proprietary data.** Maine will continue to work with developers and stakeholders to ensure timely public access to environmental and other non-proprietary data. The state will also work with partners such as the Regional Wildlife Science Collaborative for Offshore Wind on data standards and centralized access.
- **Using data and stakeholder engagement to support a stable, predictable permitting process.** To attract and secure offshore wind investment, permitting processes will be transparent and efficient, development efforts will be informed by proactive stakeholder input, and regulatory decisions will be consistent with applicable standards.

- **A collaborative and regional approach to monitoring and research.** To ensure transparency during the process of leasing, siting, permitting, and constructing offshore wind projects, as well as operations once begun, Maine will leverage existing work and coordination with regional public and private entities, such as the Regional Wildlife Science Collaborative for Offshore Wind and Responsible Offshore Science Alliance, to expand upon a framework for continued monitoring, research, and engagement.

JOSH ROSEN
JD/MBA, and a *Roadmap* contributor

"Maine stands to strongly benefit from offshore wind development and this *Roadmap* represents one of the State's keys to success with this burgeoning multi-billion-dollar industry. In addition to helping address the climate crisis, Maine's thoughtful approach to offshore wind development will support regional collaboration, grow the State's economy, and create a wide variety of supply chain and workforce opportunities throughout the State."

Regional Collaboration & Coordination

Maine shares the Gulf of Maine with other states and Atlantic Canada, and shares a regional electricity grid and participates with five other States in the ISO New England electricity market. Regional collaboration and coordination are essential to achieving the full benefits of offshore wind development.

To that end, the successful implementation of the *Roadmap* will require regional collaboration, partnerships, and information-sharing involving numerous public and private entities, governments, and individuals across the jurisdictions abutting the Gulf of Maine and beyond.

In the Gulf of Maine, offshore wind development will take place in federal waters and likely involve one or more states through cable landing, port facilities, operation and maintenance facilities, workforce, and supply chain companies. Additionally, some policy, planning, or regulatory goals relating to offshore wind may be achieved more readily at the regional scale, rather than at the individual state level.

Maine's electric utilities, as well as many of Maine's electricity market participants, are members of ISO New England (ISO-NE), an independent, not-for-profit corporation authorized by the Federal Regulatory Commission "responsible for keeping electricity flowing across the New England states and ensuring that the region has reliable, competitively priced wholesale electricity today and into the future."

After more than a decade of offshore wind research and planning, Maine has established collaborative relationships with federal agencies, neighboring states, State universities, and commercial partners. Advantages of this regional collaboration include:

- **Increasing economies of scale.** For the increased scale of projects contemplated in the *Roadmap*, Maine is partnering with New England and Atlantic states, organizations, and commercial entities to expedite and reduce costs of offshore wind technology development and manufacturing, while strengthening supply chain relationships to ensure stable costs and timelines.
- **Coordinated and efficient pursuit of federal funding.** With the recent passage of the Bipartisan Infrastructure Legislation (BIL), the Inflation Reduction Act (IRA), and the CHIPS and Science Act, federal resources will figure prominently in the development of Maine and the region's grid infrastructure and offshore wind more broadly. Maine is coordinating closely with states throughout New England and the Atlantic coastal region to pursue funding opportunities where appropriate.

- **Transmission planning.** A planned ocean grid has the potential to reduce impacts offshore and maximize interconnection points. It also raises unique timing, technology, and cost challenges. Maine is working with regional partners—such as New England states and ISO-NE—to develop a coordinated transmission plan. Maine will continue to research, plan, and develop new pathways related to responsible and innovative approaches to transmission. Maine will continue to align with regional partners throughout New England—and beyond—to match new production capacity with market demand and explore joint procurement options.
- **Coordinate regionally on procurement.** Maine has the benefit of taking lessons learned from past procurement efforts in the U.S. and around the world and will look to build on this experience in any future procurement of offshore wind for Maine. Given the size, scale, and costs associated with offshore wind projects, Maine will be best positioned to, at a minimum, coordinate procurement approaches with other states. Maine will also explore opportunities for regional procurement to help lower costs for Maine ratepayers and maximize benefits to Maine from economies of scale.
- **Protection of fisheries, environment, and wildlife.** Offshore wind's potential impacts on the Gulf of Maine's fisheries, environment, and wildlife are a shared interest for the local, Tribal, State, and regional economies and communities. As offshore wind advances, Maine is committed to collaborating with regional partners to foster cooperation, avoid duplication, learn from environmental research and monitoring and mitigation efforts, and engage insights of marine industry stakeholders and Tribal communities whose practices have necessarily adapted to survive. Further, Maine will maintain existing regional environmental partnerships and continue to build new opportunities for regional relationships that advance sustainability practices and inform efforts to mitigate potential impacts of offshore wind.

Implementing Maine's Offshore Wind Roadmap

Maine's Offshore Wind Roadmap charts a course for responsible offshore wind for Maine with immediate, short-term, and long-term actions. Implementing the Roadmap successfully will require the State and partners to leverage regional collaborations, provide clear communication and stakeholder engagement, ensure equitable access to opportunities, and utilize sound data.

Implementing the *Roadmap* will require action, coordination, and resources from across Maine and the region, including the State, the federal government, the private sector, educational institutions, the non-profit sector, regional organizations, and more.

Federal Resources:

The recent passage of three pieces of federal legislation provides an historic opportunity for Maine and the nation to advance renewables like offshore wind: The Bipartisan Infrastructure Law, the Inflation Reduction Act, and the CHIPS and Science Act. These laws clearly indicate that the energy transition is an economic transition for the United States. The Bipartisan Infrastructure Law provides $1.2T in funding for infrastructure such as electrical transmission and ports, improving federal permitting, offshore wind demonstration projects, regional clean hydrogen hubs, marine energy centers, and many coastal resilience activities. The Inflation Reduction Act (IRA) is widely considered the most significant federal investment in U.S. history to fight climate change. It includes $370B in investment in climate and clean energy programs, including tax credits for renewable energy developers and manufacturers, tax credits to companies to boost clean hydrogen production and carbon capture storage technologies, and provisions to advance inter-regional and offshore wind transmission planning, modeling, and analysis. IRA also incorporates prevailing wages and registered apprenticeships to create a skilled labor pipeline, diversify the workforce, and create access to high quality careers. The CHIPS and Science Act includes funding $170B in funding for R&D programs, including advanced energy, over 5 years. The passage of these federal laws provides historic opportunities to implement the relevant *Roadmap* actions and will require action from the State and private sector to realize these funding opportunities.

State and Other Resources:

In addition to federal funding, the State should also continue to advocate for federal legislation to require revenues from federal commercial leasing to be shared with states proximate to development.

To develop the *Roadmap*, the State has provided matching funds and considerable staff time and resources to support the development of the plan. Going forward, other funding opportunities may be considered by the Governor and Legislature. This could include State resources for planning and research, matching funds for federal grants, utilizing the green bank or other grant or bonding mechanisms, or stipulations in future power purchase agreements.

Implementation Progress

The State and partners have already begun implementing key actions from the to ensure responsible development of the Maine offshore wind industry. These include the following, organized by Roadmap Objective:

Objective A Pursue Offshore Wind Supply Chain, Infrastructure, and Workforce Investments to Support Economic Growth and Resiliency

- Participating in BOEM's Gulf of Maine Intergovernmental Renewable Energy Task Force
- Supporting the Maine Supply Chain Connect Registry linked to the national registry at the Business Network for Offshore Wind (Maine is a member)
- Coordinating with the Maine International Trade Center to offer preparatory training and marketing in 2023 for Maine businesses interested or working in the offshore wind sector
- Awarding grants through the Clean Energy Partnership Program to two workforce training projects lead by the University of Maine and the Local Ironworkers 7
- Using Roadmap Working Group recommendations to help inform State comments to the BOEM Request for Interest in the Gulf of Maine
- Participating in the Federal-State Offshore Wind Implementation Partnership on supply chain development, workforce training, transmission and interconnection, port capacity and other priorities
- Participating in a regional clean hydrogen hub proposal to the U.S. Department of Energy with five other states (NY, NJ, CT, RI, MA) and other public and private partners

Objective B Harness Abundant Renewable Energy to Reduce Long-Term Costs, Reliance on Fossil Fuels, and Fight Climate Change

- Participating in BOEM's Gulf of Maine Intergovernmental Renewable Energy Task Force
- Participating in a regional Request for Interest on transmission with four other states (MA, NH, CT, RI)
- Participating in the Federal-State Offshore Wind Implementation Partnership on supply chain development, workforce training, transmission and interconnection, port capacity and other priorities.
- Using Roadmap Working Group recommendations to help inform State comments to the BOEM Request for Interest in the Gulf of Maine

Objective C Advance Maine-Based Innovation to Compete in Emerging National and Global Offshore Wind Industry

- Advancing the floating demonstration projects in the Gulf of Maine in a phased approach to responsible offshore wind development
- Establishing the Maine Offshore Wind Research Consortium
- Participating in the National Offshore Wind Research and Development Consortium
- Participating in a regional clean hydrogen hub proposal to the U.S. Department of Energy with five other states (NY, NJ, CT, RI, MA) and other public and private partners

Objective D Support Maine's Vital and Thriving Seafood Industries and Coastal Communities

- Prohibiting commercial offshore wind projects in state waters (LD 1619)
- Participating in BOEM's Gulf of Maine Intergovernmental Renewable Energy Task Force
- Governor Mills' 10/29/21 letter to BOEM, asking the agency to prioritize engagement with fishing industry
- Using Roadmap Working Group recommendations to help inform State comments to the BOEM Request for Interest in the Gulf of Maine, the BOEM fisheries mitigation strategy, and the BOEM-NOAA Right Whale strategy
- Funding the mapping project to identify areas of potential greatest conflict for fisheries, environment, and wildlife; Maine funding has enabled the Northeast Ocean Data Portal to leverage additional funding to further advance and share Gulf of Maine data
- Gulf of Maine States' 1/11/22 Letter to BOEM recommending studies on environmental and socioeconomic impacts
- Conducting fisheries baseline trawl, acoustic, and other environment & wildlife surveys to inform research array
- Governors' Letters to Congressional Leadership and President Biden to support the Reinvesting in Shoreline Economies and Ecosystems (RISEE) Act
- Establishing the Maine Offshore Wind Research Consortium
- Reviewing state laws and regulations related to offshore wind to ensure protection of Maine's interests, per LD 1619
- Coordinating with other East Coast states and the Special Initiative for Offshore Wind to explore a fisheries mitigation fund to compensate existing ocean users from economic losses from offshore wind development

Objective E Protect the Environment, Wildlife, & Fisheries Ecosystem in the Gulf of Maine

- Participating in BOEM's Gulf of Maine Intergovernmental Renewable Energy Task Force
- Funding the mapping project to identify areas of potential greatest conflict for fisheries, environment, and wildlife; Maine funding has enabled the Northeast Ocean Data Portal to leverage additional funding to further advance and share Gulf of Maine data
- Using Roadmap Working Group recommendations to help inform State comments to the BOEM Request for Interest in the Gulf of Maine, the BOEM fisheries mitigation strategy, and the BOEM-NOAA Right Whale strategy
- Providing additional funding to the Seascape bathymetry surveys in the Gulf of Maine
- Gulf of Maine States' January Letter to BOEM recommending studies on environmental and socioeconomic impacts
- DIFW leveraging DMR state funding to secure federal funds to expand digital aerial surveys of the Gulf of Maine
- Reviewing state laws and regulations related to offshore wind to ensure protection of Maine's interests, per LD 1619
- Governors' August Letters to Congressional Leadership and President Biden to support the Reinvesting in Shoreline Economies and Ecosystems (RISEE) Act
- Establishing the Maine Offshore Wind Research Consortium
- Participating in the Regional Wildlife Science Collaborative on Offshore Wind to ensure that information essential to informing responsible offshore wind is collected and made widely available

See *Maine Offshore Wind Roadmap* Proposed Milestones on page 14

Implementation Chart on maineoffshorewind.org

Appendices

The Roadmap is informed by working group recommendations and scientific and technical studies including:

Working Group Full Recommendations:

Energy Markets And Strategies Working Group

Environment And Wildlife Working Group

Supply Chain, Workforce Development, Ports, And Marine Transportation Working Group

Fisheries Working Group

Technical Articles:

State of the Offshore Wind Industry: Today through 2050

Offshore Wind Energy Needs Assessment

Maine Offshore Wind Supply Chain Assessment

Offshore Wind Supply Chain Diversification and Attraction

Offshore Wind Supply Chain - Partnership Building

Maine Offshore Wind Talent Analysis

Offshore Wind Transmission Technical Review - Initial Report

Socioeconomic Analysis of Offshore Wind in the Gulf of Maine

Market Deployment Strategies for Offshore Wind in Maine

Supplemental Materials:

Summary of Maine Aviation Assets for Offshore Wind

Summary of Maine Manufacturing Assets for Offshore Wind

Stakeholder Engagement Summary

Additional External Reports Consulted

DOE Offshore Wind Vision

DOE Offshore Wind Strategy

**Reports available at maineoffshorewind.org*

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Offshore Wind
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GOVERNOR'S
Energy Office

offshorewind@maine.gov
maineoffshorewind.org